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Neonatal Outcomes in Planned Community Birth Settings

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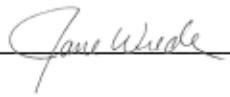
Second Reader Signature: 

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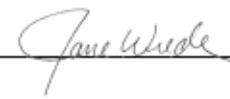
Director of Nurse-Midwifery Program Signature: 

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Abstract Background/Purpose: The safety of community births is a common point of discussion, especially in regard to neonates. Planned community births are supported for low-risk, informed patients by the ACNM. The purpose of this literature review was to understand neonatal morbidity and mortality in planned community birth settings.

Theoretical Framework: Orlando's Nursing Theory focuses on immediate patient needs and promotes growth of nurses in unstable environments. This theory applies the competency of the nurse's practice and the satisfaction of the patient. The Orlando Nursing Theory will be applied and explored as a framework in relation to neonatal outcomes in different birth settings.

Results/Findings: It was identified that maternal characteristics, including parity, gestational length, and advanced maternal age, affect neonatal outcomes. Results showed that distance from the hospital did not affect neonatal outcomes in community births. The lowest rates of neonatal morbidity and mortality were found to be midwife-attended hospital births, compared to physician-attended births at the hospital and community births by midwives. Community births were found to be just as safe, or even had better neonatal outcomes, compared to hospital births. Limitations of the research existed due to small sample size and factors, such as maternal transfer during labor, that may have altered the results of some studies.

Implications for Research and Practice: The data affect how midwives counsel patients about birth settings and safety, regardless of practice setting, and could spur recommendations for improving safety. Midwives, as the primary care attendants in home and birth center settings, have the priority to assess all outcomes that occur and provide efficient solutions if necessary.

Further research is needed; in addition to identifying accurate representation of neonatal outcomes in the home and birth center setting, there is a need to alter and adjust research strategies. Controlling for the attendant present at delivery and modifying for the community's integration level of birth setting would provide results that are more transferable.

Keywords: community births, newborn, neonates, outcomes

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Chapter I: Introduction

Midwives are becoming more and more prevalent in today's society. As the use of certified nurse-midwives and certified midwives grows, so does the opportunity to give birth in a place other than the hospital. Women are becoming more interested in giving birth at home or in a birth center, where a more private and intimate birth experience is available. This gives women a feeling of control and safety as a more calming environment of one-on-one midwifery care provides the physical, emotional, and spiritual support that is vital to good outcomes in birth (Cohen, 1999). Regardless of setting, protocols should be set with risks addressed and health requirements reviewed. As women decide in which setting they will deliver, they will want to know the risks and safety measures in place for both themselves and their newborns. One of the best ways to determine the effectiveness of these measures is to compare the outcomes for home and birth center births. Midwives in community settings screen pregnant patients to ensure they are low risk and not likely to require excessive interventions at birth, which gives them the potential for better outcomes than those resulting from giving birth in the hospital. However, it cannot always be determined how a baby will respond to delivery based on the mother's low level of risk, which is why there is a need to specifically examine neonatal morbidity and mortality in home and birth center settings.

Birth centers were created when women began to desire options for alternative settings and care. The Maternity Center Association answered these yearnings in 1975 by opening the Childbearing Center in New York, following an approved model with certification and licensing (American Association of Birth Centers, n.d.). Over the years, guidelines, certifications, funding, and research have all been put in place to improve and grow the birth center setting. In 2017, there were more than 345 freestanding birth centers in the United States within 37 states and

Washington, DC; this demonstrates the continued progress in the birth center setting with a growth rate of 76% since 2010 (American Association of Birth Centers, n.d.).

Home births have existed since the beginning of time, when they were the only option (Pascucci, 2014). Although hospital births are the setting for 99% of births that occur in the United States, planned home births do still take place (Pascucci, 2014). As home births become more widespread, with data published for approximately 17,000 planned American home births, concerns about safety in maternal and neonatal outcomes become more prevalent (Pascucci, 2014). Safety is the priority in any birth setting and no birth is ever risk-free, regardless of where it takes place. There are many factors to consider when an individual is deciding where to give birth; further research into the neonatal outcomes within home and birth center births can help guide these decisions and determine areas of potential growth and development.

Statement of Purpose

The purpose of this paper is to critically examine scholarly works in order to determine the occurrence of neonatal morbidity and mortality in the home and birth center setting compared to in-hospital births. The intent of this review will focus on studies of births in either the home or birth center setting that were planned and attended by certified nurse-midwives or certified midwives within the last 10 years. Orlando's Nursing Theory focuses on immediate patient needs and promotes growth of nurses in unstable environments. This theory applies the competency of the nurse's practice and the satisfaction of the patient. The Orlando Nursing Theory will be applied and explored as a framework in relation to neonatal outcomes in different birth settings.

Significance to Nurse-Midwifery

The American College of Obstetricians and Gynecologists (ACOG) and the American College of Nurse-Midwives are the primary organizations that influence the practice standards

for certified nurse-midwives and certified midwives. According to the ACOG (2017), the safest setting for birth is a hospital or accredited birth center; however, it states that each woman has the right to make a medically informed decision about delivery. It is also vital to inform women of the factors that are crucial to reducing perinatal mortality rates and achieving favorable home birth outcomes (ACOG, 2017).

The American College of Nurse-Midwives (ACNM) has published a large list that encompasses its position statement in relation to the home birth setting. Similarly to ACOG, it does not take a specific stance on neonatal outcomes in home and birth center settings; however, it does address safety, outcomes, and appropriate care for certified nurse-midwives (CNMs) and certified midwives (CMs). According to the ACNM (2011), every woman has the right to make an informed decision about where to give birth, and CNMs/CMs are professionals who are qualified to provide ongoing assessment of appropriate birth site selection over the course of the antepartum, intrapartum, and postpartum periods as well as provide newborn care in the home or birth center setting. The organization also states that the characteristics and management of normal birth, including the influence of birth setting, should be the focus of research and evaluation that should address outcomes, client satisfaction and experience, markers of morbidity as they relate to birth site, and the development of ongoing quality assurance initiatives (ACNM, 2011).

This highlights the need for additional and continuous research on outcomes across birth settings. While the majority of women in the United States deliver in a hospital setting, some couples choose to plan a home or birth center birth. Within midwifery care, women and families are encouraged to make informed decisions concerning the kind of birth plan that will best meet their individual needs. This includes the choice of location for the birth experience based on the

adequate assessment of maternal and fetal health and proper education about potential risks and benefits at each site. It also includes a review of transfer protocols and transport procedures if the patient's condition requires additional personnel or equipment available only in a hospital setting (American College of Nurse-Midwives, 2011).

Midwives are the primary attenders of home and birth center births, which makes these data specific to their practice. The hallmarks of midwifery guide and characterize the care they provide to their patients. Incorporation of scientific evidence into clinical practice is one of the hallmarks that promotes and emphasizes the importance of implementing the results identified in the literature (ACNM, n.d.). These data affect how midwives counsel patients about birth settings and safety regardless of practice setting and could spur recommendations for improving safety.

Evidence Demonstrating Need

According to Cochrane (2012), there is no strong evidence from randomized trials that favors either a planned hospital birth or a planned home birth for low-risk pregnant women. However, some observational studies have advised that planned hospital births are not any safer than planned home births assisted by an experienced midwife with collaborative medical support (Olsen & Clausen, 2012). The Cochrane study emphasizes the importance of preparing a consistently updated systematic review that includes observational studies because there has been a progressively increasing number of observational-type studies with quality evidence in favor of home births (Olsen & Clausen, 2012). This review seeks to understand the true comparative neonatal risks based on birth setting. Stronger evidence and additional studies are necessary to fully determine the safety of home and birth center settings compared to in-hospital settings.

Theoretical Framework

Ida Jean Orlando worked as an associate professor in the nursing school at Yale University, where she was also a director of the Graduate Program in Mental Health Psychiatric Nursing (*Ida Jean Orlando—Nursing Theorist*, 2016). During her time at Yale, she assumed the role of project investigator of a National Institute of Mental Health grant, and this research led to the development of the Deliberative Nursing Process. Better known as Orlando's Nursing Theory, the process was established in 1961 with the focus of assisting the nurse to determine and suit the immediate needs of her patients (*Orlando's Nursing Process Discipline Theory*, 2016). The nursing theory implements three elements within a process to adequately address the needs of the patient. Any situation a nurse may encounter contains the components of the patient's behavior, the nurse's response, and any interventions or care the nurse provides to relieve the patient's distress (Potter & Bockenhauer, 2000). The method to be used by the nurse in Orlando's theory starts with identifying her own perception and feelings about the patient's behavior; she then confirms this with the patient (Potter & Tinker, 2000). Once she addresses this with the patient, she must devise an intentional action plan to meet the immediate needs of the patient (Potter & Tinker, 2000). Finally, the nurse determines whether the patient's needs have been fulfilled or there is a need for further action. This theory applies the competency of the nurse's practice and the satisfaction of the patient.

Orlando's theory states that the purpose of nursing is to provide help to address and meet the patient's needs (*Orlando's Nursing Process Discipline Theory*, 2016). Orlando states that nursing is receptive to those who suffer, or who foresee a sense of helplessness, such as a neonate. It is focused on the course of care in an immediate experience. It is also concerned with delivering direct support and intervention to a patient in any setting, whether it is a home birth or

birth center, for the purpose of evading, relieving, lessening, or curing the helplessness in the patient (*Orlando's Nursing Process Discipline Theory*, 2016). By implementing Orlando's theory, the provider can seek to better understand the occurrence and risks of neonatal morbidity and mortality in the home and birth center setting and use these findings to improve safety. Neonates may be reliant on others to sustain life, especially in the vulnerable time directly after delivery when transitioning to life outside the womb. Recognizing when a fetus or neonate is in need of additional support is vital to providing efficient and effective care to prevent poor outcomes.

Summary

Neonatal outcomes need to be reviewed for all birth settings; however, as the prevalence of home and birth center births grows, further research is indicated to recognize safety and provide education to those who decide to deliver in such settings. Midwives, as the primary attendants in the out-of-hospital setting, have the priority to assess all outcomes that take place and act quickly when necessary. Both the ACOG and the ACNM position statements support women having the right to make an informed decision concerning the location in which to give birth; however, further research needs to be completed and reviewed to address the outcomes within each setting to ensure women are able to make a fully informed decision. Chapter 2 will define the methods used to analyze scholarly works in order to determine the occurrence of neonatal morbidity and mortality in the home and birth center settings compared to in-hospital births. Chapter 3 will synthesize the literature, including a description of outcomes and strengths and limitations of the studies. Finally, chapter 4 will discuss literature findings in relation to the practice question, with implications and recommendations for midwifery practice and future research.

Chapter II: Methods

The purpose of this chapter is to discuss the review of the literature regarding neonatal morbidity and mortality in community birth settings. This chapter will cover the search process for discovering the literature, criteria for both inclusion and exclusion of articles, a summary of selected articles, and evaluation criteria of the literature.

Search Strategies

An extensive literature review was conducted utilizing CINHAL, PubMed, Google Scholar, and the Cochrane Database of Systematic Reviews. During the initial search, no date limit was included to ensure the review of all available literature. The search terms used in all of these sites included *home birth neonatal*, *home birth*, *out of hospital*, and *neonate*. The initial search resulted in 4,481 articles. The search was then restricted to the years 2010–2019, which resulted in 553 studies. Research from developing nations and articles that were not published in English were eliminated, reducing the total number to 309. Redundant results across search engines were also eliminated. Abstracts of the remaining 278 articles were reviewed to ensure relevance to the topic being studied. The resulting 278 articles consisted of 39 articles from CINAHL, eight articles in Cochrane, 12 articles in Google Scholar, and 219 articles in PubMed. This resulted in a total of 20 articles being compiled for further analysis upon fully applying the inclusion and exclusion criteria.

Criteria for Inclusion and Exclusion

Parameters used for inclusion of articles in this literature review included limiting the dates of publication to 2010–2019. Articles were also selected based on the intended place of birth being a planned home birth, a freestanding birth center, or both. Additionally, the birth attendants in the articles included CNMs, or the international equivalent. It is important to note

that some of the articles included in the literature review did contain births attended by other professionals, including physicians and certified professional midwives (CPMs); in some articles, these outcomes are not differentiated. Articles were not limited based on the country and reflect outcomes from the United States as well as Canada, Israel, and several Western European countries.

Exclusion criteria for this literature review eliminated articles published prior to 2010 or not published in English. Additionally, studies that took place in non-Westernized nations, where the health systems were too difficult to compare, were also excluded from this review. Articles that did not specify whether the neonatal outcomes in home births were the result of planned or unplanned home birth were also excluded in order to better evaluate the studies that focused on planned community births.

Summary of Selected Studies

The final 20 articles consisted of 10 retrospective cohort studies, six retrospective descriptive studies, one prospective descriptive study, two retrospective case studies, and one prospective cohort study. The studies took place in the United States, Canada, Denmark, France, Finland, the Netherlands, Germany, and Israel. After condensing the initial search results to 278, a final 20 were selected after reviewing the abstracts for relevancy.

Evaluation Criteria

The articles that were utilized for the literature review were evaluated using the Johns Hopkins Research Evidence Appraisal Tool (Dearholt & Dang, 2012). This tool allows for the evaluation of articles on a scale of I–IV depending on the type of research that was performed. Level I studies consist of meta-analyses, which were excluded from this literature review. All articles included in this review were evaluated as Level III studies, which consist of non-

experimental studies, quasi-experimental studies, qualitative studies, and systematic reviews of randomized controlled trials or systematic reviews without meta-analysis (Dearholt & Dang, 2012).

After evaluating each article in the literature review on the scale of I–IV, the quality of evidence that each article provided was evaluated on a scale of A, B, and C (Dearholt & Dang, 2012). Level A research demonstrates highly generalizable results and has an adequate sample size as well as a control group, which allows recommendations to be consistent with scientific evidence. Level B research provides fairly consistent results and has an adequate sample size. It allows for mostly consistent recommendations and contains a thorough literature review that includes scientific evidence. Finally, Level C contains either very little evidence, inconsistent results, insufficient sample size, or conclusions that cannot be drawn from the study (Dearholt & Dang, 2017). Only four of the articles in the literature review were rated C for quality due to the small sample size, and the remaining 16 were rated B for quality.

Summary

An extensive search was conducted to ultimately identify 20 articles regarding neonatal morbidity and mortality in community birth settings. These articles were carefully evaluated to ensure relevance to the literature review through consistent exclusion and inclusion criteria. The selected articles were then evaluated using the Johns Hopkins Research Evidence Appraisal Tool.

Chapter III: Literature Review and Analysis

Synthesis of Matrix

The matrix was used to compile a literature review and to help identify outcomes and themes within the articles (see Appendix 1). The articles included in the matrix were made up of 10 retrospective cohort studies, two retrospective descriptive studies, five retrospective studies, two retrospective case studies, and one prospective cohort study. All of the studies were evaluated using the Johns Hopkins Research Evidence Appraisal Tool (Dearholt & Dang, 2012). The matrix is composed of the purpose of the study, sample and setting, level of evidence, quality of evidence, research design, outcomes and measurements, results, conclusion, strengths and limitations, author recommendations, and summary for clinical practice. The matrix was organized alphabetically by citation.

Synthesis of Major Findings

After conducting a literature review, 20 research articles were identified to further understand neonatal mortality and morbidity associated with planned community deliveries. Five categories emerged while analyzing the literature review to determine both outcomes and major contributing factors to outcomes. The categories included maternal characteristics affecting neonatal outcome, variations in outcome related to type of birth attendant, transfer and transportation factors, neonatal morbidity, and neonatal mortality.

Maternal Factors Affecting Neonatal Outcomes

Parity. Gaining a deeper understanding of which maternal factors lead to poor neonatal outcomes can help women be more informed about their choice of birth location and allow providers to give accurate risk information to patients. Several studies examined the relationship of nulliparity to neonatal deaths, although their findings were not statistically significant. They

found that nulliparous mothers had a mortality risk of 1:444 births (Grünebaum et al., 2017b), nulliparous neonatal death rates were higher in planned home births than hospital births (p = 1.02; Jonge et al., 2014), and midwife-attended home births compared to midwife-attended hospital births resulted in higher infant mortality rates, 2.19 per 1,000 births ($p < 0.001$; Grünebaum et al., 2014). Nulliparous women delivering at home were found to have a greater incidence of 5-minute Apgar scores of less than 7 ($p = 0.168$; Darling et al., 2019). In contrast, multiparous mothers had only a very slight increase in neonatal mortality in planned home births over hospital births (0.59 vs. 0.58; Jonge et al., 2014). Jonge et al. (2014) noted an increased neonatal mortality rate among multiparous women in home birth settings attended by midwives compared to those who delivered in the hospital ($p = 5.34$). Multiparous mothers had decreased neonatal morbidity risks associated with planned home births, including lower rates of NICU admission (1.36 vs. 1.95) and lower Apgar scores, versus planned hospital births (Jonge et al., 2014).

Previous Cesarean Section. Women pursuing a community birth after a prior cesarean were found to be at increased risk of neonatal mortality and morbidity in the two studies that explored this factor (Grünebaum et al., 2017b; Bovbjerg et al., 2017). Mothers who had a trial of labor after cesarean (TOLAC) in a home birth setting (N = 12,953,671) had a 1:529 risk of neonatal mortality (Grünebaum et al., 2017b). Mothers who pursued a TOLAC were found to have an increased risk of the infant having low and very low Apgar scores (< 7 and < 5 at 5 minutes of life respectively), NICU admission, neonatal hospital admission, and neonatal death; all of these findings were statistically significant, with p values < 2 for all outcomes (Bovbjerg et al., 2017).

Prolonged Pregnancy. Prolonged gestation was found to lead to adverse neonatal outcomes as well. In a retrospective cohort study ($N = 15,906,211$), it was found that gestations of greater than or equal to 41 weeks had a neonatal mortality rate of 1:582 (Grünebaum et al., 2017a). Neonatal mortality was also higher specifically for home births attended by midwives in pregnancies that were 41 weeks or greater, though this was not statistically significant ($p = 4.43$; i; Grünebaum et al., 2017a). Two retrospective studies found an increased risk of neonatal death in post-term pregnancies of greater than 41 weeks gestation. Bovbjerg et al. (2017; $N = 47,392$) was one, and these findings were not statistically significant ($p = 2.2$). However, Grünebaum et al. (2014; $N = 13,936,071$) found a statistically higher rate of neonatal death in planned home deliveries, with a midwife at 41 weeks or greater gestation, than in those attended by a midwife at a hospital ($p < 0.001$).

Advanced Maternal Age. Advanced maternal age, 35 years and older, was found to possibly contribute to increased neonatal morbidity and mortality, with a neonatal death rate of 1 in every 735 births (Grünebaum et al., 2017b). In a retrospective cohort study, only a slightly increased risk of adverse neonatal outcomes was found in association with advanced maternal age, and it was not statistically significant ($p = 1.7$; Bovbjerg et al., 2017). The same study also found no increased risk of neonatal death in the advanced maternal age group in the home birth setting (Bovbjerg et al., 2017).

Variations in Neonatal Outcome Related to Type of Birth Attendant

Neonatal outcomes also seemed to be affected by the provider attending to the birth. One notable factor is that these studies did not include physicians in the community birth setting; a retrospective cohort study ($N = 12,953,671$) noted that the risk of neonatal mortality was higher in home births attended by CNMs as opposed to hospital births attended by CNMs ($p < 0.001$;

Grünebaum et al., 2017a). While not statistically significant, another retrospective cohort study ($N = 13,936,071$) that looked more in-depth at the attending providers and the location of birth found that midwives who attended home births had the highest rate of neonatal mortality ($p = 3.6$), followed by physician-attended hospital births ($p = 1.7$), and midwife-attended hospital births had the lowest rate of neonatal death ($p = 1$; Grünebaum et al., 2017b). These findings were also echoed in another study that found midwife-attended home births to have a higher rate of neonatal mortality than midwife-attended hospital births (Grünebaum et al., 2014). Lastly, the final retrospective study ($N = 1,335,471$) that was reviewed regarding neonatal outcomes and providers looked at neonatal mortality rates per 1,000 live births and found that CNM-attended home births had a mortality rate of 1.0, whereas other midwife-attended home births had a mortality rate of 1.8 (Malloy, 2010). CNM-attended birth center births had a mortality occurrence of 0.6. (Malloy, 2010).

Transfer and Transportation Factors

One theme that emerged in the research was the distance between the intended community birthplace and the nearest hospital and how that affected neonatal outcomes. One retrospective cohort study ($N = 11, 869$) asserted that there was nothing to support inferior neonatal outcomes when the mother's intended place of birth was greater than 30 minutes from the nearest hospital with 24-hour cesarean capabilities (Darling et al., 2019). This claim was further strengthened by another study's findings that women who delivered at home or in a birth center in a rural setting did not have any differences in neonatal outcomes compared to women who delivered in non-rural settings (Nethery et al., 2017).

A secondary theme that emerged was patient transfer during either the intrapartum or neonatal period. Darling et al. (2019) studied the need for emergency medical services (EMS) at

delivery and found no difference in neonatal outcomes when deliveries occurred greater than 30 minutes from the nearest hospital with 24-hour cesarean capabilities, compared to home births that occurred within the 30-minute radius; however, this finding was not statistically significant ($p = 0.16$). The author noted that EMS may often be called as a precautionary measure, but it does not necessarily lead to transfer of the patient(s) or adverse outcomes. The study also examined EMS transfers within the rural and non-rural home birth cohorts and found no difference in neonatal outcomes for those in either group who did require transfer, although not statistically significant ($p = 0.12$; Darling et al., 2019). A prospective cohort study that examined outcomes in freestanding birth centers ($N = 15,574$) discovered a 2.6% transfer rate of newborns after birth (Stapleton et al., 2013). The majority of these transfers were non-emergent, as only 1.9% of transfers were emergent for either mother or baby throughout the labor and delivery process (Stapleton et al., 2013).

Neonatal Morbidity

Low Birth Weight. The literature review presented a wide variety of findings regarding neonatal morbidity. The trend of low-birth-weight infants (LBW) emerged as well as preterm births. Home births were found to increase the incidence of LBW infants of less than 2,500 grams ($p = 1.41$; Hutton et al., 2016). A study that focused on the impact of freestanding birth centers found that women in their care had preterm birth rates at half the national average (Alliman et al., 2019). The preterm birth rate for non-Hispanic white women was 4.2%, and non-Hispanic black women had a preterm birth rate of 5.1% (Alliman et al., 2019).

Apgar Scores. Apgar scores were another indicator of neonatal morbidity that became a theme throughout the research. A total of thirteen studies included this outcome, of which only two had statistically significant findings. Hutton et al. (2016; $N = 11,493$) was a matched

retrospective cohort study in which less than 1% of all neonates, both those born in the hospital and those born at home, showed an Apgar score of less than 4 at 5 minutes of life. In Maimburg (2018; $N = 268$), home births resulted in only 1% of neonates having Apgar scores less than 7 at 5 minutes of life. Another study with a smaller sample size ($N = 1,206$) found no statistical differences in Apgar scores between infants born in a birth center or hospital setting ($p = 0.117$; Gaudineau et al., 2013). One study found no significant difference in low Apgar scores between hospital and home birth groups examined among nulliparous women (.41& vs. 3.61&, aOR 1.05, 95% CI [0.92–1.18]; Jonge et al., 2014). Another study also found that while Apgar scores of less than 7 at 5 minutes of life occurred in the home birth setting, this rate was not higher than in the hospital setting ($p = 0.58$; Darling et al., 2019).

However, some studies found a positive correlation between low Apgar scores and home birth. One study ($N = 720,217$) noted that infants born at home were more likely to have a 1-minute Apgar score of less than 7 ($p = < 0.001$; Ovaskainen et al., 2019). Additionally, a different retrospective cohort study ($N = 2,081,753$) discovered that planned home births resulted in a greater number of infants who had an Apgar score of less than 4 at 5 minutes of life, compared to the hospital control group (0.37% vs. 0.24%; $p = 0.009$; Cheng et al., 2013). While studies' findings are conflicting, there is currently more data to support comparable rates of low Apgar scores between community and hospital birth settings.

NICU Admissions. Admission of neonates to the neonatal intensive care unit (NICU) was another measure of neonatal morbidity. The studies reviewed showed a range of results, including increased risk, decreased risk, and no difference of risk of NICU admission. It is important to note that no studies that examined NICU admission had statistically significant results. One descriptive study ($N = 196$) found NICU admission rates were twice as high for

newborns born in the hospital cohort as opposed to the community setting (Maimburg, 2018). Ovaskainen et al. (2015), a cohort study ($N = 76,773$), found that infants born outside the hospital were more likely to be admitted to the NICU for suspected infection or hypothermia than infants born in the hospital. Several studies did not speak of conclusive increased or decreased rates of NICU admissions, such as a retrospective descriptive study ($N = 6,424$) that noted NICU admission accounted for 2.9% of births in one study, including 1.8% of LBW infants who were admitted to the NICU (Alliman et al., 2019). In a retrospective cohort study that had the largest sample size of the studies reviewed ($N = 720,047$), 2.9% of infants in the home birth cohort were admitted to the NICU, compared to 5.8% of the hospital cohort, which was not statistically significant ($p = 0.11$; Ovaskainen et al., 2019). NICU admission was a noted adverse outcome in Darling et al. (2019; $N = 11,869$); however, there were statistically significant lower rates of NICU admission in the group of home births in a rural setting as compared to the group of home births within 30 minutes of the nearest hospital capable of performing 24-hour cesareans ($p = 0.001$). NICU admissions did not statistically differ between hospital and home birth cohorts or change among the parity of the mothers in Jonge et al. (2014; $N = 814,979$; 3.41& vs. 3.61&, aOR 1.05, 95% CI [0.92–1.18]). In a small descriptive study by Maimburg (2018; $N = 268$) that examined neonatal outcomes with a caseload midwifery team in Denmark, less than 1% of newborns born at home were transferred to the NICU after delivery. These admissions included an infant who was observed following maternal fever during labor and one who was observed due to meconium aspiration. Only one study ($N = 79,727$) noted decreased rates of NICU admission that were lower for the home birth cohort compared to the hospital cohort (Snowden et al. 2015). While there was mixed evidence regarding NICU

admission rates in community birth settings, a substantial amount of literature supports the assertion that NICU admissions are lower in community birth settings than in the hospital.

Other Adverse Outcomes. Other various adverse neonatal morbidities were found in these studies, including meconium aspiration syndrome, neonatal seizures, use of positive pressure ventilation (PPV), and the need for compressions. In a retrospective cohort study conducted by Hutton et al. (2016; $N = 11,493$), 28 infants in both the home birth and hospital cohorts required PPV and chest compressions, and the study found no statistical differences in neonatal morbidity between the cohorts. Maimburg (2018) noted that 14% of patients who were having a planned home birth had meconium-stained fluid, 23% of which resulted in transfer to the hospital. The results of the study by Darling et al. (2019) showed that meconium aspiration occurred during home birth, but at rates no different from its occurrence in the hospital ($p = 0.19$). In a retrospective cohort study ($N = 79,727$), neonates born in planned home births were at higher risk for neonatal seizures compared to those born in the hospital (Snowden et al., 2015). Another retrospective cohort study ($N = 2,081,753$) found that neonatal seizures actually occurred at higher rates in the hospital cohort compared to the planned home birth cohort (0.06% vs. 0.02%; Cheng et al., 2013). The study by Ovaskainen et al. (2019; $N = 720,047$) found that infants born at home were at an increased risk of requiring invasive ventilation or therapeutic hypothermia; however, it also found that infants born at home were at a lower risk of overall neonatal morbidity than those born in the hospital, but these findings were not statistically significant ($p = 0.9$).

Special Populations. One retrospective study ($N = 47,392$) specifically identified two special populations as being correlated to adverse outcomes for neonates in the home and birth center settings (Bovbjerg et al., 2017). The first population, twin pregnancies, showed an

increased risk for most morbidities, including NICU admission, intrapartum transfer, postpartum transfer, maternal hospitalization, cesarean section, and low and very low (< 7 and < 4) Apgar scores at 5 minutes of life (Bovbjerg et al., 2017). The second population was breech presentations. This population showed increased risk for all adverse outcomes, including NICU admission, low and very low Apgar scores at 5 minutes of life, and neonatal death. Breech presentations also had the highest risk of fetal death and cesarean sections (Bovbjerg et al., 2017).

Positive Neonatal Outcomes. Some positive outcomes of neonates were also worth noting from this literature review. Two studies showed no differences between neonatal morbidity found in home birth and hospital groups (Hutton et al., 2016; Ovaskainen et al., 2019). Umbilical arterial pH levels were higher among infants born in the birth center, as compared to in the hospital labor ward ($p = 0.017$; Gaudineau et al., 2013). Neonatal morbidity was the same between the hospital labor ward and birth center groups (Ovaskainen et al., 2019).

Neonatal Mortality

When examining neonatal mortality, trends were found within the data regarding correlation to increased mortality risk, including certain special populations that were found to have increased risk of neonatal mortality. The findings regarding neonatal mortality ranged from four studies finding increased mortality, to one study finding no difference in mortality between cohort groups, to three studies finding decreased mortality in community birth settings, and were overall inconsistent. The studies were composed of five retrospective cohort studies, one retrospective case study, and one prospective cohort study. In the retrospective cohort study by Grünebaum et al. (2017a; $N = 15{,}906{,}211$), there were several important findings: (1) the population with the highest risk of neonatal death was women planning a home birth with a

known breech presentation, which resulted in a 1:78 risk of neonatal mortality; (2) nulliparous women had a 1:444 risk of neonatal mortality with planned home births; (3) women pursuing a vaginal birth after cesarean in a home birth setting had a neonatal mortality risk of 1:529; (4) gestational age of 41 weeks or greater was associated with a risk of neonatal death in 1:582 births; and (5) advanced maternal age was found to lead to a neonatal mortality rate of 1:753 births (Grünebaum et al., 2017a). Vaginal twins born in an out-of-hospital setting were the only neonatal deaths in a retrospective cohort study with a sample size of 720,217 (Ovakainen et al., 2019).

Understanding causation of neonatal deaths is important to increasing safety and screening for community births. In the retrospective study by Grünebaum et al. (2017b), there was increased neonatal mortality in the home birth setting. The increased mortality findings, which were not statistically significant, included labor and delivery complications that accounted for 39.3% of neonatal deaths (Grünebaum et al., 2017b). These complications consisted of hypoxic ischemic encephalopathy (HIE), birth asphyxia, and intrauterine hypoxia and accounted for 18.1% of home-birth deaths. These cases made up 8.6% of physician-attended neonatal deaths and 5.5% of hospital midwife-attended births ($p = 13.4$ Grünebaum et al., 2017b). Congenital anomalies led to 29.5% of neonatal mortality in the home birth setting compared to the hospital, where these deaths led to 51% of neonatal deaths attended by physicians and 43% attended by midwives ($p = 2.5$; Grünebaum et al., 2017b). Infection was the cause of 12.3% of deaths in the home birth setting, in contrast to 0.3% of midwife-attended hospital births and 0.4% of physician-attended hospital births ($p = 4.4$; Grünebaum et al., 2017b).

Unfavorable findings regarding neonatal mortality in community birth settings included a retrospective cohort study that found a higher neonatal mortality rate associated with planned

community births as opposed to planned hospital births (Snowden et al., 2015). Additionally, it found an increase in neonatal mortality for home births attended by midwives as opposed to hospital births attended by midwives, 9.32 vs. 7.89 per 10,000 births respectively (Grünebaum et al., 2014).

There were favorable outcomes regarding neonatal mortality in community settings. Hutton et al. (2016) found no difference in neonatal mortality rates between planned home and hospital groups. A retrospective case study ($N = 679,952$) found lower rates of neonatal mortality in the planned home birth group compared to the hospital cohort, though not statistically significant ($p = 0.8$; van der Kooy et al., 2011). Basic mortality rates favored the safety of home birth over hospital birth (0.18% vs. 0.22%; van der Kooy et al., 2011). Stapleton et al. (2013; $N =$ 15,574) found very low mortality rates of 0.40/1,000, excluding anomalies in the birth center setting. Neonatal mortality was found to be less in the home birth cohort than in the hospital birth cohort, 0.6/1,000 (CI [0–3.4]) vs. 0.9/1,000 (CI [0.5–1.5]) respectively (Blix et al., 2012). The evidence regarding neonatal mortality in community birth settings is evenly divided between increased and decreased rates of neonatal death. Therefore, a conclusion cannot be drawn as to the impact of community birth on neonatal mortality.

Strengths and Weaknesses

The articles examined in this literature review included good quality evidence. Eleven studies had large sample sizes, for a cumulative sample size of 46,472,619 women (Alliman et al., 2019; Bovbjerg et al., 2017; Cheng et al., 2013; Darling et al., 2019; Grünebaum et al., 2014; Grünebaum et al., 2107a; Grünebaum et al., 2017b; Jonge et al., 2014; Nethery et al., 2017; Stapleton et al., 2013; van der Kooy et al., 2011). An additional five studies utilized databases that represented diverse populations (Alliman et al., 2019; Grünebaum et al., 2014; Grünebaum

et al., 2017a; Grünebaum et al., 2017b; Stapleton et al., 2013). Most of these databases also included complete data sets with little missing data regarding perinatal risk factors, so that correlations could be drawn regarding the effect of these factors on neonatal outcomes (Alliman et al., 2019; Bovbjerg et al., 2017; Grünebaum et al., 2014; Grünebaum et al., 2017a; Grünebaum et al., 2017b; Hutton et al., 2016; Ovaskainen et al., 2019; van der Kooy et al., 2011). Several of the studies included were the first studies to ever examine their dependent variables and therefore positively contributed to the body of research regarding neonatal out-of-hospital outcomes (Darling et al., 2019; Nethery et al., 2017). Several studies covered long time periods, leading to more consistent results and a better understanding of trends in the data (Alliman et al., 2019; Blix et al., 2012; Ovaskainen et al., 2015; Ovaskainen et al., 2019; Stapleton et al., 2013). Two studies included the same midwives caring for patients in both the hospital and community settings, which provided some of the most consistent independent variables to study (Hutton et al., 2016; Maimburg, 2018).

The weaknesses of the literature review included the small sample sizes of several of these studies, which may have contributed to the lack of statistically significant data (Blix et al., 2012; Darling et al., 2019; Gaudineau et al., 2013; Maimburg, 2018; Ovaskainen et al., 2015; Ovaskainen et al., 2019; Pasternak et al., 2018). Self-selection bias was a concern in some studies given that certain women may be more likely to choose to give birth in community settings (Alliman et al., 2019; Blix et al., 2012; Gaudineau et al., 2013; Nethery et al., 2017; Pasternak et al., 2018; Snowden et al., 2015). Some studies did not explicitly state whether births were attended by certified nurse-midwives or other types of midwives, leading to inability to generalize the data about nurse-midwife outcomes (Alliman et al., 2019; Bovbjerg et al., 2017; Cheng et al., 2013; Grünebaum et al., 2014; Grünebaum et al., 2017a; Grünebaum et al., 2017b;

Malloy, 2010). Many of the studies lacked data regarding intrapartum transfer rates, which is an important consideration in birth and neonatal outcomes, and this may lead to underrepresentation of adverse outcomes (Grünebaum et al., 2014; Grünebaum et al., 2017a; Grünebaum et al., 2017b; Malloy, 2010; Ovaskainen et al., 2019; Snowden et al., 2015). Some of the data sets used were incomplete, leading to possible misrepresentation of the data and outcomes (Cheng et al., 2013; Darling et al., 2019; Jonge et al., 2014; Malloy, 2010; Ovaskainen et al., 2015). Some of the results are only transferrable to communities where home births and birth centers are well integrated into the community and have supportive resources and protocols (Blix et al., 2012; Cheng et al., 2013; Darling et al., 2019; Nethery et al., 2017; Snowden et al., 2015; Stapleton et al., 2013). Additionally, there were no randomized controlled trials included in the literature review due to the fact that it is unethical to dictate the location in which a woman gives birth.

Summary

Twenty articles were reviewed and their findings were synthesized to gain a deeper understanding of neonatal morbidity and mortality in community birth settings. The majority of the research was retrospective cohort studies and was of good quality, with a few low-quality studies included due to lack of sample size according to the Johns Hopkins Research Evidence Appraisal Tool. While neonatal morbidity tended to increase in community births, there was a noted decrease in neonatal mortality in community births in most of the studies examined. Additionally, it was also found that distance from the hospital did not affect neonatal outcomes in planned community births. Hospital-based midwives had lower rates of morbidity and mortality than midwives practicing in community birth environments or physicians practicing in the hospital. Maternal characteristics, including parity, gestation length, and advanced maternal

age, also played a significant role in neonatal outcomes. Strengths and weaknesses were also examined.

Chapter 4 will review nurse-midwifery practice implications and areas for future research. It will also integrate Orlando's nursing theory with the concept of neonatal mortality and morbidity in community births.

Chapter IV: Discussion, Implications and Conclusions

The purpose of this review was to critically examine scholarly works in order to determine the occurrence of neonatal morbidity and mortality in the home and birth center setting compared to in hospital births. A total of 20 pertinent research studies were chosen for critical analysis. Once the research review was completed, limitations and trends within existing literature were identified, emphasizing the implications for nurse-midwifery as well. Chapter 4 will include discussion of the implications for future nurse-midwifery practice and suggestions for future research. The chapter will conclude with the integration of Orlando's nursing theory and discuss how application of this theory could reduce risk of neonatal morbidity and mortality in the home and birth center settings through safety improvements.

Synthesis of Literature

The research focus for this critical literature review was to examine the occurrence of neonatal morbidity and mortality in the home and birth center settings compared to in the hospital setting. Interest in home and birth center births has grown because the more private and intimate birth experience offers women the feeling of control and safety and the more calming environment of one-on-one midwifery care provides the physical, emotional, and spiritual support that is vital to good outcomes in birth. Both the ACOG and the ACNM position statements support women having the right to make an informed decision concerning the location in which to give birth; however, the need to address outcomes in different birth settings was identified and results from the review have been examined (ACOG, 2017; ACNM, 2011). Midwives are trained to provide care in low-intervention intimate environments with skills and maneuvers necessary to assist in most situations that arise.

Sometimes, events occur that increase risks or influence poor outcomes within those environments. These include maternal characteristics, variations in the type of birth attendant, and transfer and transportation factors. The majority of studies found an increase in neonatal morbidity but a decrease in neonatal mortality for births in the community setting. It was also discovered that being close to the hospital did not affect neonatal outcomes in planned community births. Midwives working in the hospital had lower rates of morbidity and mortality than midwives practicing in home and birth center settings and physicians practicing in the hospital.

Three categories were identified in the literature as affecting neonatal outcomes. Maternal factors played a considerable part in neonatal outcomes, including parity, gestation length, and advanced maternal age. Nulliparity was found to pose a higher risk of poor neonatal outcomes, with higher incidence in the planned home birth setting than in hospital births. Nulliparous mothers in the planned home birth setting, attended by a midwife, also had a higher neonatal mortality rate when compared to hospital births, but this was not statistically significant. Multiparous mothers are less likely than nulliparous mothers to have poor neonatal outcomes, with only a slight increase in neonatal mortality in home birth settings than in hospital births. However, multiparous mothers showed a decrease in neonatal morbidity risks associated with planned home births compared with planned hospital births. Prolonged gestation or greater than 41 weeks of pregnancy has been found to lead to adverse neonatal outcomes. Multiple studies identified an increased risk for neonatal mortality in pregnancies of greater than 41 weeks, however, only one was statistically significant. According to Grünebaum et al. (2014; $N =$ 13,936,071), there was a statistically higher rate of neonatal death in planned home deliveries with a midwife at 41 weeks or greater gestation than in those attended by a midwife at a hospital

($p < 0.001$). Advanced maternal age is considered 35 years or older and has been found to contribute to increased neonatal morbidity or mortality, with a neonatal death rate of 1 in every 735 births (Grünebaum et al., 2017b). However, there was only a slightly increased risk of poor neonatal outcomes in advanced maternal age, which was not statistically significant, and there was no increased risk of neonatal death in the advanced maternal age group in the home birth setting (Bovbjerg et al., 2017).

Type of birth attendants also have an influence on neonatal outcomes. Multiple studies showed that midwives in home birth settings have a higher rate of neonatal mortality than those working in hospital settings (Grünebaum et al., 2014; Grünebaum et al., 2017b). Keeping in mind that the studies did not include physician deliveries in the home and birth center settings, physician rate of neonatal mortality in the hospital setting followed behind those of the CNM in the home birth setting, with midwives in the hospital setting having the lowest rate of neonatal death.

It was found that distance from the hospital, including for deliveries in rural locations, did not have a negative effect on neonatal outcomes. EMS transfers were also addressed within the intrapartum or neonatal period, during which EMS was sometimes called as a precautionary measure but did not necessarily result in transfer of the patient(s) or adverse outcomes. The need for EMS presence at delivery leading to the need for transfer was not found to be statistically significant. One study of outcomes in the birth center setting found a transfer rate of 2.6% of newborns after birth, with only 1.9% of all transfers identified as emergent for mother or baby (Stapleton et al., 2013).

Trends in the Literature

The studies reviewed identified a few different trends within the literature. The type of study and the questions being asked were the major inclinations recognized. Retrospective studies were the leading type of study in this area, with only two articles using a different study type, the prospective study. Retrospective study is an observational study of cases that have already happened and look back in time, using questionnaires, medical records, and other methods to collect and examine data with the goal of identifying potential risk factors or other associations and relationships (Glen, 2016).

The types of questions being asked in this literature leaned toward the research question being addressed in this review. However, there were four trends in the type of questions the studies researched. Two articles specifically asked if the birth location distance from the hospital affected outcomes. Another two articles questioned the reasons women are wanting or choosing home births. Additionally, two other studies addressed who is considered a good candidate for home and birth center setting births and what the contraindications for these settings are. The overarching question identified as a trend asked specifically what maternal and/or neonatal outcomes are based on location of birth, comparing the hospital setting to the birth center or home birth settings. This question was broken down further, with some specifics looking at safety and type of birth attendant present. These trends helped to focus the research in this area, define the questions that still needed to be asked and the gaps that were present, and highlight where further research is needed.

Gaps in the Literature

Some areas within the review required more information to draw reliable conclusions. Because they prevent reliable conclusion, these areas are identified as gaps within the literature:

criteria used to identify low-risk women, definition of type of attendant, and rates or types of transfers.

Outcomes may differ based on the women's risk level, and often home and birth center settings allow only women who are considered in the low-risk category to deliver in these environments. The studies reviewed lacked the measures used to classify risk levels. Many studies were missing data in relation to risk factors. According to Malloy (2010), preexisting maternal medical conditions and complications of pregnancy are significantly underreported. Hutton et al. (2016) and Darling et al. (2019) lacked the inclusion of maternal characteristics that are risk factors, potentially affecting outcomes.

Findings specific to attendant present could be beneficial for identifying and implementing safety concerns in the home and birth center setting. However, all data did not specify the type of attendant present at the delivery, making these findings ungeneralizable to nurse-midwife outcomes. Transfer types were not adequately addressed, with data missing regarding rates of intrapartum and neonatal transfer. Without sufficient data included, poor outcomes may be underrepresented. Reliable conclusions are necessary to properly apply the data to practice. Identifying gaps in the literature pinpoints the areas in which further research recommendations are needed.

Recommendations for Future Research

Through the research appraisal process, several areas for future research were uncovered. These include studies of the type of attendant and integration level of home and birth center settings in the community that would add to the knowledge base on this topic. Such research would identify evidence-based strategies for increasing safety in home and birth center settings.

Further research would allow for more reliable conclusions when exploring neonatal outcomes based on setting.

Research conducted by Grünebaum et al. (2017a identified an increase in neonatal death in the home birth setting attended by a midwife; causes of these neonatal deaths were mainly associated with labor and delivery complications, infection, and congenital abnormalities. These findings could have potential benefits in identifying and implementing safety concerns in the home and birth center settings. More research is needed that controls for type of attendant present to determine whether outcomes are truly related to the setting, without the added confounding variable of provider type.

Another study by Jonge et al. (2014) identified no increased risk of adverse perinatal outcomes for planned home births among low-risk women. These results are only transferrable to communities where home and birth center births are well integrated into the community and have supportive resources and protocols. Research is required to look deeper into areas where the home and birth center settings are not as prevalent or incorporated into routine practice, notably in the United States, to identify differences in outcomes based on preparedness.

To identify accurate representation of neonatal outcomes in the home and birth center setting, there is a need to alter and adjust research strategies. Controlling for the attendant present at delivery and modifying for the community's integration level of birth setting would provide results that are more transferable.

Implications for Nurse-Midwifery Practice

As home and birth center births become more abundant, safety protocols, evidence-based knowledge, and skilled midwives become a necessity. This review of the literature identified results of multiple studies recognizing neonatal outcomes in a variety of settings with different

types of attendants. However, with their focus on neonatal outcomes in home and birth center settings, these findings are geared toward a midwife population. This data affects how midwives counsel patients about birth settings and safety, regardless of practice setting, and could spur recommendations for improving safety. Midwives, as the primary care attendants in home and birth center settings, have the priority to assess all outcomes that occur and provide efficient solutions if necessary.

One study completed by Grünebaum et al. (2017a found home births attended by a midwife to have the highest neonatal death rate (12.75/10,000), followed by hospital physicians with the second-highest (6.02/10,000), and identifying midwives in the hospital setting as having the lowest (3.52/10,000). There seems to be a disconnect in that outcomes differ based on location, with midwives having the best outcomes in one location and the worst in another. Although this review does not answer the substantial question of why the disconnect is present, partially due to the significant number of factors that must be considered, it does imply there is a need for change, and this is where the implication for midwifery practice presents itself.

The research also identified maternal characteristics, including parity, gestation length, and advanced maternal age, as playing a significant role in neonatal outcomes. These attributes can be used to influence protocols for candidate selection, improve safety, and provide appropriate counseling to enhance informed decision-making by women as they choose a birth setting.

Applying Theory to the Research Topic

Orlando's Nursing Theory was established in 1961 by Ida Jean Orlando with the focus of assisting the nurse to determine and suit the immediate needs of her patients (*Orlando's Nursing Process Discipline Theory*, 2016). The nursing theory implements three elements within a

process to adequately address the needs of the patient. Any situation a nurse may encounter contains the components of the patient's behavior, the nurse's response, and any interventions or care the nurse provides to relieve the patient's distress (Potter & Bockenhauer, 2000).

It has been found that implementation of Orlando's theory in practice aids nurses and nurse-midwives in accomplishing more positive patient outcomes than they would otherwise (Potter & Bockenhauer, 2000). The theory focuses on the immediate need of the individual; when newborns are in distress, there is a need to act quickly to determine the most appropriate intervention that will efficiently address the concern, whether that is providing prompt care in the out-of-hospital setting or transferring the infant to the hospital. Although in newborns it is not possible to discuss the perception of the need, it can be discussed with the mother or observed by the cues the newborn relays in response to intervention. If the need has been adequately addressed, then the status of the newborn will change or the issue will be resolved, indicating that no further action is needed.

The Orlando theory also helps to empower nurses to flourish in unpredictable environments (Potter & Tinker, 2000). Home and birth center settings have less support or immediate help than would be present in the hospital setting, but by incorporating this theory, the provider can better understand the occurrence and risks for neonatal morbidity and mortality in the home and birth center settings and use these findings to improve safety. Neonates may be reliant on others to sustain life, especially during the vulnerable time directly after delivery when they are transitioning to life outside of the womb. Recognizing when a neonate is in need of additional support is vital to providing efficient and effective care to prevent poor outcomes. Taking into account maternal factors affecting neonatal outcomes and providing appropriate

counseling, making adjustments in the birth setting, or implementing safety measures prior to delivery could reduce neonatal mortality and morbidity in the home and birth center settings.

Conclusion

The pertinent findings of this review identified through examining 20 articles related to neonatal outcomes in home and birth center setting include five categories: neonatal morbidity, neonatal mortality, type of birth attendant, transfer factors, and maternal characteristics affecting neonatal outcomes. Midwives practicing in home and birth center settings can implement these findings to adjust protocols, improve safety, and enhance education for informed decision-making. Further research specifying the type of attendant present and modifying for the community integration level of the birth setting would be beneficial in identifying valid outcomes applicable in clinical practice.

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Source: Alliman, J., Stapleton, S. R., Wright, J., Bauer, K., Slider, K., & Jolles, D. (2019). Strong Start in birth centers: Socio-demographic characteristics, care processes, and outcomes for mothers and newborns. *Birth*, *46*(2), 234-243. https://doi.org/10.1111/birt.12433

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To evaluate the outcomes of mothers and infants who participated in the Strong Start medicaid program and utilized an CABC birth center for birth. **Sample/Setting:** 6424 Medicaid or Children's Health Insurance Program (CHIP) beneficiaries in birth center care who gave birth between 2013 and 2017 in the United States **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** Retrospective, descriptive study. The data was collected at 45 CABC birth centers in 19 states detailing the outcomes of 6424 Medicaid beneficiaries between 2013-2017. **Outcome/Measurements** **Primary outcomes:** -LBW infants -Cesarean rate -Nulliparous cesarean rate -Exclusive breastfeeding rates -NICU admissions -Postpartum contraception -Induction of labor **Secondary outcomes:** -Location of birth -Adequacy of prenatal care -Primary provider of prenatal care -Care in labor -Postpartum care	-The biggest risk factors identified were unplanned or unwanted pregnancy 34.4%, smoking 11.9%, chronic stress 11%, history of depression 10.6%, interval between pregnancies <18 mo 5.2%. All of these risk factors are linked to preterm birth. -The women in this study had preterm births (4.4.%) and LBW infants (3.7%) at a rate of half of the national average. NICU admission accounted for 2.9%. 1.8% of LBW newborns were admitted to the NICU. Newborns in this study were twice as likely to be admitted to the NICU if they were born in a hospital. -Preterm birth rate for white non-hispanic women in the study was 4.2%. For non-hispanic black women it was 5.1%. **Conclusion:** CABC Birth Centers were able to achieve good perinatal outcomes better than national averages for medicaid patients. Continued expansion of this model of care has promise to improve maternal-infant care throughout the country and is transferable to a diverse group of patients.	**Strengths:** -Large sample size -Geographically and ethnically diverse, in such a way that is representative of the larger childbearing population. -Reliable data source from care providers and previous study to validate the data. **Limitations:** -This study was not performed in such a way to affect public policy and would require a risk-adjusted analysis using propensity scoring if it were to be used for those purposes. -Despite the diversity seen in this study there still might be self-selection bias in who desired to seek care in a birth center.

Author Recommendations: More research should be done on women's maternity care preferences and where the choose to give birth. This research should include low-risk women who choose to give birth in the hospital. There should be continued access and expansion of the AABC birth center model of care to allow for more women to access this type of care.

Summary for current clinical practice question: This study found good outcomes for neonates born at home and in birth centers. The rate of LBW infants and infants being admitted to the NICU were significantly lower than national averages. There was also lower rates of NICU admission for home/birth center infants than those born in the hospital.

Source: Bovbjerg, M. L., Cheyney, M., Brown, J., Cox, K. J., & Leeman, L. (2017). Perspectives on risk: Assessment of risk profiles and outcomes among women planning community birth in the United States. *Birth*, *44*(3), 209-221. DOI: 10.1111/birt.12288

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To understand who is a good candidate for an out-of-hospital birth. **Sample/Setting:** 47,392 community planned births were examined using the MANA dataset focusing on low-risk women in North America. These births were attended primarily by CPMs in addition to CNMs. **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** A retrospective study utilizing the MANA data set. It studied planned home and birth center births within North America. **Outcomes/Measurement** **Primary Outcomes:** -Adverse maternal/fetal outcomes for these specific sub-groups: -Primiparity -TOLAC -twin pregnancy -breech presentation -gestational diabetes -preeclampsia -postterm pregnancy -advanced maternal age -obesity **Secondary Outcomes:** -Genital tract trauma -Postpartum hospitalization in the first 6 weeks -Postpartum hemorrhage -Low 5 minute Apgar score, < 7 -Very low 5 minute Apgar score, < 4 -Neonatal hospitalization in the first 6 weeks -Any NICU admission in the first 6 weeks -Neonatal deaths	-Women of advanced maternal age, AMA, had only a slightly increased risk of poor secondary outcomes than younger women, p=1.7 -There was no increased risk of adverse fetal outcomes or neonatal death in the AMA group, p=0.52. -Pregravid obesity was associated with adverse neonatal outcomes, p=1.4 -Breech presentation increased adverse outcomes in all categories except genital tract trauma. The risk of cesarean and fetal death were the highest in this group. -Twin pregnancies were associated with an increased risk of intrapartum transfer, maternal hospitalization, and NICU admission. There was also an increase in postpartum transfer, cesarean section, and low and very low five minute Apgars. -Postterm pregnancies greater or equal to 42 weeks were associated with increased risk of cesarean section, intrapartum transfer, and neonatal death, p=2.2. -TOLAC women had an increased risk of all adverse secondary outcomes with p values all below 2 for these risks. **Conclusion:** AMA and pregravid obesity is not associated with as many adverse outcomes as previously thought. TOLAC/VBAC women also have lower risk of adverse outcomes than previously assumed. In low intervention settings with high levels of support the majority of TOLAC women will be able to achieve a VBAC. Breech birth at this time is best managed in the hospital setting.	**Strengths:** -Large sample size -Utilized a large database with complete data regarding risk factors, prenatal, intrapartum, postpartum, and neonatal course and outcome for patients. -The authors were able to study each risk variable independently in regards to their effect on birth and neonatal outcome in a community birth setting **Limitations:** -There was some variation in how variables and risk factors were defined between the MANA 2.0 and 4.0 data sets which led to some adjustments on the part of the authors. -Over-generalization about risk rather than interpreting each individual result. -There wasn't statistically significant data for twins, breech, preeclampsia, and gestational diabetes subgroups.

Author Recommendations: While the findings of this research can help guide decisions about what births are typically safer and successful in the community birth setting these results should not be a definitive guide to who should be excluded from community birth. Provider experience, patient-provider relationship, and family preference should all be considered when choosing the site of birth.

Summary for current clinical practice question: This research supported overall good outcomes for neonates born in out of hospital settings. It specifically focused on what risk factors put neonates at increased risk of morbidity or mortality. These risk factors include breech presentation, twins, postterm pregnancy (greater or equal to 42 weeks), and pregravid obesity.

Source: Cheng, Y., Snowden, J., King, T., & Caughey, A. (2013). Selected perinatal outcomes associated with planned home births in the United States. *American Journal of Obstetrics & Gynecology, 209*(4), 325.e1-8. doi:https://doi.org/10.1016/j.ajog.2013.06.022

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To examine outcomes that were associated with planned home compared with hospital births **Sample/Setting:** -Term singleton live births in 2008 in the United States -There were 2,081,753 births that met the study criteria -12,039 births (0.58%) were planned home births **Level of evidence:** Level III **Quality of evidence:** B, good quality	-retrospective cohort study -Deliveries were categorized by location: hospitals or intended home births - Neonatal outcomes were compared with the use of the $\chi(2)$ test and multivariable logistic regression **Outcome/Measurement** **Primary Outcome:** -Neonatal outcome by birthplace, attendant, and parity -5-minute Apgar score <4 -5-minute Apgar score <7 -Ventilator support >6 hours -Neonatal seizures -Neonatal intensive care unit admissions	Planned home births had a greater number of lower 5 minute apgar score < 4 and more neonatal seizures than with hospital births -Apgar scores 0.37% vs 0.24% -Seizures 0.06% vs 0.02% -Women with planned home birth had fewer interventions, including operative vaginal delivery and labor induction/augmentation **Conclusion:** Planned home births were associated with increased neonatal complications but fewer obstetric interventions	**Strengths:** -Large sample size **Limitations:** -Confounding or missing data could potentially bias findings. Multivariable logistic regression analyses to control for bias in the effect estimation was used; however, there may be residual confounding from unobserved or uncontrolled covariates that cannot be accounted for by statistical models. -Underlying difference may not be accounted for by characteristics such as age, education, marital status, or race/ethnicity alone -Births in 27 states that they used may not be representative of all births in the United States

Author Recommendations: We propose that a large, population-based observational study design is the best option available to date to examine the safety of planned home birth in the United States

Summary for current clinical practice question: See conclusion

Source: Grünebaum, A., McCullough, L. B., Arabin, B., Dudenhausen, J., Orosz, B., & Chervenak, F. A. (2017). Underlying causes of neonatal deaths in term singleton pregnancies: Home births versus hospital births in the United States. *Journal of Perinatal Medicine*, *45*(3), 349-357. Doi: https://doi.org/10.1515/jpm-2016-0200

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To understand the causes of neonatal mortality of home births attended by a midwife compared to planned hospital births. **Sample/Setting:** 15,906,211 births were reviewed in the United States focusing in on 9297 deaths. It included singleton, term pregnancies with birth weight greater than 2500 grams. **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** This study was a retrospective cohort study. It utilized the CDC's linked birth/infant death data set from 2008-2012. **Measurements/Outcomes** **Primary Outcomes:** Neonatal mortality **Secondary Outcomes:** Underlying causes of neonatal mortality	-Home birth attended by a midwife had the highest neonatal death rate p=3.6. Hospital physicians had the second highest neonatal death rate. p=1.7 Midwives in the hospital had the lowest neonatal death rate p=1 -Neonatal death rate for nulliparous women with a midwife-assisted home birth was higher than the rate for midwife-assisted hospital births p= 5.34. Neonatal mortality was increased for midwife-attended home births than for hospital midwife -attended births for gestations 41 weeks and greater p=4.43 -Patients who delivered in the hospital had no discernable risk of neonatal death such as parity or postdates. -L&D accounted for 39.3% of neonatal deaths in the home birth setting, p=13.4. 29.5% of neonatal deaths at home were caused by congenital anomalies, p=2.5. 12.3% of neonatal deaths at home were due to infection, p=4.4. -In the hospital congenital malformations was the main cause of neonatal death. 51% for physicians and 43% for midwives. L&D complications led to 10.6% of neonatal deaths for midwives in the hospital and 12.9% of physician attended births. -The most common labor and delivery complications leading to neonatal death in the home birth setting including HIE, birth asphyxia, intrauterine hypoxia, which accounted for 18.1% of home birth deaths. These cause were accounted for 8.6% of physician-attended neonatal deaths and 5.5% of hospital midwife-attended births. **Conclusion:** There is an increase in neonatal death in the home birth setting attended by a midwife. The causes of these neonatal deaths were mainly associated with labor and delivery complications, infection, and congenital abnormalities. The increased risk of neonatal death should be apart of the informed risks and benefits shared with all women planning a home birth.	**Strengths:** -Utilized the CDC's linked birth/infant death data which is the most comprehensive data set available. -Large sample size **Limitations:** -The data does not allow for disclosure of rather a hospital birth was the intended place of birth. The authors believe that neonatal mortality rates associated with home births are actually higher due to not being able to account for intrapartum transfers to the hospital. -They did not clarify if all the midwife-attended home births were attended by CNMs. -Neonatal morbidity was unable to be studied due to the nature of data available in the CDC's data set. -Stillbirth was unable to be studied as the CDC's data set only collects information on live births.

Author Recommendations: Home births have a lack of equipment and lack of trained personnel available to attend to complex perinatal and neonatal needs. There is also inconsistency with the training of midwives who are overseeing home births, most of which are not CNM/CMs. Hospitals should focus on creating a more home-like space for women who desire a more comfortable and low-intervention birth.
Summary for current clinical practice question: The outcome of this study showed a strong correlation between increased neonatal mortality and home birth. However the CDC data set is flawed in the sense that CNM-attended home births cannot be exclusively studied. Therefore the neonatal outcomes are including birth attended by CMs, CPMs, and direct-entry midwives. This is an important distinction when looking at the neonatal mortality in the home birth setting.

Source: Grünebaum, A., Mccullough, L., Sapra, K., Arabin, B., & Chervenak, F. (2017). Planned home births: The need for additional contraindications. *American Journal of Obstetrics and Gynecology, 216*(4), 401.e1-401.e8. https://doi.org/10.1016/j.ajog.2017.01.012

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: Evaluate if there should be contraindications to home birth. **Sample/Setting:** 12,953,671 singleton, nonanomalous, term pregnancies with infants who were > 2500 grams were reviewed that were planned home or hospital births within the United States. **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** This was a population-based retrospective cohort study. It utilized revised birth certificate data from all reporting states and information from the CDC's period-linked birth-infant deaths files that allowed for identifying intended versus unintended home births. **Outcome/Measurements:** **Primary outcome:** -Neonatal death	-Risk of neonatal death was significantly higher for births attended by CNMs at home versus the hospital $p < 0.001$ -Women with the highest risk of neonatal death in a home birth setting were those planning a breech delivery, 1:78 breech births -Nulliparous women had a 1:444 risk of neonatal death -Previous cesarean had a risk of 1:529 of neonatal death -Gestational age greater or equal to 41 weeks had a neonatal death occur every 1:582 -Women who were 35 years old or greater had a neonatal death occur every 1:735 **Conclusion:** This study found an increased risk of neonatal death associated with planned home birth. In particular nulliparous women and postdate pregnancies were associated with higher rates of neonatal death.	**Strengths:** -Large sample size was used for this study. -Utilized the CDC's period-linked birth-infant deaths files which is the preferred source on neonatal mortality in the United States. **Limitations:** -There has been concern over the accuracy of the data collected on the birth and death records used in this study due to using incomplete data sets. -The data does not allow for disclosure of whether a hospital birth was the intended place of birth. Therefore the authors believe that neonatal mortality rates associated with home births are actually higher due to not being able to account for intrapartum transfers to the hospital.

Author Recommendations: Nulliparity and postdate pregnancies greater than 41 weeks should be absolute contraindications to planned home birth. These risk factors should be placed on ACOG's list of contraindications to home birth that is currently comprised of previous cesarean section, malpresentation, and multiple gestation.
Summary for current clinical practice question: This study showed an increase in neonatal mortality associated with home births. The highest risk associated with neonatal death in home birth was a breech presentation.

Source: Grünebaum, A., McCullough, L. B., Sapra, K. J., Brent, R. L., Levene, M. I., Arabin, B., & Chervenak, F. A. (2014). Early and total neonatal mortality in relation to birth setting in the United States, 2006-2009. *American Journal of Obstetrics & Gynecology, 211*(4), 390 e391-e397. doi:10.1016/j.ajog.2014.03.047			
Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**

Purpose: -To examine neonatal mortality in relation to birth settings and birth attendants in the United States from 2006 through 2009 **Sample/Setting:** -Singleton, vertex, and term births in and OOH births in United States. There were 13,936,071 deliveries between 2006 and 2009 that met study criteria **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** -Retrospective study -Data from the Centers for Disease Control and Prevention–linked birth and infant death dataset in the United States from 2006 through 2009 were used to assess early and total neonatal mortality for singleton, vertex, and term births without congenital malformation delivered by midwives and physicians in the hospital and midwives and others out of the hospital **Outcome/Measurement** **Primary Outcome:** -early deaths <7 days of life -total deaths <28 days of life −neonatal mortality in term singleton births (≥37 weeks and newborn weight of ≥2500 g) without documented congenital malformation -Birth setting -Provider type	-Midwife home births had a significantly higher total neonatal mortality risk than deliveries by hospital midwives (1.26 per 1000 births; relative risk [RR], 3.87 vs 0.32 per 1000; $P < .001$) -Midwife home births of 41 weeks or longer (1.84 per 1000; RR, 6.76 vs 0.27 per 1000; $P < .001$) and midwife home births of women with a first birth (2.19 per 1000; RR, 6.74 vs 0.33 per 1000; $P < .001$) had significantly higher risks of total neonatal mortality than deliveries by hospital midwives -Excess total neonatal mortality for midwife home births compared with midwife hospital births was 9.32 per 10,000 births, and the excess early neonatal mortality was 7.89 per 10,000 births **Conclusion:** -Significantly increased total and early neonatal mortality for home births and even higher risks for women of 41 weeks or longer and women having a first birth -Home births are associated with not only increased neonatal deaths but also other increased neonatal risks such as low Apgar scores and an increased risk of neonatal hypoxic ischemic encephalopathy.	**Strengths:** -Utilized the largest and most reliable dataset on neonatal mortality for live births in the United States -Reports on the largest population to date comparing neonatal mortality among different birth settings and providers -Used the linked birth/infant death dataset, which is generally the preferred source for infant and neonatal mortality in the United States. **Limitations:** -Results likely underestimate the actual neonatal mortality rates in home births because the higher adverse neonatal outcomes for patients transferred from home to the hospital are counted in the CDC-linked data as hospital and not home birth neonatal outcomes.
Author Recommendations: The author believes that US birth certificate data would be improved by using a new revision that specifies those who originally planned a home birth and then were transferred to the hospital.			
Summary for current clinical practice question: See conclusion			

Source: Hutton, E., Cappelletti, A., Reitsma, A., Simioni, J., Horne, J., McGregor, C., & Ahmed, R. (2016). Outcomes associated with planned place of birth among women with low-risk pregnancies. *CMAJ: Canadian Medical Association Journal, 188*(5), E80-E90. DOI: https://doi.org/10.1503/cmaj.150564

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To compare outcomes via analyzing neonatal morbidity and mortality and birth outcomes in planned home and hospital birth settings. **Sample/Setting:** It included 11,493 planned home births for low-risk women against 11,493 planned hospital birth outcomes for low-risk women in Ontario, Canada **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** -Matched retrospective cohort study -The authors searched a provincial database for all midwife attended births of low-risk women between 2006-2009. **Outcome/Measurement:** **Primary Outcomes:** -Stillbirth - Neonatal death (<28d), -Serious morbidity defined as Apgar < 4 at 5 minutes of life or a neonate requiring PPV and chest compressions. **Secondary Outcomes:** -Intrapartum interventions -Maternal morbidity -Breastfeeding -Birth weight less than 2500 grams	The following results were the findings regarding home birth: -Increased risk of neonates weighing less than 2500 grams p=1.41 -Increased exclusive breastfeeding rates p=1.11 -In both groups less than 1% of infants had Apgar scores less than 4 at 5 minutes of life. -In both groups 28 infants required PPV and chest compressions. -There was no difference in stillbirth, neonatal death, or neonatal morbidity between the two groups. **Conclusion:** Low-risk women who are planning a midwife-attended home birth should not expect any increased risk of perinatal death compared to the hospital setting.	**Strengths:** -Adequate sample size -Complete data set with reasonable details on labor, birth, and neonatal outcomes -The same midwives provided care to both groups of women, home and hospital, in this study **Limitations:** -Maternal hemorrhage was not defined within the data set -The data set changed during the course of the study so the authors were not able to report on NICU admissions or length of stay -The data set did not include BMI so this variable could not be studied. -A larger sample size would allow for the study of maternal death -130 records in the data set were missing data such as parity or previous cesarean sections.

Author Recommendations: Self-selection and thorough screening by the midwives is likely to account for the positive outcomes of home birth in Ontario. Having women choose their setting of birth and receiving care from the same midwives as the hospital cohort is most likely responsible for the low rates of intervention and good neonatal outcomes.

Summary for current clinical practice question: This study was helpful as it demonstrated that there were no significant differences in neonatal outcomes for low-risk women who delivered at home. This provides good evidence supporting equivocal neonatal morbidity and mortality in the home birth setting compared to the hospital setting.

Source: Jonge, A., Geerts, C., van der Goes, B., Mol, B., Buitendijk, S., & Nijhuis, J. (2014). Perinatal mortality and morbidity up to 28 days after birth among 743 070 low-risk planned home and hospital births: A cohort study based on three merged national perinatal databases. *Royal College of Obstetricians and Gynaecologists, 122*(5), 720-728. doi: 10.1111/1471-0528.13084

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To compare rates of adverse perinatal outcomes between planned home births versus planned hospital births. **Sample/Setting:** 814,979 low-risk women in midwife-led care at the onset of labour in the Netherlands. Women in the study had a spontaneous onset of labor, gave birth between 37 and 42 weeks gestation to a single baby, and did not have a known medical or obstetric risk factor before labor **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** A nationwide cohort study, which included analysis of national registration data. **Outcome/Measurement** **Primary Outcome:** -Intrapartum and neonatal death (uncertain and certain time of death), 0–28 days -Intrapartum and neonatal death (certain time of death), 0–28 days -Neonatal death, 0–7 days -Neonatal death, 0–28 days -Apgar score < 7 at 5 minutes -Apgar score < 4 at 5 minutes -Admission to NICU within 7 days -Admission to NICU within 28 days -Severe adverse perinatal outcome	-Of the total of 814,979 women, 466,112 had a planned home birth and 276 958 had a planned hospital birth -71,909 women, their planned place of birth was unknown. -Combined intrapartum and neonatal death rates up to 28 days after birth, including cases with discrepancies in the registration of the moment of death, were: for nulliparous women, 1.02& for planned home births versus 1.09& for planned hospital births,adjusted odds ratio (aOR) 0.99, 95% confidence interval(95% CI) 0.79–1.24; and for parous women, 0.59& versus 0.58&, aOR 1.16, 95% CI 0.87–1.55. -The rates of NICU admissions and low Apgar scores did not significantly differ among nulliparous women (NICU admissions up to 28 days,3.41& versus 3.61&, aOR 1.05, 95% CI 0.92–1.18 -Among parous women the rates of Apgar scores below seven and NICUadmissions were significantly lower among planned home births(NICU admissions up to 28 days, 1.36 versus 1.95&, aOR 0.79,95% CI 0.66–0.93). **Conclusion:** We found no increased risk of adverse perinatal outcomes for planned home births among low-risk women.	**Strengths:** -Large sample size. -The study was carried out in a country where home birth is still common, and therefore the maternity care system is well equipped to deal with emergencies during home births **Limitations:** -The planned place of birth was missing for about 9% of the women included in the study. -Some paediatric data were missing. In particular, this was a problem for NICU admissions and neonatal deaths occurring between 7 and 28 days after birth, because midwives and obstetricians only record perinatal deaths up to 7 days after birth; -Results may only apply to regions where home births are well integrated into the maternity care system.

Author Recommendations: Ideally studies into the safety of home birth should be randomised controlled trials with a prospective cohort study as the next best method. Although the study did not have enough power to show significant differences in mortality, nulliparous women with planned home birth at the onset of labour, compared with those planning a hospital birth, had a significantly higher rate of composite severe adverse neonatal outcome. Further studies are needed to explore the factors that may have contributed to the differences in these results.

Summary for current clinical practice question: This study was helpful because it found no increased risk of adverse perinatal outcomes for planned home births among low-risk women. Although the study was done in a place where home birth is common and midwives are well trained in this setting it is still beneficial.

Source: Malloy, M. H. (2010). Infant outcomes of certified nurse midwife attended home births: United States 2000 to 2004. *Journal of Perinatology*, *30*(9), 622. doi:10.1038/jp.2010.12

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To examine the safety of certified nurse midwife attended home deliveries compared with certified nurse midwife in-hospital deliveries in the United States as measured by the risk of adverse infant outcomes among women with term, singleton, vaginal deliveries. **Sample/Setting:** There were 1,335,471 term, singleton, vaginal births available from the 5-year period that were used in the analysis throughout the United States. **Level of evidence:** Level III **Quality of evidence:** B, Good quality	-Retrospective study -United States linked birth and infant death certificate files from the National Center for Health Statistics for the years 2000 to 2004 were used -Chi-square tests for general association were used for comparing the distributions of nominal variables. -Logistic regression models were used to determine odds ratios and 95% confidence intervals for the adverse neonatal outcomes comparing site of delivery and attendant type to hospital births attended by CNMs as the reference group. -All analyses were carried out using SAS.24 - An arbitrary P-value of 0.05 was designated to indicate statistical significance. **Outcome/Measurement** **Primary Outcome:** -Site of delivery - Type of attendant at delivery **Secondary:** -Maternal age -Maternal education - Parity -Race -Medical or labor risk -Fetal anomaly -Gestational age -Neonatal mortality -Anemia at birth -Hyaline membrane disease -Injury at birth -Mechanical ventilation <30 min -Mechanical ventilation 30 min -Meconium aspiration -Apgar 5 min< 4	-For the 5-year period there were 1,237,129 in-hospital certified nurse midwife attended births; 17 389 in-hospital 'other' midwife attended births; 13,529 home certified nurse midwife attended births; 42,375 home 'other' midwife attended births; and 25,319 birthing center certified nurse midwife attended births. -The neonatal mortality rate per 1000 live births for each of these categories was, respectively, in-hospital certified nurse midwife attended births 0.5 (deaths ¼ 614), in-hospital 'other' midwife attended births 0.4 (deaths ¼ 7), home certified nurse midwife attended births 1.0 (deaths ¼ 14), home 'other' midwife attended births 1.8 (deaths ¼ 75), and birthing center certified nurse midwife attended births 0.6 (deaths ¼ 16). The adjusted odds ratio (95% confidence interval) for neonatal mortality for home certified nurse midwife attended deliveries vs in-hospital certified nurse midwife attended deliveries was 2.02 **Conclusion:** Deliveries at home attended by CNMs and 'other midwives' were associated with higher risks for mortality than deliveries in-hospital by CNMs	**Strengths:** -Neonatal deaths related to underlying congenital anomalies were excluded -The author declares no conflict of interest -This analysis shows that the population choosing to deliver at home in the United States for the period from 2000 to 2004 is more likely to be older, better educated, non-Hispanic White, multiparous women. **Limitations:** -Lack of information on maternal outcome associated with site of delivery and attendant type -Unable to provide information on the intention to deliver at home and the transfer rate incurred for those pregnancies that develop complications during the course of labor -Demographic characteristics, methods of delivery, and infant characteristics appear to be reliably reported on birth certificates. - Reporting of pre-existing maternal medical conditions and complications of pregnancy, however, appears to be significantly under-reported

Author Recommendations: Women electing to deliver in the home environment should be aware of the higher risk

Summary for current clinical practice question: See conclusion

Source: Nethery, E., Gordon, W., Bovbjerg, M., & Cheyney, M. (2017). Rural community birth: Maternal and neonatal outcomes for planned community births among rural women in the United States, 2004-2009. *Birth, 45*(2), 120-129. doi:doi: 10.1111/birt.12322			
Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To examine maternal and neonatal outcomes among planned home and birth center births attended by midwives, comparing outcomes for rural and nonrural women. **Sample/Setting:** Using the Midwives Alliance of North America Statistics Project 2.0 dataset of 18 723 low-risk, planned home, and birth center births, rural women (n = 3737) were compared to nonrural women. **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** -Retrospective study -Using the Midwives Alliance of North America Statistics Project 2.0 dataset of 18 723 low-risk, planned home, and birth center births, rural women (n = 3737) were compared to nonrural women. -Analysis involved multivariable logistic regression, controlling for sociodemographics, antepartum, and intrapartum risk factors **Outcome/Measurement** **Primary Outcome:** -Maternal outcomes -cesarean delivery - assisted delivery -Intrapartum transfer -postpartum transfer -any severe events (seizure, eclampsia, uterine rupture, cord prolapse, embolism) -blood transfusion -3rd or 4th degree laceration or cervical trauma. -Neonatal outcomes - 5-minute Apgar scores <7 And <4 -assisted ventilation for longer than 10 mins -congenital anomalies - any hospital or NICU admission (in the first 48 hours) lasting longer than 24 hours.	-Rural women had different risk profiles relative to nonrural women and reduced risk of adverse maternal and neonatal outcomes in bivariable analysis -Adjustment for risk factors and confounders, there were no significant differences for a composite of maternal (adjusted odds ratio [aOR] 1.05 [95% confidence interval {CI} 0.93-1.19]) or neonatal (aOR 1.13 [95% CI 0.87-1.46]) outcomes between rural and nonrural pregnancies. **Conclusion:** Among this sample of low-risk women who planned midwife-led community births, no increased risk was detected by rural vs nonrural status	**Strengths:** -Large sample size - Rigorously validated data collection tool -High participation rate among women -A large number of covariates, -Prospective data collection strategy whereby clients are preregistered into the system early in care - No prior analyses have examined rural status and birth outcomes within a cohort of women who planned midwife-attended births at home or in freestanding birth centers **Limitations:** -Inadequate power to study rare outcomes despite using a neonatal composite to increase statistical power -Only represents outcomes of care for approximately 30% of United States community-based midwives practicing at that time -No way to predict how voluntary sampling may have affected our findings

Author Recommendations: Future studies could incorporate newer data, as data through 2016 are now available. Replication with a larger study sample could indicate significant clinical differences between midwife-attended rural and nonrural women in the United States which were too small to detect in our study
Summary for current clinical practice question: See conclusion

Source: Snowden, J., Tilden, E., Snyder, J., Quigley, B., Caughey, A., & Cheng, Y. (2015). Planned out-of-hospital birth and birth outcomes. *New England Journal of Medicine, 373*(27), 2642-2653. doi:10.1056/NEJMsa1501738

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To assess the rates of outcomes according to planned place of delivery (hospital or out of hospital) in Oregon with the use of multiple adjustment techniques and to show the effects of the misclassification of out-of-hospital-to-hospital transfers on these comparisons **Sample/Setting:** sample included 79,727 cephalic, singleton, term, nonanomalous deliveries in Oregon in 2012 and 2013 **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** -This is a population-based, retrospective cohort study -It analyzed data from Oregon state birth, infant death, and fetal death certificates from January 1, 2012, through December 31, 2013 **Outcome/Measurement** **Primary Outcome:** -Maternal -Fetal -Neonatal -Labor and delivery **Secondary outcome:** -Fetal, neonatal, perinatal death -5-minute Apgar score of less than 7 - A 5-minute Apgar score of less than 4 - Neonatal seizure -Ventilator support -Admission to NICU -Induction of labor -Augmentation of labor -Type of delivery consisting of unassisted vaginal delivery , operative vaginal delivery, or cesarean delivery -Maternal admission to the ICU -Blood transfusion,	-Planned out-of-hospital birth was associated with a higher rate of perinatal death than was planned in-hospital birth - The odds for neonatal seizure were higher and the odds for admission to a neonatal intensive care unit lower with planned out-of-hospital births than with planned in-hospital birth. -Planned out-of-hospital birth was strongly associated with unassisted vaginal delivery (93.8%, vs. 71.9% with planned in-hospital births; P<0.001) and with decreased odds for obstetrical procedure **Conclusion:** Perinatal mortality was higher with planned out-of-hospital birth than with planned in-hospital birth, but the absolute risk of death was low in both settings	**Strengths:** -There are few current data available on rates of out-of-hospital-to-hospital transfer in the United States. The observed rate of 16.5% in this study is informative and is consistent with rates reported in a recent systematic review of transfers in developed countries (including the United States), in which intrapartum transfer rates ranged from 10 to 17% **Limitations:** -The inability in the case of planned home births to distinguish between transfers from birth centers and transfers from home -Controlled for maternal characteristics in regression models, but there are probably differences between women who choose to give birth in a hospital and those who choose out-of-hospital birth. -Oregon has a high out-of-hospital birth rate, the annual number of births in the state is relatively small (approximately 45,000, before exclusions), which provides low power for the analysis of rare outcomes -Since data was analyzed from only one state, it is hard to generalize findings -The accuracy of vital statistics data has well-known limitations, especially in regard to patient conditions before pregnancy; the coding of these conditions is less sensitive than that for procedures -Misclassification may have affected results with differences in completion of birth certificates according to birth setting and the accuracy of the

	-Severe perineal lacerations (third or fourth degree)		reporting of many demographic and clinical variables is unknown

Author Recommendations: The study was underpowered to analyze specific outcomes according to provider type, making this a useful area for future research

Summary for current clinical practice question: See conclusion

Source: Stapleton, S., Osborne, C., & Illuzzi, J. (2013). Outcomes of care in birth centers: Demonstration of a durable model. *Journal of Midwifery and Womens Health, 58*(1), 3-14. doi:10.1111/jmwh.12003

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**

Purpose: This study examines outcomes of birth center care in the present maternity care environment. **Sample/Setting:** 15,574 women who planned and were eligible for birth center birth at the onset of labor women receiving care in 79 midwifery-led birth centers in 33 US states **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** Prospective cohort study of women receiving care in 79 midwifery-led birth centers in 33 US states from 2007 to 2010 **Outcome/Measurement** **Primary Outcome:** -Intrapartum admissions and transfers -Mode of birth -Postpartum and neonatal complications -Mortality	-4% of women gave birth at the birth center. -4% were transferred to a hospital prior to birth center admission, and 12% were transferred in labor after admission. -Regardless of where they gave birth, 93% of women had a spontaneous vaginal birth, 1% an assisted vaginal birth, and 6% a cesarean birth. -Of women giving birth in the birth center, 2.4% required transfer postpartum, whereas 2.6% of newborns were transferred after birth. -Most transfers were non-emergent, with 1.9% of mothers or newborns requiring emergent transfer during labor or after birth. -There were no maternal deaths. -The intrapartum fetal mortality rate for women admitted to the birth center in labor was 0.47/1000. -The neonatal mortality rate was 0.40/1000 excluding anomalies. **Conclusion:** This study demonstrates the safety of the midwifery-led birth center model of collaborative care as well as continued low obstetric intervention rates, similar to previous studies of birth center care	**Strengths:** -Relatively large sample size - Geographic diversity of birth centers contributing data -Data collection over a period of 4 years **Limitations:** -Limitations were not mentioned within the article, however it focused on low-risk women so may not be relatable to others
Author Recommendations:. Future research should be carried out to describe the cost components of birth center care and strategies for optimizing and expanding this high-value care model. Qualitative studies exploring the experiences of childbearing women and families in birth center and hospital models of care are also critical.			
Summary for current clinical practice question: See conclusion			

Source: van der Kooy, J., Poeran, J., de Graaf, J. P., Birnie, E., Denktas, S., Steegers, E. A., & Bonsel, G. J. (2011). Planned home compared with planned hospital births in the Netherlands: Intrapartum and early neonatal death in low-risk pregnancies. *Obstetrics & Gynecology*, *118*(5), 1037-1046. doi: 10.1097/AOG.0b013e3182319737

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**

Purpose: To compare the intrapartum and early neonatal mortality rate of planned home birth with planned hospital birth in community midwife-led deliveries. **Sample/Setting:** The perinatal outcome of 679,952 low-risk women was obtained from the Netherlands Perinatal Registry **Level of evidence:** Level III **Quality of evidence:** B, Good quality	**Design:** A retrospective case study. Two different analyses were performed on the data. They investigated the potential risk role of intended place of birth, and utilized multivariate stepwise logistic regression to investigate the potential risk role of intended place of birth. **Outcome/Measurement** **Primary Outcome:** -Intrapartum death -Early neonatal death within the first 24 hours -Neonatal death within the first seven days **Secondary Outcome:** -Congenital abnormalities -IUGR -Preterm birth -Low Apgar scores	-60% of the women had a planned home birth and 32% had a planned hospital birth -Intrapartum and early neonatal mortality was lower for planned home birth. p= 0.8 -Crude mortality favors safety of home birth 0.18% vs. 0.22% at hospital. **Conclusion:** Planned home birth under routine conditions is not associated with higher rates of intrapartum or early neonatal mortality.	**Strengths:** -large sample size -comprehensive data set of Dutch births from 2000-2007 -Includes complete mortality data **Limitations:** -Unable to create a RCT due to having to respect women's choice of place of birth -Cannot rule out confounding cause of death in 15% of neonatal deaths due to little data being reported. -Hospital births were not limited to low risk women.
Author Recommendations: Home birth is safe in low-risk women, however, this conclusion cannot be drawn for additional risk factors.			
Summary for current clinical practice question: See conclusion			

Source: Blix, E., Schaumburg Huitfeldt, A., Øian, P., Straume, B., & Kumle, M. (2012). Outcomes of planned home births and planned hospital births in low-risk women in Norway between 1990 and 2007: A retrospective cohort study. *Sexual & Reproductive Healthcare, 3*(4), 147-153. doi:https://doi.org/10.1016/j.srhc.2012.10.001

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: to compare outcomes in women who planned for, and were selected to, home birth at the onset of labor to those planned for a hospital birth **Sample/Setting:** Data from 1631 planned home births between 1990 and 2007 were compared with a random sample of 16,310 low-risk women with planned hospital births in Norway. **Level of evidence:** Level III **Quality of evidence:** C, low quality, due to small sample size	**Design:** -Retrospective cohort study -Data from 1631 planned home births between 1990 and 2007 were compared with a random sample of 16,310 low-risk women with planned hospital births -Data were collected by the midwives filling in a register form for each birth, or by one of the authors by telephone interviews of the midwives. -The control group consists of low-risk women giving birth in a Norwegian birth institution. We received a data file from the MBRN containing data from all births from 1990 to 2007, totally 1072,748 and after reviewed for inclusion criteria a total of 629,643 births remained, and a random sample of 16,310 was extracted. -Data were analyzed using STATA, version 11.0 [20]. To compare outcomes after planned home births with planned hospital births, crude and adjusted odds ratios (OR) with 95% confidence intervals were calculated. **Outcome/Measurement** **Primary Outcome:** - Intrapartum intervention rates and complications **Secondary outcomes:** -Perinatal and neonatal death rates	-Primiparas who planned home births had reduced risks for assisted vaginal delivery (OR 0.32; 95% CI 0.20–0.48), epidural(OR 0.21; CI 0.14–0.33) and dystocia(OR 0.40; CI 0.27–0.59). -Multiparas who planned home births had reduced risks for operative vaginal delivery (OR 0.26; CI 0.12–0.56), epidural analgesia (OR 0.08; CI 0.04–0.16), episotomy (OR 0.48; CI 0.31–0.75), anal sphincter tears (OR 0.29; CI 0.12–0.70), dystocia (OR 0.10; CI 0.06–0.17) and postpartum hemorrhage (OR 0.27; CI 0.17–0.41). We found no differences in c-section rate. Perinatal mortality rate was 0.6/1000 (CI 0–3.4) and neonatal mortality rate 0.6/1000 (CI 0–3.4) in the home birth cohort. In the hospital birth cohort, the rates were 0.6/1000 (CI 0.3–1.1) and 0.9/1000 (CI 0.5–1.5) respectively **Conclusion:** Planning for home births was associated with reduced risk of interventions and complications	**Strengths:** -The control group was carefully selected among all women registered in the MBRN giving birth from 1990–2007 to represent a true low-risk group -To minimize bias in the analyses, adjustment was made for known confounders **Limitations:** - Small sample size, the study is not sufficiently dimensioned to assess effect on perinatal and neonatal mortality -The present study does not consist of a national sample, but a sample from midwives who attended at least 30 home births during an eighteen-year period -Difficult to assess if the sample is representative for all planned home births in Norway
Author Recommendations: To assess and evaluate outcomes after planned home births, the MBRN should register planned home births systematically, included transfers during or after labor			
Summary for current clinical practice question: See conclusion			

Source: Darling, E. K., Lawford, K. M. O., Wilson, K., Kryzanauskas, M., & Bourgeault, I. L. (2019). Distance from home birth to emergency obstetric services and neonatal outcomes: A cohort study. *Journal of Midwifery & Women's Health*, *64*(2), 170-178. https://doi.org/10.1111/jmwh.12896

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: This study examined if the distance from the nearest hospital with 24-hour cesarean capabilities affected neonatal outcomes for planned home births. **Sample/Setting:** 11, 869 women were used in this study who were planning a home birth in Ontario, Canada between 2012-2015. These women were considered low risk, with term, singleton pregnancies. The women included in this study started labor at home, at their planned location of birth **Level of evidence:** Level III **Quality of evidence:** C, low quality, due to small sample size	**Design:** A retrospective cohort study. It utilized the Better Outcomes and Registry Network, which tracks all perinatal outcomes within the Ontario Province. **Outcome/Measurement** **Primary Outcomes:** -Apgar score less than 7 at 5 minutes of life -Driving distance to nearest hospital with 24 hour cesarean capabilities	- 5 minute Apgar <7 p= 0.58 -Newborn with 5 minute Apgar <7 by parity: nulliparous p= 0.168, multiparous p= 0.431 - perinatal mortality p=0.19 -NICU admit p= 0.001 - Meconium aspiration syndrome p= 0.19 -EMS attended delivery 0.16 -EMS transfer 0.12 **Conclusion:** There was no evidence to support that there were worse neonatal outcomes when home births were planned greater than 30 minutes from the nearest obstetric emergency services.	**Strengths:** -This study examined the distance from a hospital with cesarean capabilities from planned place of birth and its impact on neonatal outcomes, which had not been previously studied. -A large sample size with significant data **Limitations:** -This was an observational study so causation cannot be determined. -There may have been increased risks by maternal characteristics such as parity, however, the screening for this study didn't differentiate these risk factors from the outcomes. -Small sample size, and unable to find statistically significant results -Utilizing postal codes as a measurement from the distance from home to hospital is not the most accurate.

Author Recommendations: There should not be arbitrary distance requirements to the nearest obstetric emergency services for planned home birth. There are medical and social risks that occur when patients in a rural setting are forced to travel for intrapartum care and this could be mitigated by allowing for planned home birth in these situations. Families should be educated on potential maternal and neonatal risks that could occur when being further than 30 minutes to the nearest equipped hospital. Midwifery services should be available in rural settings.

Summary for current clinical practice question: See Conclusion

Source: Gaudineau, A., Sauleau, E. A., Nisand, I., & Langer, B. (2013). Obstetric and neonatal outcomes in a home-like birth centre: A case–control study. *Archives of Gynecology and Obstetrics*, *287*(2), 211-216. doi:10.1007/s00404-012-2553-6

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To compare the intervention rates associated with labor in low-risk women who began their labor in the "home-like birth centre" (HLBC) and the traditional labor ward (TLW). **Sample/Setting:** 316 women were studied in the HLBC setting compared to 890 women in the TLW setting who delivered in Strasbourg, France. **Level of evidence:** Level III **Quality of evidence:** C, low quality, due to sample size	**Design:** A retrospective study utilizing the Baysian information criterion to ensure the best predictive model. **Outcome/Measurement** **Primary Outcome:** -Perineal lacerations -Mode of delivery -PPH -Breastfeeding initiation -Type of analgesia -Adverse neonatal outcomes -Transfer from HLBC. **Secondary Outcome:** - Umbilical cord pH <7.15 -5 minute Apgar less than or equal to 6 -Neonatal death -Episiotomy - 1st or 2nd degree laceration -3rd or 4th degree laceration -Instrumental delivery -Cesarean section	-Umbilical arterial pH level was higher among infants born in the HLBC p = 0.017 -Low five minute Apgar scores among the groups was n=10 in both groups and not significant. P = 0.117 -Adverse neonatal outcomes was approximately the same among both the HLBC and TLW groups. P =0.852 **Conclusion:** Women who gave birth in the HLBC were more likely to have spontaneous vaginal deliveries, less likely to have perineal trauma without these factors affecting neonatal outcomes.	**Strengths:** -All midwives in this study reviewed all of the patient's cases to ensure continuity of care regardless of intended place of birth. **Limitations:** -Small sample size -Women utilizing the HLBC were compared against women utilizing the TLW, who were not necessarily considered low-risk -Possible selection bias due to lack of randomization of birth site.

Author Recommendations: The favorable outcomes associated with care at the HLBC is not entirely due to the quality of midwifery care, but also due to patient's having a high motivation for less intervention seeking care at the HLBC. Women benefited from care in the HLBC. Larger studies are needed to establish the safety of these centers and to validate the findings of this study.

Summary for current clinical practice question: Neonatal outcomes were not affected by women birthing in the HLBC.

Source: Maimburg, R. D. (2018). Homebirth organised in a caseload midwifery model with affiliation to a Danish university hospital–A descriptive study. *Sexual & Reproductive Healthcare*, *16*, 82-85. https://doi.org/10.1016/j.srhc.2018.02.011

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To identify birth and neonatal outcomes of women planning a home birth with a caseload midwifery team. **Sample/Setting:** 268 women planned to give birth at home in Denmark. 196 actually ended up giving birth at home. All women in the study had a low-risk, singleton pregnancy in a vertex position and delivered at term. **Level of evidence:** Level III **Quality of evidence:** C, low quality, due to insufficient sample size	**Design:** A descriptive study using prospectively collected data that occured between Feb. 2015-Jan 2017. Data on the birth and neonatal outcome was collected in a database at the Aarhus University Hospital. **Outcome/Measurement** **Primary Outcome:** -Birth outcome -Neonatal outcome **Secondary Outcome:** -Postpartum hemorrhage -Vaginal and perineal tears -Apgar score at 1 and 5min -Transfer to NICU	-72% of women enrolled in this study gave birth at home as planned. -80% of nulliparous women were transferred to the hospital either during the intrapartum or postpartum period compared to 20% of multiparous women. The most common intrapartum transfer reason was lack of labor progress and the most common postpartum reason was perineal repair -14% had meconium-stained fluid, 23% of which were transferred to the hospital -92% of women had spontaneous vaginal deliveries -31% of women had a waterbirth -1% of newborns had an Apgar below 7 at 5 minutes of life -Less than 1% of newborns was transferred to the NICU after birth, of the two newborns transferred one was transferred for observation for maternal fever during labor and the other one for observation for meconium aspiration **Conclusion:** This study revealed high rates of women giving birth at home who elected to have water births or birth in upright birthing positions. There were high rates of transfer in nulliparous women. Most transfers were for non-emergent reasons. There were low rates of adverse outcomes for neonates.	**Strengths:** -Detailed data set, from which to be able to understand trends in home births and outcomes. -The same midwives who cared for the women at home also cared for the women who transferred into the hospital **Limitations:** -Small sample size -This study was a descriptive study and therefore didn't include p values with their findings.

Author Recommendations: This study was consistent with other nordic studies in regards to transfer rates of 28% primarily for non-emergent reasons such as slow labor progress. There were good neonatal outcomes in this study. However a larger study that is not descriptive would need to be done in order to draw more concrete conclusions about the effect of home birth on neonatal morbidity and mortality.

Summary for current clinical practice question: This study showed good outcomes for neonates born at home in terms of both morbidity and mortality. However, due to the small sample size these results are not significant.

Source: Ovaskainen, K., Ojala, R., Gissler, M., Luukkaala, T., & T. O. (2015). Out-of-hospital deliveries have risen involving greater neonatal morbidity. *Acta Paediatricia, 104*(12), 1248-1252. doi:10.1111/apa.13117

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To evaluate trends and reasons for Out of hospital deliveries, OHDs, in the Tampere University Hospital catchment area **Sample/Setting:** The study cohort included all planned and unplanned OHDs in the Hospital area from 1996 to 2011. There were 76 773 births in the catchment area, 67 of them occurring out-of-hospital **Level of evidence:** Level III **Quality of evidence:** C, low quality based on sample size	**Design:** -Cohort study -The control group comprised two hospital births for each OHD. -Trends in incidence and risk factors for OHDs, including neonatal morbidities, were established and compared to the controls. **Outcome/Measurement** **Primary Outcome:** -Smoking -Living in partnership -Mother's nationality -Maternal age -Parity -Number of previous pregnancies - Number of all prenatal visits to maternity clinics in health centres or hospital -Home-to-hospital distance -Travel time - Length of gestation -Duration of labour -Duration of hospital care -one- and five-minute Apgar scores -Congenital anomaly -Birthweight and birth length -SGA and LGA -Admission to neonatal unit and diagnoses received	-OHDs accounted for 67 (0.10%) of the 76,773 births in the area, the proportion remaining unchanged between 1996 and 2005, but then increasing. -Risk factors associated with OHDs were smoking during pregnancy, short labour, higher number of previous births, single status, residence more than 35 kilometres from the delivery unit and fewer prenatal visits. -OHD cases were more likely to be admitted to the neonatal care unit than controls and to be treated for suspected infections and hypothermia **Conclusion:** -Smoking, short duration of labour, a higher number of previous births, single status and longer distances from the delivery unit were associated with OHDs. Eight (12%) mothers had OHDs without antenatal care, and their infants had more neonatal morbidities	**Strengths:** -long study period -Data was population-based and covered all OHD infants born in the hospital region - Multiple data sources were used to improve data quality **Limitations:** - Rather small number of OHDs - Missing values for maternal education or socioeconomic status or the use of alcohol or drugs - Data were based on self-reporting and found in only a small number of cases

Author Recommendations: OHDs incidence is increasing. We should therefore concentrate on the training of ambulance staff and develop and implement a protocol to educate attendants working in the alarm units

Summary for current clinical practice question: See conclusion

Source: Ovaskainen, K., Ojala, R., Tihtonen, K., Gissler, M., Luukkaala, T., & Tammela, O. (2019). Planned home deliveries in Finland, 1996–2013. *Journal of Perinatology*, *39*(2), 220. doi: https://doi.org/10.1038/s41372-018-0267-8

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To understand the trend of home birth in Finland and its associated perinatal outcomes. **Sample/Setting:** This study collected data from all births in Finland that occured between 1996-2013. In that period 170 of those births were disclosed as planned home births. The results were compared to a control group of 720,047 newborns born in the hospital. Preterm deliveries, operative deliveries, deliveries with congenital anomalies, delivery records that did not contain delivery mode or gestational age were excluded from the study. **Level of evidence:** Level III **Quality of evidence:** C, low quality due to small sample size	**Design:** A retrospective cohort study. It utilized data from the Medical Birth Register and the Register of Congenital Malformations maintained by the National Institute for Health and Welfare. **Outcome/Measurements** **Primary Outcomes:** -Maternal morbidity and mortality -Neonatal morbidity and mortality	-There were no maternal deaths or adverse maternal outcomes during the study, $p < 0.001$ -Infants born in the home birth group were heavier on average $p= 0.01$. -Infants born at home were more likely to have a one minute Apgar score less than 7. -Infants born at home suffered less birth trauma. -5 infants in the study group were admitted to the NICU $p=0.11$ -There were a set of twins who were the only neonatal deaths in the study. -Infants born at home had an increased risk of requiring invasive ventilation or therapeutic hypothermia. However, overall infants born at home had a lower percentage of neonatal morbidity compared to those born in the hospital $p=0.9$. -There were not any difference in mortality and morbidity between the mothers who had additional risk factors and those who were considered to have uncomplicated pregnancies. **Conclusion:** Home births are rare in Finland, but steadily increasing. Planned home birth was found to result in fewer episiotomies and shorter duration of labor. Infant outcomes in planned home births resulted in lower Apgar scores, but fewer cases of birth trauma. In the one case of neonatal death the mother did not meet the set criteria for safe home birth in Finland. There seems to be an increased risk of asphyxia, hypothermia, and need of assisted ventilation for infants born at home. The findings of this study should be shared with women considering home birth.	**Strengths:** -Data came from several comprehensive data sets and was studied over a 17 year period. **Limitations:** -Small sample size -There was no data on intended place of birth prior to delivery, so patients who were transferred in labor could not be accounted for. -There were many home births with missing data which resulted in them not being a part of the study.

Author Recommendations: Midwives attending home deliveries should ensure that the data they are collecting is complete. Hospitals should strive to support physiologic birth and offer low-intervention and home-like environments within the hospital.
Summary for current clinical practice question: While the sample size was very small in this study there was significant neonatal mortality associated with planned home birth. This included lower Apgar scores, therapeutic hypothermia, and assisted ventilation. There was a decrease in birth trauma for neonates born at home.

Source: Pasternak, Y., Wintner, E. M., Shechter-Maor, G., Pasternak, Y., Miller, N., & Biron-Shental, T. (2018). Perinatal outcomes of unplanned out-of-hospital deliveries: a case–control study. *Archives of Gynecology and Obstetrics, 297*(4), 871-875. doi:10.1007/s00404-017-4634-z

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**

Purpose: To compare the pregnancy and perinatal outcomes of unplanned home or car births vs. in-hospital deliveries **Sample/Setting:** Women who underwent unplanned out-of-hospital deliveries vs. in-hospital deliveries from 2004 through 2014 in an urban area in Israel with 54,283 deliveries occurred in our department but only 90 patients (0.17%) met the inclusion criteria for the study group **Level of evidence:** Level III **Quality of evidence:** C, low quality- sample size is small	**Design:** -A retrospective, case–control study of women who underwent unplanned out-of-hospital deliveries vs. in-hospital deliveries from 2004 through 2014. -Matching was based on gestational age and parity in a ratio of 2:1 -Data presented as mean ± SD. Pearson's Chi square test or Fisher's exact test, and the Mann–Whitney *U* test were used, where appropriate **Outcome/Measurement** **Primary Outcome:** -Patient characteristics evaluated include age, BMI, gravidity, parity, screening tests, abnormal blood glucose or gestational diabetes, mode of delivery and complications in previous pregnancies -Maternal pregnancy outcome parameters analyzed include pregnancy-induced hypertension, preeclampsia, perineal tears, retained placenta, postpartum hemorrhage, intrapartum and postpartum fever, postpartum maternal days of admission -Neonatal data included gestational age at delivery, birth weight, gender, umbilical artery pH values after delivery and 1 and 5 min Apgar scores, respiratory interventions, admission to the NICU, fetal polycythemia, hypothermia, hypoglycemia, jaundice, day of admission and mortality	-No differences between the groups regarding demographic criteria, prenatal care and delivery complications. -Women who delivered out of hospital ($n = 90$) had significantly fewer cesarean deliveries (1.1 vs. 10.6%; $p = 0.05$) and operative deliveries (2.2 vs. 13.3%; $p = 0.004$) in their obstetrical history than did the control group ($n = 180$). -Significantly more newborns delivered out of the hospital had polycythemia (25.6 vs. 1.7%; $p < 0.0001$) and hypothermia (3.3 vs. 0%; $p = 0.036$) compared to the control group **Conclusion:** -Unplanned out-of-hospital deliveries in urban areas are more likely to occur among women without previous cesarean deliveries or operative vaginal deliveries. -Hypothermia and polycythemia occurred more frequently among neonates born out of the hospital	**Strengths:** -Designed so that case and control groups had similar demographic and clinical characteristics, by matching according to gestational age and parity, rather than choosing the subsequent delivery as a control for every subject **Limitations:** -Nature of being retrospective -A potential control selection bias due to comparing a low-risk study group, with fewer complications in previous births and the tendency to deliver quicker, to the general population -Study group was small because of the low prevalence of unplanned out-of-hospital deliveries. It is almost impossible to analyze and compare frequencies of rare complications such as perinatal mortality in a small data set -The largest group of unplanned out-of-hospital deliveries studied so far in an urban area
Author Recommendations: Authors of future studies may want to examine how to better identify prenatally the characteristics of mothers whose pregnancies result in an unplanned home birth, to prevent neonatal morbidity			
Summary for current clinical practice question: This study found that hypothermia and polycythemia are more common among neonates born in unplanned out of hospital births			