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The Effect of Alternative Labor Positions Versus the Lithotomy Position on Birthing Outcomes: An Integrative Literature Review

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THE EFFECT OF ALTERNATIVE LABOR POSITIONS VERSUS THE
LITHOTOMY POSITION ON BIRTHING OUTCOMES: AN INTEGRATIVE
LITERATURE REVIEW

by

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A thesis submitted in partial fulfillment of the requirements
for Honors in the Major Program in Nursing
in the College of Nursing
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at the University of Central Florida
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ABSTRACT

Traditionally, the lithotomy position is the most commonly used birthing position in western cultures. The purpose of this literature review was to examine the differences in maternal and neonatal outcomes when alternative labor positions are used. Implications for future use of alternative labor positions were explored. Peer reviewed, English-language research articles published from 2009 to 2015 were included for synthesis. Study results revealed that the lithotomy position is linked to multiple negative maternal outcomes. Birthing in a water pool or in a lateral position has been linked to more optimal maternal and neonatal outcomes compared to other positions. Health care providers, and nurses in particular, should be educated on the benefits and consequences of both the lithotomy position and alternative labor positions. Using this evidenced based research, health care professionals can educate women and families as they encounter the birthing process. Further research is needed to identify additional birthing outcomes of labor positions, specifically neonatal outcomes of the lithotomy position. In addition, research on innovative obstetric monitoring techniques will expand the opportunity to use alternative labor positions while protecting the mother and fetus.

DEDICATION

To my loving family for supporting me throughout this journey.

To my dear friend, Briana Jamieson, for her inspiration and encouragement.

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INTRODUCTION

The birthing stage of a pregnancy can be one of the most exhilarating, yet the most fearful stage for a woman to undergo. Early in the pregnancy, many women construct a plan to follow during the birthing process to help the passage of the fetus from intrauterine life to the external environment go more smoothly. However, even the most well constructed plans often do not come to fruition. Complications can arise during the various stages of labor that alter the intended labor strategies; also, the pain intensity associated with the birthing process may be greater than the woman anticipated. Thus, the birthing plan must be modified. One reason the birthing process can become more difficult is attributable to a woman resisting the ‘natural’ physiologic course of events. For example, the supine or lithotomy position is currently the most commonly used in obstetrical care during labor and delivery; other birthing positions could facilitate the body’s natural physiologic process to facilitate the delivery of the fetus. Labor positions other than the supine or lithotomy position, that promote the use of gravity and the woman’s urge to bear down, can improve the labor and delivery experience for the woman and could reduce post-partum complications (DiFranco & Curl, 2014). The terms ‘fetus,’ ‘infant’ and ‘neonate’ will be used interchangeably in this report.

When encountering a woman who is nearing the end of pregnancy, healthcare providers should understand the physiological stages of labor; then, be able to tailor client-centered interventions based on an individual’s needs and preferences (Nieuwenhuijze, Low, Korstjens & Lagro-Janssen, 2014). Each pregnancy is unique; thus, no two deliveries will be alike. Nurses must identify what each woman is experiencing as her labor progresses along with offering

supportive interventions during delivery to promote optimal birthing outcomes (Nieuwenhuijze et al., 2014). Birthing in the lithotomy position has inherent disadvantages and risks for a woman and the baby (Reid & Harris, 1988). Yet, only 10% of pregnant women choose alternative labor positions (DiFranco & Curl, 2014). Evidence supports the benefits associated with alternative labor positions throughout the progression of labor as well as protecting the woman and the baby during and after delivery (Lawrence et al., 2013). Although evidence supports the use of alternative labor positions, the lithotomy position continues to be most used (Meyvis et al., 2012). Armed with knowledge about alternative labor positions, nurses can individualize care that will contribute to positive maternal and neonatal outcomes.

Of all pregnant women in the United States from 2003-2011, about 75% received prenatal care at some time during their pregnancy (Child Health USA, 2013). Therefore, about one quarter of U.S. women do not receive any prenatal care before delivery. The role of the healthcare team is to facilitate a safe and effective delivery experience for the woman and the fetus regardless of whether or not she received prenatal care. Nurses who care for women during various stages of labor and delivery have a responsibility to support and advocate for the birthing mother, as well as provide high quality, evidence-based care to both the mother and the fetus (Lawrence, Lewis, Hofmeyr, & Styles, 2013). Nurses should understand the benefits and risks of labor and delivery positions that can facilitate the birthing process and improve maternal-infant outcomes (Nieuwenhuijze, Low, Korstjens, & Lagro-Janssen, 2014).

PROBLEM STATEMENT

The problem statement of this thesis is to examine the effect of alternative birthing positions during labor and delivery on maternal-fetal outcomes.

PURPOSE

The purpose of this thesis is to examine evidence in the literature focusing on the outcomes associated with use of the various maternal birthing positions during labor and delivery. Current studies identify disadvantages with use of lithotomy position, as it can be detrimental to maternal-infant outcomes (DiFranco & Curl, 2014). Consequently, the next step is to identify labor and birthing positions that contribute to more optimal maternal and neonatal outcomes. Evidence related to alternate birthing positions can help the nurses empower a woman and her family members to make informed decisions during the labor and delivery process (Lawrence et al., 2013). Essentially, nurses need evidence to support and advocate for women who are pregnant during the labor and delivery process.

METHOD

This thesis includes an integrative review of literature that focuses on the lithotomy position and alternative labor positions during childbirth. Databases utilized include Cochrane, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and MEDLINE, using the following search terms: “alternative labor positions,” “labor positions,” “birthing positions,” “birth outcomes,” “neonatal outcomes,” “maternal outcomes,” “water birth.” Inclusion criteria include peer-reviewed, original research articles published in 2009 to 2015 in the English language. Exclusion criteria include inaccessible full-text articles, a focus on the length of labor stages and an irrelevant aim to this literature review topic. Original search results revealed 5,948 studies (Figure 1). A variety of combinations of key terms were searched in order to narrow results. The narrowed search revealed 104 studies. Five studies pertaining to birthing outcomes of the lithotomy position and alternative labor positions were hand selected for further review. Additional searches were conducted including search terms: “lithotomy,” “lateral,” “all fours,” “hands and knees,” “birth stool,” “sitting,” semi-recumbent,” “semi-seated,” “standing,” OR “squatting” AND “birth outcomes.” These searches revealed 24 studies. One additional article was included for review. Further searches were conducted using additional key terms; articles that pertain to the literature review topic and meet inclusion criteria were collected. A final thirteen articles were utilized to conduct the literature review.

All studies were individually critiqued. A table that summarizes the backgrounds and limitations of each study was constructed (Table 1). Another table was created to convey the studies’ findings (Table 2). The critiques have been synthesized to identify consistent and

inconsistent findings along with gaps in the literature. Recommendations for nursing practice, education, policy and future research have been included. Limitations of this review have been noted.

BACKGROUND

Historically, mothers used physiologically appropriate labor positions such as squatting, sitting up right, and even standing in the birthing process (Reid & Harris, 1988). A pregnant woman delivered her infant in more natural physical positions that allowed for flexing of the hips, straightening the pelvis and facilitating the use of gravity, all of which facilitated the fetus moving through the birth canal (DiFranco & Curl, 2014). Along with less discomfort, these more natural positions are less fatiguing for the woman in the late stages of pregnancy (Nilsen, Sabatino, & Lopes, 2011).

Water birth is another alternative labor option that allows labor and delivery to be a more natural process. During water birth, the mother is immersed in a pool of warm water and the infant is delivered under water (Menakaya, Albayati, Vella, Fenwick, & Angstetra, 2013). The United Kingdom has integrated water birth into almost all maternity services in efforts to decrease the use of labor interventions and increase the possibility of spontaneous labor (Burns, Boulton, Cluett, Cornelius, & Smith, 2012). In addition to a more natural delivery, women who used this position gain a sense of control, feel safe and relaxed (Menakaya et al., 2013). Emerging in the nineteen-eighties, water birth is now being adopted by many countries as an alternative labor position that may result in better maternal and neonatal outcomes. The terms “water birth” and “water pool” will be used interchangeably in this review.

Currently in obstetric practice, these alternative positions infrequently are used during labor while the supine position has come to be accepted as ‘best practice’ in hospital-based deliveries (Reid & Harris, 1988). Over the past century western medicine has designated

pregnancy as a medical diagnosis, along with technology have led to replacing more natural obstetrical positions with the reclining lithotomy position during labor (Reid & Harris, 1988). For example, one recent study reports that among pregnant women, 68% delivered their baby in the supine or lithotomy position (DiFranco & Curl, 2014). On the one hand, the lithotomy position is convenient for healthcare providers to perform cervical exams and administer anesthetics during labor and delivery (Meyvis et al., 2012). Conversely, alternative positions may not be as convenient for the health care providers but may lead to more optimal maternal-infant outcomes and increased patient satisfaction with her birthing experience (Nieuwenhuijze et al., 2014).

Meyvis and colleagues (2012) investigated the effects of the lithotomy position versus alternative positions such as sitting upright, kneeling, squatting, left lateral, and reclining. Maternal-infant outcomes were examined to determine benefits and consequences associated with alternative obstetrical positions. Their findings indicate that the lithotomy position has residual consequences associated with restricted movement of the woman (Meyvis et al., 2012). Consequences for the pregnant woman can include perineal and cervical trauma, increased pain and discomfort as well as an increased demand for labor augmentation. These consequences can lead to a need for more risky and oftentimes invasive medical interventions. The supine position may then demand more extensive medical interventions, including use of forceps delivery or even a Cesarean Section (Lawrence et al., 2013). Subsequently, the neonate could suffer decreased Apgar scores, respiratory distress and an increased demand for critical care while the mother experiences additional physiological and emotional trauma.

During early stages of labor, alternative natural birthing positions tend to be more comfortable for the pregnant women by altering the shape and size of the pelvic cavity, increase blood flow and uterine activity (DiFranco & Curl, 2014). These positions also facilitate the fetus rotating and descending into the pelvic cavity (Nilsen et al., 2011). Use of evidence based natural ‘alternative’ labor positions leaves the pregnant family feeling ‘in control’ of this major life transition; and, will enable a safe and satisfying labor experience along with reduced risks for the neonate (Nieuwenhuijze et al., 2014). Nurses can best support pregnant women by understanding and educating her about the risks and benefits associated with the lithotomy position as well as alternative labor positions.

RESULTS

Thirteen studies related to the lithotomy position and alternative labor positions were included in this review of literature. All studies included in this review are quantitative studies published between 2009 and 2015. The studies were published in various geographical locations including the United Kingdom, New Zealand, Brazil, Australia, Netherlands, Sweden, Belgium, Turkey, South Africa, and Japan. Subsequently, the findings were analyzed to determine maternal and fetal outcomes for the lithotomy position versus alternative birthing positions.

Lithotomy

The lithotomy position is characterized as a woman “lying on her back with her feet elevated in stirrups” (Reid & Harris, 1988). Positions included in the literature analysis of this position are lithotomy, dorsal, supine and recumbent. Six studies analyzed the use of a lithotomy position. One study assessed both maternal and neonatal outcomes and five studies assessed only maternal outcomes.

Maternal

Two studies recorded the use of episiotomy (da Silva et al., 2012; Meyvis et al., 2012). da Silva and colleagues (2012) found that women in a dorsal position ($n=887$) were 55% more likely to receive an episiotomy. Meyvis and colleagues (2012) found that women in the lithotomy position ($n=348$) were more likely to receive an episiotomy compared to the lateral position ($n=209$). Of the women that delivered in the lithotomy position, 38.2% ($n=132$) received an episiotomy, compared to less than 7% of women in the lateral position.

In respect to maternal perineal damage, Meyvis and colleagues (2012) compared birthing in the lithotomy position to the lateral position. The lithotomy position was associated with more perineal damage than the lateral position. Two studies reported obstetric anal sphincter injuries (De Jonge, Van Diem, Scheepers, Buitendijk, & Lagro-Janssen, 2010; Elvander, Ahlberg, Thies-Lagergren, Cnattingius, & Stephansson, 2015). Maternal complications that can result from anal sphincter injuries include anal incontinence, sexual dysfunction, pain, and a reduced long-term quality of life (Elvander et al., 2015). De Jonge and colleagues (2010) reported that 2% ($n=31$) of women using the recumbent position had a third degree tear, which involved the anal sphincter. Elvander and colleagues (2015) reported that the lithotomy position had the highest prevalence of obstetric anal sphincter injury compared to all other positions examined in the study.

Nilsen and colleagues (2011) assessed pain during labor and delivery. The lithotomy position ($n=46$) was found to be less painful compared to a lateral position ($n=186$) during delivery. Pain during labor was comparable across all positions, including semi-seated, left lateral, and the lithotomy.

Neonatal

One study reported five-minute Apgar scores (Dahlen, Dowling, Tracy, Schmied, & Tracy, 2013). The labor position used in a group of women was unidentified in this study ($n=105$). Thus, Dahlen and colleagues (2013) reported from a previous study that there are no significant results in respect to the lithotomy position and Apgar scores compared to upright, lateral, use of a birthing stool, squatting and other unidentified positions (De Jonge, Teunissen & Largo-Janssen, 2004).

Water birth

Six studies analyzed water births. Four studies analyzed both maternal and neonatal outcomes, one study analyzed only maternal outcomes, and one study analyzed only neonatal outcomes. The use of a water pool varied between being in the pool for all or part of labor, and delivering inside or outside of the pool.

Maternal

Two studies examined the need for labor augmentation, such as amniotomy or oxytocin infusion (Burns et al., 2012; Mollamahmutoglu et al., 2012). Both studies concluded that laboring in a water pool required less of a need for augmentation. Burns and colleagues (2012) found that only about 21% ($n=1,888$) of participants needed their labor augmented. The majority of participants experienced a spontaneous labor ($n=7,915$), more than half of which occurred in the water pool ($n=5,192$). These two studies also assessed the use of analgesia for maternal pain. Burns and colleagues (2012) recorded that 80% ($n=7,137$) of women who experienced a spontaneous birth did not use any form of analgesia for pain management. Mollamahmutoglu and colleagues (2012) also found that water births were associated with a decreased need for pain analgesia.

Two studies assessed the need for episiotomy (Burns et al., 2012; Menakaya et al., 2013). Both studies found that water births were associated with less of a need for episiotomy. Burns and colleagues (2012) recorded that almost 80% of women ($n=7,137$) who experienced a spontaneous birth did not receive an episiotomy. Menakaya and colleagues (2013) recorded that no participants who had a water birth ($n=219$) had an episiotomy performed.

Five studies assessed perineal laceration (Burns et al., 2012; Dahlen et al., 2013; Menakaya et al., 2013; Mollamahmutoglu et al., 2012; Suto, Takehara, Misago, & Matsui, 2015). Three studies found that use of a water pool is associated with less of a risk for perineal laceration (Burns et al., 2012; Dahlen et al., 2013; Menakaya et al., 2013). About 40% of women who used a water pool ($n=88$) had an intact perineum after delivery, while only 31% of women who delivered on land ($n=68$) had an intact perineum (Menakaya et al., 2013). Two studies reported that use of a water pool resulted in more perineal lacerations (Mollamahmutoglu et al., 2012; Suto et al., 2015). However, Suto and colleagues (2015) reported that an increased risk for laceration is only found in nulliparous women ($n=422$).

One study assessed the third stage of labor (Burns et al., 2012). Approximately 86% of women who had a water birth ($n=1,613$) did experience the third stage of labor. About of the women who experienced the third stage of labor delivered the placenta under water ($n=864$). A retained placenta was only experienced by less than 2% of women ($n=137$). Three studies assessed blood loss (Burns et al., 2012; Menakaya et al., 2013; Mollamahmutoglu et al., 2012). All studies found no significant difference in blood loss when comparing water births to land births. One study assessed blood pressure (Mollamahmutoglu et al., 2012). Readings were lower for women who birthed in water, but the findings were insignificant.

Neonatal

Two studies reported neonate temperatures (Burns et al., 2012; Ros, 2009). Burns and colleagues (2012) found that only 1% of neonates ($n=35$) experienced pyrexia, and none were found to have an infection. Ros (2009) reported that neonates born in water ($n=27$) did have higher temperatures than neonates born on land ($n=27$). Hyperthermia was experienced by 4%

($n=1$) of neonates born in water, and 15% ($n=4$) experienced hypothermia. One study reported cases of jaundice (Burns et al., 2012). Time of incidence of jaundice was not included in the study. Less than 1% ($n=17$) of neonates born of water birth had jaundice and needed treatment at the hospital. Two studies reported pH levels of the neonates (Carpenter & Weston, 2012; Ros, 2009). Carpenter and colleagues (2012) reported an association between water birth babies and acidosis. Ros (2009) tested the pH of umbilical cord blood and found that it was slightly acidotic amongst water births and land births. Ros (2009) also reported the hemoglobin and sodium levels of the umbilical cord blood. All levels were within range amongst both groups of newborns, but the cord blood of the water birth group had a slightly higher hemoglobin level and slightly lower sodium level.

Two studies reported feeding difficulties (Carpenter & Weston, 2012; Menakaya et al., 2013). Time of incidence was not reported in the studies. Carpenter and Weston (2012) reported a higher prevalence of feeding difficulties in neonates born underwater. Menakaya and colleagues (2013) reported only three infants with feeding difficulties that were born underwater. These studies also reported meconium aspiration. Both studies found that the prevalence of meconium aspiration did not vary amongst land and water born neonates.

Three studies reported respiratory distress in neonates (Burns et al., 2012; Carpenter & Weston, 2012; Menakaya et al., 2013). Two studies found that the majority of babies born underwater did not experience respiratory distress (Burns et al., 2012; Menakaya et al., 2013). Carpenter and Weston (2012) reported that all babies born on land ($n=24$) experienced respiratory distress. Carpenter and Weston (2012) reported an increased need for respiratory support, including ventilation and nitric oxide, in babies born under water ($n=14$). However, less

than 30% ($n=4$) of babies born under water required this treatment. This study also reviewed chest x-ray changes of neonates. Thirty-five films were available for review; twenty-five volunteers examined the films, creating 875 film assessments. About half of the chest x-rays of neonates born under water were found severely abnormal ($n=156$), and only 16% of x-rays of babies born on land ($n=88$) were found severe.

Five studies analyzed Apgar scores (Carpenter & Weston, 2012; Dahlen et al., 2013; Menakaya et al., 2013; Mollamahmutoglu et al., 2012; Ros, 2009). Four studies did not find a significant difference in Apgar scores amongst neonates born on land or under water (Carpenter & Weston, 2012; Dahlen et al., 2013; Menakaya et al., 2013; Mollamahmutoglu et al., 2012). Ros (2009) reported that neonates born on land ($n=27$) correlated with lower Apgar scores; neonates born under water ($n=27$) always had an Apgar score at or above seven. Ros (2009) also assessed reflexes. No difference was found in reflexes amongst neonates born on land or under water.

Five studies recorded neonates that were sent to a neonatal intensive care unit or neonates that required critical care (Burns et al., 2012; Carpenter & Weston, 2012; Menakaya et al., 2013; Mollamahmutoglu et al., 2012; Ros, 2009). All studies found that few neonates received critical care, or there was no difference between neonates that received critical care when comparing neonates born on land to those born under water. Two studies reported the need for resuscitation (Burns et al., 2012; Ros, 2009). Burns and colleagues (2012) reported that less than 2% ($n=110$) of infants born under water required resuscitation. Ros (2009) found that infants born in water needed resuscitation less than infants born on land.

Two studies reported neonatal mortalities (Burns et al., 2012; Carpenter & Weston, 2012). Burns and colleagues (2012) reported two stillbirths and two neonatal deaths. Carpenter and Weston (2012) reported one infant death at three weeks of age due to persistent pulmonary hypertension. Both of these studies only reviewed water birth; thus a comparison could not be made to other positions.

One study reported incidences of umbilical cord avulsion (Burns, et al. 2012). This study found that umbilical cord avulsion only occurred in less than 1% of deliveries ($n=20$), almost all of which were water births ($n=18$). Two studies reported post-partum hemorrhage (Burns et al., 2012; Dahlen et al., 2013). Both studies found that water births were associated with less post-partum hemorrhage in the mother compared to land births.

Kneeling (“All-fours”)

Three studies analyzed the use of an all fours or kneeling position by the woman during labor (Dahlen et al. 2013; Elvaner et al., 2015; Suto et al., 2015). Maternal positions this category includes are kneeling and hands and knees. Two studies only analyzed maternal outcomes, and one study analyzed both maternal and neonatal outcomes.

Maternal

Suto and colleagues (2015) reported perineal laceration for the kneeling position ($n=296$). An increased risk of perineal lacerations was reported among women in the kneeling position. Dahlen and colleagues (2013) assessed perineal trauma and post-partum hemorrhage in women. No significant results were found on these outcomes regarding the kneeling position ($n=2,936$). Elvander and colleagues (2015) assessed maternal obstetric anal sphincters ($N=113,256$). No

significant results were found for the all fours position ($n=678$) compared to sitting, lithotomy, lateral, standing, supine, squatting, and using a birth seat.

Neonatal

One study reported five-minute Apgar scores ($N=6,144$; Dahlen et al., 2013). No significant differences were found for the all fours and kneeling position ($n=2,936$) compared to water births, semi-recumbent, lateral, standing, squatting, and use of a birth stool.

Birth Stool & Sitting

The sitting position is a vertical position in which a woman's back is elevated higher than her pelvis (Reid & Harris, 1988). A birthing stool allows a woman to use a sitting position while the health care provider can easily access her perineum during delivery. De Jonge and colleagues (2010) identified this position as "sitting in a bed supported by a person or on a birthing stool or similar birthing aid." Schirmer, Fustinoni and Oliveira (2011) identified this position as "[a women] with her body weight on her buttocks and her torso inclined 30 degrees behind from the upright axis." Five studies assessed the use of a birthing stool or sitting position (Dahlen et al., 2013; De Jonge et al., 2010; Elvander et al., 2015; Schirmer et al., 2011; Suto et al., 2015). One study assessed both maternal and neonatal outcomes and four studies only assessed maternal outcomes.

Maternal

Four studies assessed perineal damage and found that the use of a birth stool increases the risk for perineal damage (Dahlen et al., 2013; De Jonge et al., 2010; Elvander et al., 2015; Suto et al., 2015). Two studies found that the use of a birth stool was associated with a higher rate of perineal damage compared to water births (Dahlen et al., 2013; De Jonge et al., 2010). Elvander

and colleagues (2015) assessed obstetric anal sphincter injury. This study reported an increased risk in parous women that used a birth seat ($n=582$). De Jonge and colleagues (2010) also found that use of a sitting position resulted in tearing of the anal sphincter in about 3% of women ($n=4$), which is the highest percentage compared to all other positions in the study, including recumbent, supine, lateral, and semi-seated. De Jonge and colleagues (2010) found that women using a sitting position ($n=119$) were less likely to have an episiotomy.

Neonatal

One study reported five-minute Apgar scores (Dahlen et al., 2013). No significant differences were found regarding the use of a birth stool ($n=582$).

Semi-recumbent & Semi-seated

A semi-recumbent position is characterized as a woman “partially raised with her shoulders above her pelvis and the legs are held abducted” (Reid & Harris, 1988). De Jonge and colleagues (2010) identified this position as “supported by pillows or a bed rest.” Three studies analyzed the use of a semi-recumbent or semi-seating position (Dahlen et al., 2013; De Jonge et al., 2010; Nilsen et al., 2011). One study recorded both maternal and neonatal outcomes and two studies only recorded maternal outcomes.

Maternal

One study reported pain during labor and delivery (Nilsen et al., 2011). Women in this position ($n=186$) reported pain as “bearable or barely unbearable.” Three studies reported perineal trauma (Dahlen et al., 2013; De Jonge et al., 2010; Schirmer et al., 2011). De Jonge and colleagues (2010) reported that of women in this position ($n=602$), 1.5% ($n=9$) experienced a third degree tear, which involved the anal sphincter. Schirmer and colleagues (2011) reported

about 20% of women in this position ($n=15$) experienced labial lacerations. Thirty-five percent of women using a semi-seated position needed an episiotomy ($n=27$). Schirmer and colleagues (2011) also reported an increased risk of vulvar edema. Thirty percent of women in a semi-seated position experienced vulvar edema ($n=23$), while only 13.6% of women in a left lateral position ($n=11$) experienced vulvar edema. Dahlen and colleagues (2013) did not report any significant findings on perineal trauma for the semi-recumbent position.

Neonatal

One study reported five-minute Apgar scores ($N=6,144$) (Dahlen et al., 2013). The semi-recumbent ($n=730$), all fours, kneeling, lateral, standing, squatting, use of a birthing stool and water births were assessed. This study reported a significantly higher prevalence of five-minute Apgar scores ≤ 7 for the semi-recumbent position compared to water births. All other positions had comparable Apgar scores.

Lateral

Seven studies analyzed the use of a lateral position (Dahlen et al., 2013; De Jonge et al., 2010; Elvander et al., 2015; Meyvis et al., 2012; Nilsen et al., 2011; Schirmer et al., 2011; Suto et al., 2015). Two studies specified that women were lying in a left lateral position (Nilsen et al., 2011; Schirmer et al., 2011). One study assessed both maternal and neonatal outcomes and six studies assessed only maternal outcomes.

Maternal

Three studies reported perineal damage (Meyvis et al., 2012; Schirmer et al., 2011; Suto et al., 2015). Two studies reported that the lateral position was associated with a higher prevalence of second-degree lacerations (Meyvis et al., 2012; Schirmer et al., 2011). Meyvis and

colleagues (2012) reported that the lateral position ($n=209$) correlates with a higher prevalence of first-degree lacerations as well. Suto and colleagues (2015) did not report a significant amount of maternal lacerations for the lateral position ($n=268$). Two studies reported that the lateral position was associated with less of a need for episiotomies (Meyvis et al., 2012; Schirmer et al., 2011). Meyvis and colleagues (2012) also reported that, including episiotomies, intact perineums were about 45% more likely in women who delivered in the lateral position. However, results become insignificant when episiotomies are excluded. De Jonge and colleagues (2010) reported that there is no significant prevalence of intact perineums according to different labor positions. Meyvis and colleagues (2012) found that almost half of multiparous women ($n=166$) experienced perineal laceration, compared to only 28% of primiparous women ($n=45$). Conversely, use of epidural analgesia and delivery by a physician (as opposed to a midwife) increases the risk for perineal damage. Meyvis and colleagues (2012) concluded that the lateral position correlates with less perineal damage overall. Elvander and colleagues (2015) reported obstetric anal sphincter injuries for the lateral position ($n=18,868$). The lateral position was associated with a reduced risk of anal sphincter injuries in nulliparous women. Schirmer and colleagues (2011) reported that only about 13% of women ($n=11$) using a lateral position experienced vulvar edema.

One study reported maternal pain and behavior during labor and delivery (Nilsen et al., 2011). Behavioral factors assessed include tremors, nervousness, and effort to control fear and nervousness. Women in the lateral position ($n=186$) reported more pain compared to those in the lithotomy position ($n=46$). Anecdotally, the lateral position was most often associated with “bearable or barely unbearable” pain. However, the lateral position was also associated with the

best behavior during labor and delivery compared to all other positions, including lithotomy and semi-seated. Behavior was reported as excellent or very good, indicating no tremors nor nervousness, or considerable effort to control fear and nervousness.

Neonatal

One study reported five-minute Apgar scores ($N=6,144$) (Dahlen et al., 2013). No significant results were found regarding the lateral position ($n=321$) compared to water birth, kneeling, semi-recumbent, standing, squatting, and use of a birth stool.

Standing

Three studies analyzed the use of a standing position (Dahlen et al., 2013; Elvander et al., 2015; Suto et al., 2015). Suto and colleagues (2015) combined kneeling and standing together ($n=296$) in this study. This literature review includes Suto's kneeling/standing position group under the standing category. One study assessed both maternal and neonatal outcomes (Dahlen et al., 2013). Two studies only assessed maternal outcomes (Elvander et al., 2015; Suto et al., 2015).

Maternal

Elvander and colleagues (2015) analyzed obstetric anal sphincter injuries for the standing position ($n=1,119$). Birthing in the standing position was associated with the fewest anal sphincter injuries compared to the use of a birth stool, sitting, lithotomy, lateral, supine, squatting, and all-fours positions. Two studies reported perineal damage (Dahlen et al., 2013; Suto et al., 2015). No significant results were found regarding a standing position compared to water birth, kneeling, semi-recumbent, supine, lateral, squatting, and use of a birth stool.

Neonatal

One study reported five-minute Apgar scores (Dahlen et al., 2013). No significant results were found regarding a standing position ($n=458$) compared to water birth, kneeling, semi-recumbent, lateral, squatting, and use of a birth stool.

Squatting

The squatting position is achieved by a woman rocking forward onto her feet with support on either side, or by squatting on the floor while being supported under her shoulders (Reid & Harris, 1988). Two studies analyzed a squatting position (Dahlen et al., 2013; Elvander et al., 2015). One study assessed both maternal and neonatal outcomes and the other study only assessed maternal outcomes.

Maternal

One study reported maternal obstetric anal sphincter injuries (Elvander et al., 2015). The use of a squatting position ($n=832$) correlated with an increased risk of anal sphincter injuries in parous women. One study reported perineal damage (Dahlen et al., 2013). No significant results were found regarding a squatting position ($n=193$) compared to water birth, kneeling, semi-recumbent, supine, lateral, standing, and use of a birth stool.

Neonatal

One study reported five-minute Apgar scores (Dahlen et al., 2013). No significant results were found regarding a squatting position ($n=193$) compared to water birth, kneeling, semi-recumbent, supine, lateral, standing, and use of a birth stool.

DISCUSSION

The intent of this literature review was to examine the effects of alternative labor positions compared to the lithotomy position on maternal-infant outcomes. Outcomes regarding the third stage of labor and post partum effects were reviewed. One study on maternal pain and behavior during labor and delivery was also included (Nilsen et al., 2011). Positions that may contribute to optimal and poor maternal and neonatal outcomes have been identified. Gaps in the literature restrict findings regarding the lithotomy position and various alternative labor positions. However, this review has linked the lithotomy position to multiple negative maternal outcomes. Birthing in a water pool or in a lateral position has been linked to more optimal maternal and neonatal outcomes compared to other positions.

Current research reveals that the lithotomy position can lead to long term residual maternal consequences after delivery. Compared to the lateral position, the lithotomy position is more likely to necessitate an episiotomy along with perineal lacerations and damage (Meyvis et al., 2012). Inconsistent findings were reported regarding maternal anal sphincter injuries. One study reported that the lithotomy position correlates with the highest risk for obstetric anal sphincter injuries compared to alternative positions (Elvander et al., 2015). One benefit of the lithotomy position is that it is associated with the least amount of maternal pain during delivery compared to other labor positions (Nilsen et al., 2011). Apgar scores is the only neonatal outcome reported for the lithotomy position. No significant findings were found in regard to the lithotomy position compared to water birth, kneeling, semi-recumbent, standing, squatting, and use of a birth stool.

(Dahlen et al., 2013). Associated with the noted gaps and inconsistent findings in the literature, empirical data on neonatal outcomes are lacking. This limitation in research evidence impedes comparing neonatal outcomes amongst alternative maternal labor positions.

Water birth is associated with many optimal maternal and neonatal outcomes. This position often led to a spontaneous birth and did not necessitate augmentation, such as amniotomy or oxytocin infusion (Burns et al., 2012; Mollamahmutoglu et al., 2012). In addition, episiotomies were less likely performed with water births and are associated with less maternal pain, therefore requiring less analgesia (Burns et al., 2012; Mollamahmutoglu et al., 2012). Most studies reported a decreased risk of perineal damage for water births (Burns et al., 2012; Dahlen et al., 2013; Menakaya et al., 2013). One study specified that there is only an increased risk for perineal damage in multiparous women (Suto et al., 2015). While in the water, most women experienced the third stage of labor and delivered their placenta (Burns et al., 2012). Records on neonatal body temperatures varied across the literature; however, one study specified that no babies born under water experienced infection (Burns et al., 2012). Two studies reported a slightly acidotic pH blood level in neonates (Carpenter & Weston, 2012 & Ros, 2009). The majority of studies reported that most neonates born under water did not experience respiratory distress (Burns et al., 2012; Menakaya et al., 2013). One study reported that 30% of neonates born under water required respiratory support (Carpenter & Weston, 2012). Two studies reported that an insignificant number of neonates born under water required resuscitation (Burns et al., 2012; Ros, 2009). All studies found that most neonates born under water did not require NICU admission or critical care (Burns et al., 2012; Carpenter & Weston, 2012; Menakaya et al., 2013; Mollamahmutoglu et al., 2012; Ros, 2009). Umbilical cord avulsion only occurred in less than

1% of deliveries (Burns et al., 2012). Lastly, water births were associated with a decreased risk of post partum maternal hemorrhage (Burns et al., 2012; Dahlen et al., 2013).

The lateral position was also found to have multiple optimal maternal outcomes. While mixed findings were reported on perineal damage, the lateral position was associated with a decreased risk of maternal perineal damage, vulvar edema, anal sphincter injuries, and need for episiotomy (Elvander et al., 2015; Meyvis et al., 2012; Schrmer et al., 2011). This position was also reported to have the best behavior during labor and delivery compared to other labor positions; the women experienced the least amount of tremors and nervousness and were best able to control fear and nervousness (Nilsen et al., 2011). The only poor maternal outcome reported regarding the lateral position is an increased prevalence of pain. Likewise with the lithotomy position, Apgar scores is the only neonatal outcome reported for the lateral position. No significant findings were found in respect to the lateral position (Dahlen et al., 2013). Gaps in the literature prevent further examination of neonatal outcomes with regards to the lateral position.

Other alternative maternal positions examined include kneeling, use of a birth stool/sitting, semi-recumbent/semi-seated, standing and squatting. Gaps in the literature limit the amount of significant results found regarding these alternative labor positions. The use of a birth stool or sitting was associated with an increased risk of maternal perineal damage and anal sphincter injuries (Dahlen et al., 2013; De Jonge et al., 2010; Elvander et al., 2015; Suto et al., 2015). One study specifically identified the seated position to be associated with a higher number of anal sphincter injuries compared to all other labor positions (De Jonge et al., 2010). The standing position was associated with the least amount of obstetric anal sphincter injuries

compared to all other positions (Elvander et al., 2015). Squatting is associated with an increased risk of obstetric anal sphincter injuries in parous women. The semi-recumbent position was associated with more five-minute Apgar scores ≤ 7 compared to all other position (Dahlen et al., 2013). The kneeling position did not reveal any consistent significant maternal or neonatal outcomes.

Limitations of the reviewed studies were noted. Study sample sizes varied. The smallest study included only 38 participants, where the largest study included 113,256 participants. All but one article reported limitations of its study (Mollamahmutoglu et al., 2012). Six studies noted a limitation in regards to obtaining empirical data. Perineal lacerations, post partum blood loss, and pain were specific factors that may have been measured subjectively. Data collected was not always uniform or may have been left out. Admissions to neonatal intensive care units could have been under reported. Four studies noted that labor or birth positions were sometimes unidentified, indistinct or undifferentiated. In addition, birthing circumstances and interventions were not always acknowledged.

In sampling procedure, inclusion and exclusion criteria were noted. The majority of studies included women with low risk, uncomplicated pregnancies. Women and fetuses with potential complications were noted in some exclusion criteria. Most studies had inclusion factors of singleton pregnancies and 37+ gestational weeks. Vaginal and spontaneous births without the use of epidural analgesia, oxytocin infusion, instrumental intervention or operative deliveries were often inclusive factors. Two studies excluded participants with a history of cesarean section. One study excluded participants who received an episiotomy. Two studies excluded participants who were illiterate or could not read the study's questionnaire form.

LIMITATIONS

Several limitations were noted in this review of the literature. Only articles published between 2009 and 2015 were included for review. Initial search results revealed abundant findings using key terms. Further searches were performed to narrow results using a variety of combinations of search terms. Thirteen articles were found to be of relevance to this topic. Research articles were subjectively included and excluded from this literature review, thus limiting findings. Exclusion criteria further limit this review. All studies included in this review were internationally based. However, no studies published in the United States were found to be relevant to the focus of this review. Consequently, culture is a limitation of this review. This review did not examine effects of birthing positions on the first stage of labor or the lengths of the labor stages. Therefore, findings only pertain to birth outcomes, including the second and third stages of labor as well as post-partum. Findings of this literature review were limited due to gaps in the literature. Scant neonatal outcomes were found with regards to all labor positions except water birth. Only one article reported neonatal outcomes for the lithotomy position, which hinders the ability to compare findings with alternative labor positions. Another limitation encountered in this review is inconsistent findings. Results of the review articles conflicted with each other, obstructing the ability to make conclusions.

IMPLICATIONS FOR NURSING

Practice

Implications for nursing based on this review support that culture preferences are predominate determinates for maternal labor and delivery practices (Meyvis et al., 2012). The majority of women in the United States birth in a lithotomy position, for medically it is accepted as ‘best practice’ in hospital settings (DiFranco & Curl, 2014; Reid & Harris, 1988). Yet international studies reveal that the lithotomy position has inherent less than optimal maternal outcomes. Using this evidenced based research, nurses should be informed about these options and assist women to use alternative labor positions. The nurse must be able to educate women and other health care providers about the benefits and risks of alternative labor positions. Maternal satisfaction and birthing outcomes can be improved when nurses offer other options.

Education

In respect to education, content should be included on alternative labor positions for health care practitioners, and nurses in particular. The literature affirms that birthing in the lithotomy position leads to unwanted birthing outcomes. Recent surveys reveal that that 68% of women in the United States delivered their baby in the supine or lithotomy position (DiFranco & Curl, 2014). Therefore, nurses caring for women in labor may lack knowledge on current evidenced based practice.

Armed with knowledge of the benefits and risks of both the lithotomy position and alternative labor positions, nurses can subsequently educate women and families. When women

are informed, they are in a better position to make decisions regarding their options and gain a sense of control over their healthcare with improved satisfaction and outcomes (Nieuwenhuijze et al., 2014).

Research

The literature indicates there is a paucity of studies focusing on the use of alternative labor positions and maternal-neonatal outcomes. This topic needs to be further explored, comparing the lithotomy position with alternative labor positions. Further research must be conducted before advocating for any particular position during labor and delivery.

Additionally, current obstetric practice deters using alternative labor positions in order to conveniently access and monitor a woman and her fetus during labor and delivery while in the lithotomy position (Meyvis et al., 2012). Future research must explore and create new ways of monitoring the mother and fetus while in an alternative labor position. By overcoming this barrier, the mother and fetus can be protected both during labor and after delivery.

Information is needed on the best time to educate a pregnant woman about the labor and delivery process. Evidence is needed on the role of a pregnant woman's significant other in making these decisions as well. Comparison of outcomes when implemented by a midwife versus medical providers is conflicting and data are needed to support evidence-based recommendations. Subsequently, families can be educated as they approach the childbirth process so that an informed decision can be made.

Policy

Hospital settings should consider creating policies regarding the use of alternative labor positions. When hospitals are more accepting of alternative labor positions, women and families will feel encouraged in exploring new options, and ultimately enhancing patient satisfaction with their experience. In addition, third party payers should be encouraged to support prenatal education that focuses on enhanced pregnancy outcomes.

APPENDIX A: FIGURE 1

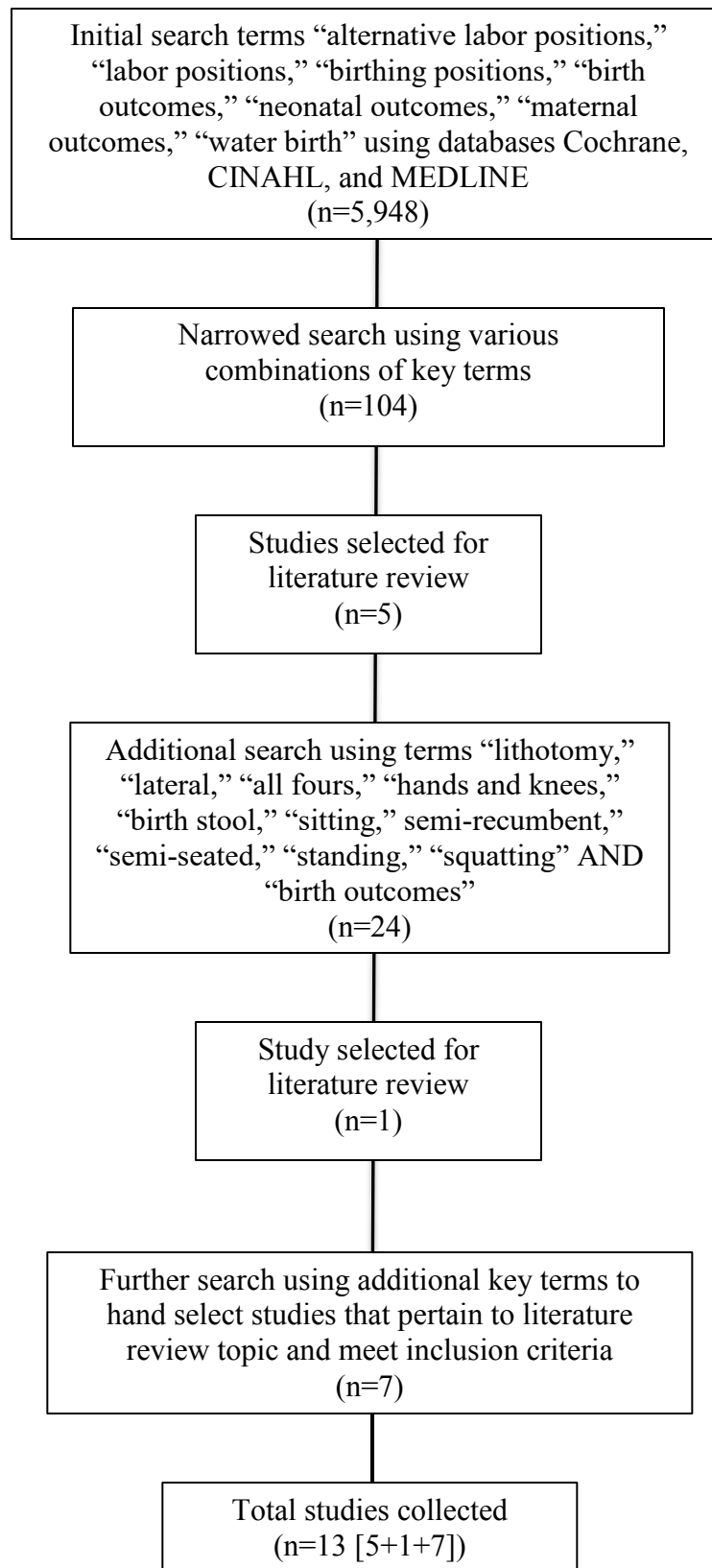


Figure 1: Selection Method of Literature

APPENDIX B: TABLE 1

Table 1: Table of Evidence

Author(s) Year Location	Study Design & Purpose	Sample Size	Screening Measures	Limitations
Burns et al. (2012) United Kingdom	Prospective observational study. Collect prospective observational data on a large sample of women who used a birthing pool during labor and were cared for by midwives.	N= 8,924 Hospital (n=4,130) Alongside Midwifery Units (n=2,100) Community (n=2,694)	Recruited from 26 National Health Service Hospital Trusts in England, Scotland, and Northern Ireland between 2000-2008. Data collected for consecutive women in labor who chose to use a birthing pool at any point during labor, and for any length of time. Midwives recorded data on a standardized form during labor, birth, through the seventh postnatal day. Inclusion Criteria: Uncomplicated pregnancy, singleton fetus with cephalic presentation, and labor at 37 weeks or more, no pre-existing disease that may affect labor risk.	Lack of a control group of women who met the eligibility criteria and chose not to be in the pool. The study is based on a convenience sample of 29 care settings and do not reflect the range of diversity of maternal care settings. Failure to collect data could have happened. Some intrapartum data is subjective.
Carpenter and Weston (2012) New Zealand	Retrospective study. Use radiology to evaluate the respiratory compromise of neonates after water births and air births.	N=38 Water Births (n=14) Air Births (n=24)	Data were gathered from medical records. Neonatal care professionals analyzed chest x-rays and identified the severity as minimal/mild, moderate, or severe. Inclusion Criteria: Term gestation (≥ 37 weeks), clinical birth care by primary care provider and subsequent admission of the baby to the NICU with respiratory distress sufficient to require positive pressure support during 2000-2006. Exclusion Criteria: Neonates whose respiratory distress was associated with encephalopathy or congenital heart disease. Further restriction that air babies born in only two local primary birthing centers	Inability to identify mothers who had labored in water but did not deliver in water. Data of admissions to special care units following water delivery was under-reported. Inconsistent recording of birth circumstances also occurred.

			close to the tertiary hospital.	
da Silva et al. (2012) Brazil	<p>Cross-sectional study with retrospective data collection.</p> <p>Identify the prevalence of maternal, newborn, and obstetric factors associated with perineal trauma in a population of women who had a spontaneous vaginal birth.</p>	<p>N=1,078</p> <p>Dorsal (n=887)</p> <p>Other (n=191)</p>	<p>Data collected from Sapopemba Birth Centre from 2006-2009 on term women (≥ 37 weeks). Data collected from medical charts and by midwives attending the births. Lacerations were recorded as first degree, second degree, and episiotomy.</p> <p>Exclusion Criteria: Women with potential obstetric complications.</p>	<p>Exclusion of women with potential obstetric complications. The international classification of perineal trauma was not used.</p>
Dahlen et al. (2013) Australia	<p>Descriptive cross-sectional study.</p> <p>Determine rates of perineal trauma, postpartum hemorrhage and five-minute Apgar scores amongst low risk women who gave birth in water compared to six positions on land.</p>	<p>N=6,144</p> <p>Water birth (n=819)</p> <p>Land birth (n=5,220)</p> <p>Missing data (n=105)</p> <p>All fours/ kneeling (n=2,936)</p> <p>Semi-recumbent (n=730)</p> <p>Lateral (n=321)</p> <p>Standing (n=458)</p> <p>Birth stool</p>	<p>Midwives collected handwritten records between January 1996 and April 2008 in a large birth center alongside Sydney.</p> <p>Inclusion Criteria: Low risk women having a normal vaginal birth.</p>	<p>Possibility that midwives and obstetricians move women to the semi-recumbent position when concerned about the fetus, thus giving a false picture of the impact of birth position on Apgar scores. More accurate data could have been gathered regarding intensive care admissions and perinatal mortality rates. Blood loss was based on midwives' estimation and is thus a variable in accuracy.</p>

		(n=582) Squatting (n=193)		
De Jonge et al. (2010) Netherlands	Secondary analysis. Examine the association between semi-sitting and sitting position at the time of birth and perineal damage amongst low-risk women.	N=1,642 Recumbent/ supine/ lateral (n=921) Semi-sitting (n=602) Sitting/ birth stool (n=119)	Data were used from a trial conducted from May 1995 to September 1996. Data was collected from 70 different midwives in 20 different midwife practices in the Netherlands. Exclusion Criteria: Use of oxytocin infusion, epidural anesthesia, and instrumental delivery, inability to read Dutch language.	Distinction amongst birthing positions is unclear. Supine and lateral positions were not differentiated. The midwives and study population involved may not represent the whole country. Data used for the study was collected a decade ago.
Elvander et al. (2015) Sweden	Population based study. Investigate the association between birth positions and occurrence of obstetric anal sphincter injuries in spontaneous vaginal deliveries.	N=113,256 Sitting (n=45,402) Lithotomy (n=20,180) Lateral (n=18,868) Standing on knees (n=10,287) Birth seat (n=10,163) Supine (n=4,978) Squatting (n=832)	Data were gathered from the population-based Stockholm-Gotland Obstetric Database, based on the medical record system used for all maternity, delivery, and postnatal care units in the region. The study period was January 2008 to October 2014. Exclusion Criteria: Cesarean and vaginal instrumental births, preterm births, births that required an episiotomy, births in the non-cephalic presentation, and stillbirths.	Lack of information on fundal pressure and perineal protection was a limitation. Not all perineal management interventions of the midwives were recorded. The experience and training of the midwives was not recorded.

		<p>Standing (n=1,119)</p> <p>All fours (n=678)</p> <p>Unknown (n=749)</p>		
Menakaya et al. (2013) Australia	Retrospective audit and comparison. Audit specific maternal and neonatal outcomes associated with water births compared to land births.	<p>N=438</p> <p>Water birth (n=219)</p> <p>Land birth (n=219)</p>	<p>Data recruited from unit records at Banstown hospital between 2000-2009. Inclusion criteria: Birthed spontaneously, uncomplicated antenatal care, term singleton pregnancy with cephalic presentation at ≥ 37 weeks gestation, clear liquid rupture if membranes ruptured, established labor at entry into water (for water births).</p> <p>Exclusion criteria: Use of epidural anesthesia, pethidine and/or syntocinon augmentation.</p>	Difficulty interpreting data, lengthy time frame data was collected over, and individual policies.
Meyvis et al. (2012) Belgium	Retrospective cross-sectional. Investigation of the effects of maternal position (lateral versus lithotomy) on perineal damage.	<p>N=557</p> <p>Lithotomy (n=348)</p> <p>Lateral (n=209)</p>	<p>Data were obtained from medical records in a general hospital from November 2008 to November 2009. Outcomes assessed perineal damage on a grading scale 1 to 3 and includes whether or not an episiotomy was performed.</p> <p>Inclusion Criteria: Women with gestations between 37 and 42 weeks who were delivering vaginally.</p> <p>Exclusion Criteria: Premature deliveries and any kind of operative deliveries.</p>	Premature births and assisted deliveries were excluded. There was not a uniform policy related to episiotomy care.
Mollamahmutoglu et al. (2012)	Prospective clinical trial. Assess the effects of	<p>N=602</p> <p>Water birth</p>	Interview and observation techniques were used at Zekai Tahir Burak Women's Health Education and Research Hospital between	No limitations declared.

Turkey	water immersion during labor and/or birth on maternal, fetal, and neonatal wellbeing and to compare the outcome and safety with conventional vaginal deliveries and deliveries with epidural analgesia.	(n=207) Vaginal delivery (n=204) Vaginal birth with epidural anesthesia (n=191)	June 2007 and September 2008. Inclusion Criteria: Women with a gestational age between 37 and 42 weeks, no previous history of cesarean section, intact membranes, absence of placental abruption or placental previa, no malpresentation, normal sized single fetus, and normal results of fetal well being tests. Exclusion Criteria: Pregnant women with medical or obstetric risk factors.	
Nilsen et al. (2011) Brazil	Descriptive, cross sectional and correlational study. Study the pain and behavior of women who had natural childbirth in either semi-seated, left lateral, or the lithotomy position.	N=418 Semi-seated (n=186) Left lateral (n=186) Lithotomy (n=46)	Data were collected from the Rooming-in facility of a public maternity hospital in Itapeceirica da Serra, Sao Paulo from August 2008 to January 2009. The women in the study filled out a questionnaire to gather data. Inclusion Criteria: Women 18 years and older, natural childbirth without use of synthetic oxytocin or drugs for pain relief, and those who chose a semi-seated, lateral, or lithotomy position. Exclusion Criteria: Women who were not able to fill out the data collection instruments because they were illiterate or unable to understand the forms.	There is a challenge in finding an evaluation instrument that is easy to apply in clinical practice, while also considering the multidimensional feature and specificity of pain in labor and delivery.
Ros (2009) South Africa	Explorative descriptive survey. Explore and describe the outcomes for neonates after water births and traditional bed births.	N=54 Water births (n=27) Traditional bed births (n=27)	Data were collected from two private hospitals in Gauteng and a governmental hospital in Guateng. A data collection tool was used to gather data during labor, immediately after delivery, two hours after delivery, and 14 days after delivery. Inclusion Criteria: Healthy, low risk	A small sample size was used. The umbilical cord of neonates born by water birth was clamped a little later than those born by traditional bed birth. Not all of the umbilical cord blood of the neonates could be analyzed due to clotting of the

			<p>pregnant women, gestational age 37-42 weeks.</p> <p>Exclusion Criteria: Anemia, cardiac disease, lung disease, renal disease, diabetes, epilepsy, rhesus sensitization, pre-eclampsia, eclampsia, hypertension, thick meconium stained amniotic fluid, rupture of membranes for longer than 24 hours, excessive vaginal bleeding, severe impaired fetal growth, preterm labor, HIV, hepatitis and herpes infection, amnionitis, previous cesarean section, any presentation which is not cephalic, and a multiple pregnancy.</p>	<p>blood or other reasons; therefore, the sample size for umbilical cord blood values was even smaller.</p>
<p>Schirmer et al. (2011) Brazil</p>	<p>Randomized clinical study.</p> <p>Evaluate if there are associations between perineal outcomes and birthing in the left lateral position versus the upright half sitting position.</p>	<p>N=158</p> <p>Left lateral (n=81)</p> <p>Upright half sitting (n=77)</p>	<p>Data were collected from the Normal Parturition Center at Hospital Geral de Itapequerica da Serra. Data was collected on a monthly basis for six months. Nurse midwives working at the hospital received training in parturitional postures and collected the data.</p> <p>Inclusion Criteria: Nulliparous women admitted at the first gestational period and parturition, singleton fetus, live birth, fetus well flexed in cephalic presentation, and absence of maternal and fetal disease.</p>	<p>The degree of laceration is subjective and thus could have been understated.</p>
<p>Suto et al. (2015) Japan</p>	<p>Retrospective descriptive study.</p> <p>Evaluate the prevalence of perineal lacerations and determine factors related to perineal outcomes.</p>	<p>N=1,466</p> <p>Supine (n=441)</p> <p>Lateral (n=268)</p> <p>Hands and knees (n=247)</p>	<p>Data were collected from three mid-wife led birth centers in Tokyo, Japan between January 2008 and June 2011. Thirteen certified midwives gathered data from medical records and transferred the data to a questionnaire.</p> <p>Exclusion Criteria: Pregnancy related complications, women who were transferred to hospitals during labor, women who gave</p>	<p>The study had missing data related to the duration of labor. Only 19 newborns weighed more than 4,000 grams; therefore it was difficult to judge if birth weight is a factor in perineal laceration. Lacerations may have been under-diagnosed or over-diagnosed. The content of the</p>

		<p>Kneeling/ standing (n=296)</p> <p>Birthing chair (n=120)</p> <p>Water birth (n=94)</p>	<p>birth at home unexpectedly, preterm births, and women with no record of perineal laceration status after birth.</p>	<p>birth records was not uniform throughout the three birth centers. Some information, such as labor position and duration, was not available for all women.</p>
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APPENDIX C: TABLE 2

Table 2: Outcomes Table

Author(s) Year Location	Labor Positions	Maternal Outcomes	Neonatal Outcomes
Burns et al. (2012) United Kingdom	<ul style="list-style-type: none"> Water pool 	<ul style="list-style-type: none"> Inhalation analgesia (50% nitrous oxide, 50% oxygen) was the most popularly used analgesia (72.4%) Only 21.1% of women had their labor augmented Most women had a spontaneous birth (88.9%) More than half of spontaneous births were water births (58.3%) A large population of women gave birth by spontaneous onset, without analgesia, and without an episiotomy (79.9%) Less than half of the sample left the pool before delivery to attain additional analgesia or due to slow labor progression (41.8%) Of the women who had a water birth, the majority had had a third stage (86.1%) and the placenta was delivered under water for about half (55.8%) Almost one third of women had an in tact perineum, 9% had an episiotomy, 2% had a third degree tear, and 1 had a fourth degree tear Fewer than 2% had a retained placenta Less than 1% had a major post-partum hemorrhage 	<ul style="list-style-type: none"> Of all deliveries, there were 2 still births and 2 neonatal deaths Less than 2% transferred to the NICU with an average length of stay 2.5 days Less than 2% of infants required resuscitation Less than 1% developed respiratory difficulty, of which 46.9% were birthed in water Less than 1% experience umbilical cord snaps, of which the majority occurred during water birth (90%) Less than 1% of babies experienced pyrexia (suspected infection). None resulted in a positive culture. Less than 1% of babies were readmitted to the hospital for breastfeeding support or phototherapy for jaundice.
Carpenter & Weston (2012) New Zealand	<ul style="list-style-type: none"> Water pool 		<ul style="list-style-type: none"> Water birth babies (14) experienced more acidosis, greater requirement for ventilation, greater requirement for nitric oxide treatment, and greater time to establish feeding. 4 of the 14 infants born under water

			<p>required ventilator support and nitric oxide treatment for persistent pulmonary hypertension; one of these infants died at three weeks of age.</p> <ul style="list-style-type: none"> • All infants born on land presented with respiratory distress, requiring respiratory support from CPAP. One of these infants had congenital heart disease. • Meconium aspiration occurred in two of the water born infants and air born infants. • 48% of the water born infant x-rays were interpreted as severe, and only 16% of air born infant x-rays were interpreted as severe. • The differences of the following factors for infants born of water birth versus air birth were found insignificant: Apgar score at 1 minute, heart rate in the first 6 hours, respiratory rate in the first six hours, time on respiratory support, and length of stay in the NICU.
da Silva et al. (2012) Brazil	<ul style="list-style-type: none"> • Dorsal • Other 	<ul style="list-style-type: none"> • A non-dorsal appeared to be a protective factor for episiotomy. Women in positions other than the dorsal position were about 45% less likely to receive an episiotomy. 	
Dahlen et al. (2013) Australia	<ul style="list-style-type: none"> • Water birth • Land birth • Missing data • All fours/ kneeling • Semi-recumbent • Lateral • Standing • Birth Stool • Squatting 	<ul style="list-style-type: none"> • Compared to water birth, birthing on a stool was associated with a higher rate of perineal trauma and post-partum hemorrhage. • Water birth was associated with less perineal trauma and postpartum hemorrhage. 	<ul style="list-style-type: none"> • Compared with water birth, birthing in a semi-recumbent position has a significantly greater incidence of five-minute Apgar scores ≤ 7. All other positions did not show significant difference in Apgar scores at five minutes compared with those born under water.

De Jonge et al. (2010) Netherlands	<ul style="list-style-type: none"> • Recumbent/ supine/ lateral • Semi-sitting • Sitting/ birth stool 	<ul style="list-style-type: none"> • 2% of women using the recumbent position, 1.5% using the semi-sitting position, and 3.4% using a sitting position had a third degree tear (involving the anal sphincter). • There was no significant difference in prevalence of intact perineums according to different labor positions. • Women in a semi-sitting position had more labial tears than women in other positions. • Women in sitting positions were less likely to have an episiotomy and more likely to have a perineal tear. 	
Elvander et al. (2015) Sweden	<ul style="list-style-type: none"> • Sitting • Lithotomy • Lateral • Standing on knees • Birth seat • Supine • Squatting • Standing • All fours 	<ul style="list-style-type: none"> • Birthing in the standing position was associated with the lowest rates of obstetric anal sphincter injuries. • Birthing in the lithotomy position was associated with the highest rates of obstetric anal sphincter injuries. • Birthing on a birth seat or in a squatting position was associated with an increased risk of anal sphincter injury among parous women. • Birthing in the lateral position was associated with a reduced risk of anal sphincter injury in nulliparous women. 	
Menakaya et al. (2013) Australia	<ul style="list-style-type: none"> • Water birth • Land birth 	<ul style="list-style-type: none"> • 40% of women who birthed in water had an intact perineum; 31% of women who birthed on land had an intact perineum. • Of all women who birthed on land, 80% experienced major degree perineal traumas • No episiotomies were performed for the water births; 33 women who birthed on land did receive an episiotomy. • There were no significant differences in blood loss amongst the two groups. 	<ul style="list-style-type: none"> • There were more infants with an Apgar scores 7 or less at 1 minute born under water, but no difference in those born under water or on land at five minutes. • Eight infants born under water were admitted to special care nurses; 3 of which were admitted related to feeding difficulties and one was admitted with respiratory distress related to meconium aspiration. Only one infant born on land was admitted to a special care nursery.

Meyvis et al. (2012) Belgium	<ul style="list-style-type: none"> • Lithotomy • Lateral 	<ul style="list-style-type: none"> • Delivering in the lateral position correlated with more first and second-degree lacerations compared to those delivering in the lithotomy position. • Less than 7% of women delivering in the lateral position received episiotomies, compared with about 38% of women who delivered in the lithotomy position that received episiotomies. • Including women who received episiotomies, in tact perineum's were about 45% more likely in women who delivered in the lateral position, compared to about 27% of women who delivered in the lithotomy position. However, these results are insignificant when excluding women who had an episiotomy. • When considering an episiotomy as perineal damage, the lateral position correlates with less perineal damage overall, compared to the lithotomy position. • Increased parity is associated with an increased risk for perineal damage. • Use of epidural analgesia and delivery by a physician (compared to a midwife) increased the risk for perineal damage. 	
Mollamahmutoglu et al. (2012) Turkey	<ul style="list-style-type: none"> • Water • Vaginal delivery with epidural analgesia • Conventional vaginal delivery 	<ul style="list-style-type: none"> • Women who had a water birth had less of a need for induction and episiotomy but had more perineal laceration. • Systolic and diastolic blood pressures appeared lower in the water birth group, but the level was insignificant. • Decrease in hemoglobin level (indicating the amount of blood loss) was insignificant amongst the groups. • All women having water birth had reduced analgesia requirements and had lower scores 	<ul style="list-style-type: none"> • The different birthing groups did not reveal a significant difference regarding admission to the NICU. • Apgar scores were also comparable amongst groups. • There were no neonatal deaths or infections amongst any groups.

		on the visual analog scale.	
Nilsen et al. (2011) Brazil	<ul style="list-style-type: none"> • Left lateral • Lithotomy • Semi-seated 	<ul style="list-style-type: none"> • An analysis of pain intensity during labor did not reveal any difference among the three labor positions. • Pain in women who delivered in the lithotomy position reported to have less pain than those who delivered in the lateral position. • Women who delivered in the left lateral and semi-seated usually reported pain as bearable or barely unbearable. Women who delivered in the lithotomy position usually reported having very bearable pain. • Women in the left lateral position more often reported having excellent or very good behavior during labor and delivery compared to other positions. • None of the groups used analgesia. 	
Ros (2009) South Africa	<ul style="list-style-type: none"> • Water birth • Bed birth 		<ul style="list-style-type: none"> • Neonates born on land had lower Apgar scores than those born in water. None of the neonates born in water were ever reported to have an Apgar score less than seven; whereas neonates born on land had Apgar scores less than seven 11% and 4% of the time at one and five minutes (respectively). • Neonates born on land were reported to have lower temperatures compared to those born in water. 41% of neonates born on land were reported to experience hypothermia, while only 15% of neonates born in water experienced this condition. Four percent of neonates born in water experienced hyperthermia, while no neonates born on and experienced this condition. • Neonates born in water appeared to need less resuscitation than those born on land. • Neonates in both groups had palmer grasp,

			<p>plantar grasp, and moro reflexes present; however none of the neonates had good rooting reflexes.</p> <ul style="list-style-type: none"> • The umbilical cord blood pH was slightly acidotic (7.26) in both groups. • All umbilical cord blood hemoglobin and sodium levels were within range. However, the water birth group has a slightly higher umbilical cord hemoglobin and slightly lowered umbilical cord blood sodium level than the land birth group. • One neonate born in water was diagnosed with sepsis and congenital pneumonia ten hours after delivery and was transferred to the NICU. • No neonates in either group were immediately transferred to the NICU after delivery. • All neonates were reported healthy in both groups two weeks after delivery.
Schirmer et al. (2011) Brazil	<ul style="list-style-type: none"> • Left lateral • Semi-sitting 	<ul style="list-style-type: none"> • Women in the left lateral position experienced a greater concentration of labial lacerations (37%) compared to about 20% of those in the semi-sitting position. • Thirty-five percent of women in the semi-sitting group had an episiotomy, compared to only 16% of women in the left lateral position. • Women in the left lateral position were associated with less vulvar edema (13.6%) compared to women in the semi-sitting position (about 30%). • The left lateral position was associated with more first-degree lacerations (37%) compared to the semi-sitting position (19.5%); however the semi-seated position was associated with more second-degree lacerations. 	

Suto et al. (2015) Japan	<ul style="list-style-type: none"> • Supine • Lateral • Hands and knees • Kneeling/standing • Birthing chair • Water birth 	<ul style="list-style-type: none"> • Hands & knees position and the use of a birthing chair were associated with increased risk of perineal laceration in both nulliparous and multiparous women. • Water births were associated with an increased risk of laceration only for multiparous women. • All births were spontaneous vaginal births, not requiring interventions (vacuum, forceps, or epidural analgesia). 	
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REFERENCES

- Burns, E. E., Boulton, M.G., Cluett, E., Cornelius, V.R., Smith, L.A. (2012). Characteristics, interventions, and outcomes of women who used a birthing pool- A prospective observational study. *Birth: Issues in Perinatal Care*, 39(3), 192-202.
doi:<http://dx.doi.org.ezproxy.net.ucf.edu/10.1111/j.1523-536X.2012.00548.x>
- Carpenter, L., & Weston, P. (2012). Neonatal respiratory consequences from water birth. *J Paediatr Child Health*, 48(5), 419-423. doi:10.1111/j.1440-1754.2011.02241.x
- Child Health USA (2013). "Prenatal Care Utilization." Retrieved from
<http://mchb.hrsa.gov/chusa13/health-services-utilization/p/prenatal-care-utilization.html>
- da Silva, F. M., de Oliveira, S. M., Bick, D., Osava, R. H., Tuesta, E. F., & Riesco, M. L. (2012). Risk factors for birth-related perineal trauma: a cross-sectional study in a birth centre. *J Clin Nurs*, 21(15-16), 2209-2218. doi:10.1111/j.1365-2702.2012.04133.x
- Dahlen, H. G., Dowling, H., Tracy, M., Schmied, V., & Tracy, S. (2013). Maternal and perinatal outcomes amongst low risk women giving birth in water compared to six birth positions on land. A descriptive cross sectional study in a birth centre over 12 years. *Midwifery*, 29(7), 759-764. doi:10.1016/j.midw.2012.07.002
- De Jonge, A., Van Diem, M. T., Scheepers, P. L., Buitendijk, S. E., & Lagro-Janssen, A. L. (2010). Risk of perineal damage is not a reason to discourage a sitting birthing position: a secondary analysis. *Int J Clin Pract*, 64(5), 611-618. doi:10.1111/j.1742-1241.2009.02316.x
- De Jonge, A., Teunissen, T.A., Lagro-Janssen, A.L. (2004). Supine position compared to other

- positions during the second stage of labour: a meta-analytic review. *Journal of Psychosomatic Obstetrics Gynecology*, 25, 35–45.
- DiFranco, J. T., & Curl, M. (2014). Healthy birth practice #5: avoid giving birth on your back and follow your body's urge to push. *J Perinat Educ*, 23(4), 207-210. doi:10.1891/1058-1243.23.4.207
- Elvander, C., Ahlberg, M., Thies-Lagergren, L., Cnattingius, S., & Stephansson, O. (2015). Birth position and obstetric anal sphincter injury: a population-based study of 113 000 spontaneous births. *BMC Pregnancy Childbirth*, 15, 252. doi:10.1186/s12884-015-0689-7
- Lawrence, A., Lewis, L., Hofmeyr, G. J., & Styles, C. (2013). Maternal positions and mobility during first stage labour. *Cochrane Database of Systemic Reviews*. doi:http://dx.doi.org.ezproxy.net.ucf.edu/10.1002/14651858.CD003934.pub2
- Menakaya, U., Albayati, S., Vella, E., Fenwick, J., & Angstetra, D. (2013). A retrospective comparison of water birth and conventional vaginal birth among women deemed to be low risk in a secondary level hospital in Australia. *Women Birth*, 26(2), 114-118. doi:10.1016/j.wombi.2012.10.002
- Meyvis, I., Rompaey, B., Goormans, K., Truijen, K., Lambers, S., Mestdagh, E., & Mistiaen, W. (2012). Maternal position and other variables- effects on perineal outcomes in 557 births. *Birth: Issues in Perinatal Care*, 39(2), 115-120. doi:http://dx.doi.org.ezproxy.net.ucf.edu/10.1111/j.1523-536X.2012.00529.x
- Mollamahmutoglu, L., Moraloglu, O., Ozyer, S., Su, F. A., Karayalcin, R., Hancerlioglu, N.,

- Uzunlar, O., Dilmen, U. (2012). The effects of immersion in water on labor, birth and newborn and comparison with epidural analgesia and conventional vaginal delivery. *J Turk Ger Gynecol Assoc*, 13(1), 45-49. doi:10.5152/jtgga.2012.03
- Nieuwenhuijze, M. J., Low, L. K., Korstjens, I., & Lagro-Janssen, T. (2014). The role of maternity care providers in promoting shared decision making regarding birthing positions during the second stage of labor. *J Midwifery Womens Health*, 59(3), 277-285. doi:10.1111/jmwh.12187
- Nilsen, E., Sabatino, H., & Lopes, M. (2011). The pain and behavior of women during labor and the different positions for childbirth. *Revista da Escola de Enfermagem da USP*, 45(3), 557-565. doi:http://dx.doi.org.ezproxy.net.ucf.edu/S0080-62342011000300002
- Reid, A.J., Harris, N.L. (1988). Alternative birth positions. *Canada Family Physician*, 34, 1993-1998.
- Ros, H. (2009). Effects of Waterbirths and Traditional Bedbirths on Outcomes for Neonates. *Curationis*, 32(2), 46-52.
- Schirmer, J., Fustinoni, S. M., & Oliveira Basile, A. L. (2011). Perineal outcomes on the left lateral versus vertical semi-sitting birth positions: a randomized study. *Acta Paulista de Enfermagem*, 24(6), 745-750.
- Suto, M., Takehara, K., Misago, C., & Matsui, M. (2015). Prevalence of perineal lacerations in women giving birth at midwife-led birth centers in japan: A retrospective descriptive study. *J Midwifery Womens Health*, 60(4), 419-427. doi:10.1111/jmwh.12324