4-2014

Supporting Labor Progress Toward Physiologic Birth

Lisa Hanson
Marquette University, lisa.hanson@marquette.edu

Leona VandeVusse
Marquette University, leona.vandevusse@marquette.edu

Supporting Labor Progress Toward Physiologic Birth

Lisa Hanson
College of Nursing, Marquette University, Milwaukee, Wisconsin
Leona VandeVusse
College of Nursing, Marquette University, Milwaukee, Wisconsin

Intrapartum nurses bear significant responsibility for assessing, supporting, documenting, and verbally communicating labor progress to birth attendants, families, and the women themselves. Nurses' assessments of each individual woman's labor involve the consideration of a number of interrelated factors. Because intrapartum nurses generally work with a variety of birth attendants, the situation is further complicated by providers who may hold their own unique philosophic beliefs about labor normalcy, the boundaries of normal, and the need to follow strict time limits for the duration of each labor phase. Overdiagnosis of the ill-defined entity, dysfunctional labor, leads to numerous interventions that have been overused in low-risk populations. This has contributed to the

rising cesarean rate and decreased opportunities for normal birth. The emphasis on technologic procedures to implement these interventions detracts from nursing care and support of women during labor and birth.[1]

Historically, the median duration of labor has been used to define normal labor.[2] In essence, this resulted in women with slower than median labor lengths being considered abnormal. While most contemporary practitioners do not believe that labor progress follows an entirely predictable pattern, there remains the need for sentinel indicators for interventions for abnormal labor progress. An interdisciplinary collaborative workshop was recently convened to address the important issue of prevention of the first cesarean.[3] The resulting publication is an essential read for all professionals involved in perinatal care. In this issue, Dr Simpson has presented detailed information and practical nursing strategies to help prevent the first cesarean.[4] Very recently, the American College of Obstetrics and Gynecology (ACOG) and the Society for Maternal-Fetal Medicine (SMFM) have also published an obstetric care consensus statement about prevention of the first cesarean.[5] However, support of normal physiologic birth goes well beyond preventing cesareans. The purpose of this article is to assist in reenvisioning labor progress by examining recent evidence and instituting measures to promote normal physiologic birth.

CONTEMPORARY SCIENCE ON LABOR PROGRESS

It has been increasingly documented that contemporary laboring women experience longer first-stage labor than the women in studies done 50 years ago.[6-9] Recently, researchers sought to identify differences in labor patterns in 98 359 modern-day (2002-2008) women who were included in the Consortium on Safe Labor (CSL), a retrospective cohort study. They were compared with 39 491 women who gave birth between 1959 and 1966 and were included in the prospective study entitled the Collaborative Perinatal Project (CPP).[10] The CPP sample was from the same time period as Friedman's work,[11,12] but it comprised a separate group of women. In the comparison, contemporary women are older, heavier, use epidural anesthesia, and receive more intrapartum oxytocin than those who gave birth more than 5 decades ago.[10] Compared with the CPP, women in the CSL had longer first-stage labors. The median first-stage labor duration had an additional 2.6 hours in nulliparas and 2.0 hours in multiparas. The researchers controlled for maternal and perinatal characteristics and concluded that the longer duration of labor was primarily attributable to individual patterns of intrapartum management decision-making and practices.[10]

Defining true labor

The first challenge in assessing labor progress is defining the onset of true labor, commonly understood as the initiation of regular uterine contractions. Latent labor onset is based on the woman's self-report, often documented by health professional assessments when she arrives at the hospital.[13] The time of labor onset is often the time entered into the electronic health record on the basis of a simple question, "when did your labor begin?" It appears that the timing of hospital admission[14] and the lack of specificity in history taking may play roles in intrapartum interventions and outcomes. Stressors such as hospital admission itself can interfere with delicate hormonal balance that contributes to labor initiation and early labor progress.[1]

Latent labor

When women present to the hospital for labor evaluation, they commonly experience an assessment including a sterile vaginal examination used to indicate if admission is warranted.

Researchers conducted a retrospective analysis of the intrapartum outcomes based on the labor phase at the time of hospital admission.[14] A total of 2697 women were admitted in latent labor (<4 cm) and 6121 women during active labor.[14] A greater proportion of women admitted in latent labor were nulliparas (51%) versus multiparas (28%). Latent labor admissions were significantly associated with arrest of active labor, the use of oxytocin, internal fetal monitoring, and the development of chorioamnionitis. More research is needed to identify if hospital admission in latent labor leads to increased applications of these particular interventions and associated morbidities, or if preexisting labor abnormalities may lead to early hospital admission.[14]

Given this contemporary understanding of latent labor duration and progress, the current practices of obstetric triage deserve reconsideration. Performing a vaginal examination in latent labor, then having the woman ambulate for 1 to 2 hours, would be unlikely to lead to meaningful cervical change. Therefore, the practice of frequent vaginal examinations to detect progress in latent labor should be questioned. The expectations of length of latent labor also needs reexamination based on the following new information about active labor onset.

Active labor parameters

The onset of active labor has received considerable attention in current research. Most importantly, the onset of active labor occurs at 6-cm dilatation.[5,15] Zhang and colleagues[15] conducted an analysis of the CSL database, which included a total of 228 668 births. The researchers studied labor patterns of a subgroup of 62 415 low-risk women who experienced spontaneous labors and normal neonatal outcomes, based on parity. Important findings included (a) nulliparas and multiparas appeared to progress at similar rates before 6 cm, (b) active labor appeared to begin at 6 cm rather than 4 cm for both groups, (c) after 6 cm multiparas progressed more rapidly than nulliparas, and (d) there was no active labor deceleration phase identified. These findings help explain the common clinical scenarios of women with advanced cervical dilatation and no evidence of contractions.

Researchers[16] conducted an extensive systematic literature (1950-2008) review to establish the lowest normal rate of cervical change among nulliparas after 3 to 5 cm. They found that low normal cervical dilatation was approximately 0.5 cm/h in spontaneous active labor with healthy birth outcomes. These findings do not support the frequent use of labor speeding practices, such as oxytocin augmentation. Unrealistic expectations of faster progress contribute to overuse of interventions to speed labor progress.[16] The recent ACOG and SMFM consensus recommendations state that "slow but progressive labor in the first stage of labor should not be an indication for cesarean delivery."[5(p700)]

Fetal descent

Fetal descent has been previously defined by abnormalities rather than normal or expected progress.[17,18] The findings of a recent study shed new light on normal fetal descent in a contemporary population.[18] A retrospective cohort analysis of 4618 vaginal births that took place between 2004 and 2008 was conducted to determine the average fetal station by each centimeter of dilatation and the duration of labor between the various levels of fetal station.[18] The researchers were able to demonstrate the slowest rate of fetal descent that still resulted in normal spontaneous vaginal birth in this sample, which excluded operative vaginal and cesareans deliveries.

The average time to descend 1 cm of station was significantly different between nulliparas and multiparas.[18] Overall, each centimeter of descent took less than 2 hours. For nulliparas the average was 1.6 hours (range: 0.2-12.5 hours) and for multiparas 1.2 hours (range 0.2-9.5 hours). After

achieving zero station, the average rate of descent per centimeter was less than 1 hour. For primiparas, the average was 0.9 hours (range: 0.1-7.9 hours) and for multiparas 0.3 hours (range: 0.004-3.1 hours). Multiparas entered labor with the fetus at a higher station than did primiparas. At the onset of active labor (6 cm), the average fetal station for nulliparas was zero (95% confidence interval [CI]: -2 to 1) and -1 for multiparas (95% CI: -3 to 0). After 6 cm, and active labor was well established, 95% of the fetuses of both nulliparas and multiparas were zero station or lower.[18]

Only 39% of the sample experienced spontaneous labor, the remainder were induced or augmented. Parturients who experienced spontaneous labor experienced faster fetal descent at all stages, when compared with women who had induced or augmented labor. Women in spontaneous labor also had lower stations in early latent labor (1-3 cm) and higher stations in late active labor (7-9 cm) compared with those who were induced or augmented.[18] The authors concluded that birth attendants should expect a wide variation in fetal descent from high stations (above 0), especially in nulliparas and in those experiencing induced or augmented labor.[18] More research on normal expectations for fetal descent are needed, especially in women experiencing spontaneous labor.

Replace Friedman's curve with contemporary evidence

Before Friedman's work, there was little scientific information available to guide clinical practice on labor progress. The Friedman curve is a partogram that marks cervical dilatation and fetal descent over time.[11,12]

The terms used in the Friedman divisions of normal and abnormal labor are still commonly used and sometimes misapplied in clinical practice. Although many practitioners will report that they do not strictly adhere to Friedman's definitions, they are often asked to speak intraprofessionally in those specific terms and to document those terms on operative reports or as billing codes. Perinatal clinicians struggle to make and communicate accurate assessments of labor progress. The continued use of Friedman's curve as a guideline for the progress of normal labor results in both unnecessary intrapartum interventions and cesarean births.[19] However, contemporary evidence on labor progress has yet to be widely adopted in hospital settings.

Induction of labor contributes to abnormal labor progress

Normal physiologic birth begins with spontaneous labor onset [20]; however, a large proportion of low-risk women are induced or augmented with oxytocin. In 2013, *Listening to Mothers III* survey, 29% of women who had recently given birth reported that they had experienced induction of labor.[21] Five years earlier, nearly half of the sample had reported experiencing labor induction.[22] This change may be the outcome of national efforts to reduce elective induction of labor before 39 weeks.

A retrospective analysis was conducted to compare the progress of induced versus spontaneous labor in low-risk women who gave birth at full-term between 2002 and 2004. Induced women were analyzed by their need for cervical ripening. The researchers presented the findings on nulliparas[23] (*n* = 2200) and multiparas[24] (*n* = 2681) in 2 separate publications. In nulliparas, induced labor with unripe cervix was associated with significantly slower latent and active labor. Nulliparas with spontaneous labor had a cesarean rate of 13.9% versus 41.3% for those who experienced labor induction with an unripe cervix, adjusted odds ratio 3.47 (95% CI: 2.69-4.47), representing a nearly 3 times increased risk. However, even among nulliparous women with spontaneous labor, 56.7% received oxytocin augmentation.[23] Although the overall rate was low, multiparas with spontaneous

labor had a lower cesarean rate of 2.3%, compared with those who were induced with a favorable cervix 3.9% and adjusted odds ratio 1.76 (95% CI: 1.09-2.84).[24] Among multiparas in spontaneous labor, oxytocin augmentation was used in 40.7%. Study findings like these, which include high proportions of oxytocin augmentations, do not enhance our understanding of spontaneous labor.

In a retrospective cohort study of 5388 women who gave birth between 2004 and 2008, 1647 experienced induction, 1720 received Pitocin augmentation, and 2021 experienced spontaneous labor.[25] In this study, women in the spontaneous labor group did not receive oxytocin augmentation but may have experienced artificial rupture of membranes. Latent labor was found to be significantly longer in women with induced labor, as compared with those in spontaneous labor. Attempts to identify "normal progress in induced labor" works to reinforce the tendency to intervene, on the natural process.

In a systematic review, researchers sought to evaluate if the use of oxytocin for slow active labor progress was associated with increased cesarean deliveries.[26] Eight trials were evaluated that included 1338 women in first stage labor. The authors compared early versus late first-stage labor augmentations; however, the ranges of cervical dilation for these categories were ill defined. Labor augmentation for slow first-stage progress was not associated with maternal or neonatal morbidity. While augmentation with Pitocin was found significantly shorten the total duration of labor by an average of 2 hours, it did not significantly impact the cesarean rate. Advocates of normal physiologic birth may view these findings as confirmation of the benefits alternative strategies to promote labor progress.

The recent ACOG statement includes a recommendation against induction before 41 weeks' gestation without a maternal or fetal indication.[5] If induction is indicated, cervical ripening is recommended for unfavorable Bishop's scores.[5] The guideline also includes allowing more time before determining that an induction has failed (12-18 hours of oxytocin with ruptured membranes), as long as the maternal-fetal status remains reassuring,[5] to prevent unnecessary cesarean deliveries. The application of these recommendations should result in more women experiencing normal spontaneous birth.

Impact of epidural anesthesia

The *Listening to Mothers III* survey findings indicated that 67% of the women who had recently given birth used epidural anesthesia.[21] In hospital birth settings with high epidural anesthesia rates, skills in nursing labor support may be underutilized. Less nursing experience with labor support for women without epidurals may further contribute to the rising epidural rate.

It has been known for over a decade that epidural anesthesia can lengthen the active phase of labor.[27] Recent evidence suggested that the effect of epidural anesthesia on second-stage labor is even greater than previously described, adding closer to 2 hours for both nulliparas and primiparas.[2] As presented in another article in this issue,[28] delayed pushing, also referred to as laboring down, is an evidence-based approach that is not yet fully translated into practice. Application of this evidence, as well as allowing more time for normal physiologic birth to occur, will prevent second-stage cesareans that would otherwise be done for "failure to progress."[29] A renewed emphasis on nursing labor support skills that can be offered for women with and without epidurals is needed.

Improved understanding of abnormal labor progress

In the recent ACOG statement, the issue of prolonged latent phase was addressed. While the duration of latent labor has not been redefined in current research, caesarean delivery for "prolonged latent labor" was not recommended.[5]

Dystocia, failure to progress, and arrest of labor are terms that have been commonly used to describe abnormal labor patterns.[30] The term, dystocia, was formerly used to refer to slow labor progress and has been criticized for being nonspecific and ill defined.[31] The diagnosis of abnormal labor progress has been closely linked to rising cesarean birth rates. A retrospective cohort analysis of 38 484 primary cesarean deliveries that were performed between 2002 and 2008 demonstrated that the 2 most common indications were "failure to progress" or "cephalopelvic disproportion," accounting for 35.4%.[3,29] Of these primary cesareans, 41.3% of the parturients had not yet reached 5 cm dilatation,[29] therefore according to the contemporary definition, these cesareans were done during latent labor.
Second-stage labor cesareans accounted for another 21.4% of these primary cesareans.[3,29] The recent ACOG recommendation calls for more use of manual rotations of the fetal head as well as skilled operative vaginal births in an effort to prevent second-stage cesarean births.[5]

Improved understanding of abnormal intrapartum progress allows for acknowledging a wider range of normal labor progress. Abnormal labor progress has undergone redefinition based on current scientific evidence. Part of the redefinition includes the recommendation that the 95th percentile should be used as the upper boundary for normal labor progress.[2,32] Previous specific expectations of labor progress at a rate of 1 cm/h have been described as unrealistic and contributing to the overdiagnosis of dystocia.[16] It is recommended that the term dystocia no longer be used.[3]

Similarly, the term failure to progress had been used when labor progress did not meet expectations.[30] It is now recommended that arrest disorders be well defined to allow for clearer distinctions from what was formerly more generally referred to as dystocia. The revised definition of failure to progress is based on (*a*) the achievement of active labor (at 6 cm), (*b*) the presence of ruptured membranes, and (*c*) the adequacy of labor contractions. The ACOG recommendation includes all the components of this revised definition.[5] As an alternative to the term "failure to progress," the focus is on sufficient time to achieve progress based on stable maternal and fetal status.[3]

One of the identified criteria for "failure to progress," ruptured membranes, needs further study. For example, in a systematic review of 15 clinical trials that included 5583 women in spontaneous labor, the researchers demonstrated that artificial rupture of the membranes did not shorten spontaneous labor and may instead contribute to an increased risk of cesarean.[33] For practitioners such as midwives, an intact bag of waters is considered a valued contributor to fetal head rotation and normal physiologic birth.[34] More research on the impact of artificial rupture of membranes in the management of arrest disorders is clearly needed.

TWO NEW EVIDENCE-BASED PARTOGRAMS

On the basis of their recent research findings, Zhang and collaborators[15] suggested a revised partogram for nulliparas that included the following features: (*a*) an alert line (signally slow dilatation) is omitted as unnecessary in hospital birth, (*b*) the 95th percentile stair step lines replace

the action lines (the point when intervention generally would be considered) because cervical dilatation is not a continuously recorded measure, (*c*) slower labor progress is expected before 6 cm, and (*d*) the intention of this partogram is to prevent premature cesarean intervention.[15]

Neal and Lowe[31] have proposed the development of a physiologic partogram as an evidence-based contemporary clinical tool for hospital birth. These researchers share an interest in reducing the cesarean rate and improving birth outcomes while promoting the safety of intrapartum care for low-risk laboring nulliparas with spontaneous labor onset. The physiologic partogram is based on 4 principles including (*a*) accurate diagnosis of active labor onset before using cervical dilatation to assess continuing progress, (*b*) appropriate expectations of cervical dilatation in centimeter per hour, (*c*) an understanding that the rate of cervical dilatation accelerates through active labor, and (*d*) acknowledgement that within active labor, the rate of cervical change is initially variable and then accelerates in a more predictable pattern.[31]

Both of these partograms hold potential to support the progress of labor on the basis of current evidence. The goal for providers is to facilitate normal birth with improved outcomes, while aiding in the prevention of unnecessary cesarean delivery.

PROMOTING PHYSIOLOGIC BIRTH

As defined in a recent consensus statement, "*A normal physiologic labor and birth is one that is powered by the innate human capacity of the woman and fetus*."[20] Normal physiologic birth has a spontaneous onset and progresses without interference. It includes physical and psychologic care practices that foster effective labor. It leads to a normal vaginal birth of both the neonate and placenta. The neonate's transition to extrauterine life is supported by early maternal newborn skin-to-skin contact and breastfeeding.[20] Rather than a strict adherence to time limits, normal labor is supported as long as the condition of the mother and fetus remain stable.

STRATEGIES TO SUPPORT NORMAL PHYSIOLOGIC BIRTH

Normal physiologic birth can be promoted through a series of evidence-based intrapartum care practices that are interrelated.[20] Lamaze International has recommended 6 strategies to promote normal birth[35] that are supported by scientific evidence.[1,19] These include (1) spontaneous labor onset, (2) self-direction of movement during labor, (3) continuous labor support, (4) avoidance of commonly over used interventions, (5) spontaneous bearing down in nonlithotomy positions, and (6) avoidance of maternal newborn separation. In the position paper, *Lamaze for the 21st Century*, the organization presented its overarching goal of "reclaiming natural birth."[36]

The avoidance of routine interventions is another care practice that supports normal birth.[35] Oral hydration and nutrition are important to provide energy for the exertion of labor.[20] Therefore, women who chose to labor without an epidural do not need intravenous fluids as long as they receive nourishment. Laboring women can be supported by their nurses to reframe labor pain as a functional and even protective response to the intrapartum process.[1] Using movement to promote labor progress can also enhance the woman's comfort and coping. The positive feedback loop created by coping is enriched by hormones, such as endorphins, that further enhance well-being.[1] The support of spontaneous bearing down during second-stage labor is an approach that honors the woman's need for rest, while awaiting anatomic and physiologic readiness for

pushing.[17] The avoidance of supine maternal positions promotes optimal maternal and neonatal hemodynamics and can aid in the prevention of abnormal fetal heart rate patterns to avert fetal acidemia.[17]

Physiologic labor and birth do not require the use of continuous electronic fetal monitoring in low-risk populations. Its overuse has contributed to the high rate of cesarean birth in the United States.[37,38] For example, a retrospective cohort analysis of 228 562 births found that 27.3% of the 38 484 primary cesareans were performed for suspected fetal compromise.[29] Greater use of intermittent auscultation (IA) is a safe alternative to continuous electronic fetal monitoring for low-risk women.[39] It requires the physical presence of a nurse or other health professional skilled in its use. The focus of care becomes the woman instead of the fetal monitor.[37] Use of IA fosters continuous labor support, which has been associated with improved outcomes.[40] Use of IA also promotes the laboring woman's freedom of movement that facilitates access to other strategies to comfort women and support labor progress, such as hydrotherapy,[37] which in turn can promote relaxation and labor progress.

CONCLUSION

Contemporary research allows for a wider range of normal labor progress than in the past. Reduction in the rate of primary cesareans is needed to improve maternal and neonatal outcomes, but it is only part of the important goal facing intrapartum care providers. Nurses and other perinatal health professionals can show leadership in actively supporting normal physiologic birth. In particular, perinatal nurses have a wide array of skills useful to laboring women's comfort and coping that can be further developed through maintaining normal physiologic processes without unnecessary technologic interference. Application of the contemporary evidence on labor progress is an important aspect of the challenge being faced, to translate the evidence about normal physiologic birth into intrapartum practice. As this evidence is applied to practice, more women will have the opportunity to experience normal physiologic birth.

References

1. Romano AM, Lothian JA. Promoting, protecting and supporting normal birth: a look at the evidence. J Obstet Gynecol Neonatal Nurs. 2008;37:94-105.
2. Cheng YW, Shaffer BL, Nicholson JM, Caughey AB. Second stage of labor and epidural use: a larger effect than previously suggested. Obstet Gynecol. 2014;123(3):527-535.
3. Spong CY, Berghella V, Wenstrom KD, Mercer BM, Saade GR. Preventing the first cesarean delivery: summary of a joint Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American College of Obstetricians and Gynecologists Workshop. Obstet Gynecol. 2012;120:1181-1193.
4. Simpson KR. Labor management evidence update: potential to minimize risk of cesarean birth in healthy women. J Perinat Neonatal Nurs. 2014;28:xx.
5. American College of Obstetricians and Gynecologists (ACOG) & Society for Maternal-Fetal Medicine (SMFM). Obstetric care consensus no. 1: safe prevention of the primary cesarean delivery. Obstet Gynecol. 2014;123:693-711.
6. Neal JL, Lowe NK, Ahijevych KL, Patrick TE, Cabbage LA, Corwin EJ. "Active labor" duration and dilation rates among low-risk, nulliparous women with spontaneous labor onset: a systematic review. J Midwifery Womens Health. 2010;55:308-318.

7. Kilpatrick SJ, Laros RK. Characteristics of normal labor. Obstet Gynecol. 1989;74:85-87.

8. Albers LL. The duration of labor in healthy women. J Perinatol. 1999;19:114-119.

9. Zhang J, Troendle JF, Yancey MK. Reassessing the labor curve in nulliparous women. Am J Obstet Gynecol. 2002;187:824-828.

10. Laughon SK, Branch DW, Beaver J, Zhang J. Changes in labor patterns over 50 years. Am J Obstet Gynecol. 2012;206:419.e1-419.e9.

11. Friedman EA. Graphic analysis of labor. Am J Obstet Gynecol. 1954;68:1568-1575.

12. Friedman EA, Kroll BH. Computer analysis of labor progression. II. Distribution of data and limits of normal. J Reprod Med. 1971;6:20-25.

13. Satin AJ. Latent phase labor. In:Lockwood CJ, Barss VA, eds. UpToDate. Waltham, MA: Wolters Kluwer Health; 2014.http://0-www.uptodate.com.libus.csd.mu.edu/contents/latent-phase-of-labor. Accessed July 5, 2014.

14. Bailit JL, Dierker LR, Blanchard MH, Mercer BM. Outcomes of women presenting in active versus latent phase of spontaneous labor. Obstet Gynecol. 2005;105:77-79.

15. Zhang J, Landy HJ, Branch DW, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Obstet Gynecol. 2010;116:1281-1287.

16. Neal JL, Lowe NK, Patrick TE, Cabbage LA, Corwin EJ. What is the slowest-yet-normal cervical dilation rate among nulliparous women with spontaneous labor onset? J Obstet Gynecol Neonatal Nurs. 2010;39:361-369.

17. Hanson L. Second-stage labor care: challenges in spontaneous bearing down. J Perinat Neonatal Nurs. 2009;23:31-39.

18. Graseck A, Tuuli M, Roehl K, Odibo A, Macones G, Cahill A. Fetal descent in labor. Obstet Gynecol. 2014;123(3):521-526.

19. King TL. Preventing primary cesarean sections: intrapartum care. Semin Perinatol. 2012;36:357-364.

20. American College of Nurse-Midwives, Midwives' Alliance of North America, and National Association of Certified Professional Midwives. Supporting healthy and normal physiologic childbirth: a consensus statement by ACNM, MANA and NACPM.http://midwife.org/ACNM/files/ACNMLibraryData/UPLOADFILENAME/000000000272/Physiological%20Birth%20Consensus%20Statement-%20FINAL%20May%2018%202012%20FINAL.pdf. Published 2012. Accessed October 12, 2013.

21. Declercq ER, Sakala C, Corry MP, Applebaum S, Herrlich A. Listening to Mothers III Pregnancy and Birth: Report of the Third National US Survey of Women's Childbearing Experiences. New York, NY: Childbirth Connection; 2013.

22. Declercq ER, Sakala C, Corry MP, Applebaum S. Listening to Mothers II: Report of the Second National US Survey of Women's Childbearing Experiences. New York, NY: Childbirth Connection; 2006.

23. Vahratian A, Zhang J, Troendle JF, Sciscione AC, Hoffman MK. Labor progress and risk of cesarean delivery in electively induced nullipara. Obstet Gynecol. 2005;105:698-704.

24. Hoffman MK, Vahratian A, Sciscione AC, Troendle JF, Zhang J. Comparison of labor progression between induced and noninduced multiparous women. Obstet Gynecol. 2006;107:1029-1034.

25. Harper LM, Caughey AB, Odibo AO, Roehl KA, Zhao Q, Cahill AG. Normal progress of induced labor. Obstet Gynecol. 2012;119:1113-1118.

26. Bugg GJ, Siddiqui F, Thornton JG. Oxytocin versus no treatment or delayed treatment for slow progress in the first stage of spontaneous labour. Cochrane Database Syst Rev. 2013;(6):CD007123.
27. Alexander JM, Sharma SK, McIntire DD, Leveno KJ. Epidural analgesia lengthens the Friedman active phase of labor. Obstet Gynecol. 2002;100:46-50.
28. Osborne K, Hanson L. Labor down or bear down: a strategy to translate second stage labor evidence to perinatal practice. J Perinat Neonatal Nurs. 2014;28:yy.
29. Boyle A, Reddy UM, Landy HJ, Huang C-C, Driggers RW, Laughon SK. Primary cesarean delivery in the United States. Obstet Gynecol. 2013;122(1):33-40.
30. American College of Obstetricians and Gynecologists (ACOG). ACOG Practice Bulletin Number 49, December 2003: dystocia and augmentation of labor. Obstet Gynecol. 2003;102(6):1445-1454.
31. Neal JL, Lowe NK. Physiologic partograph to improve birth safety and outcomes among low-risk, nulliparous women with spontaneous labor onset. Med Hypotheses. 2012;78(2):319-326.
32. El-Sayed YY, Diagnosis and management of arrest disorders: duration to wait. Semin Perinatol. 2012;36(5):374-378.
33. Smyth RMD, Markham C, Dowswell T. Amniotomy for shortening spontaneous labour. Cochrane Database Syst Rev. 2013;(6):CD006167.
34. American College of Nurse-Midwives (ACNM). Evidence-based practice: pearls of midwifery.http://www.midwife.org/pearls. Published 2012. Accessed February 16, 2014.
35. Lamaze International. Position paper: promoting, supporting, and protecting normal birth. J Perinatal Educ. 2007;16(3):11-15.
36. Lamaze International. Position paper: Lamaze for the 21st century.http://www.lamazeinternational.org/p/cm/ld/fid=211. Published 2014. Accessed February 14, 2014.
37. Alfirevic Z, Devane D, Gyte GML. Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour. Cochrane Database Syst Rev. 2006;(3):CD006066.
38. Grimes D, Peipert J. Electronic fetal monitoring as a public health screening program: the arithmetic of failure. Obstet Gynecol. 2010;116:1397-1400.
39. Association of Women's Health, Obstetric and Neonatal Nurses. Fetal Heart Monitoring Principles and Practices. 4th ed. Dubuque, IA: Kendall/Hunt; 2009.
40. Hodnett ED, Gates S, Hofmeyr GJ, Sakala C, Weston J. Continuous support for women during childbirth. Cochrane Database Syst Rev. 2013;(7):CD003766.