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## Dystocia and Augmentation of Labor

*Dystocia, characterized by the slow, abnormal progression of labor, is the leading indication for primary cesarean delivery in the United States. Currently, 1 in every 10 women who give birth in the United States has had a previous cesarean delivery (1). Because many repeat cesarean deliveries are performed after primary operations for dystocia, an estimated 60% of all cesarean deliveries in the United States are attributable to the diagnosis of dystocia (2). Thus, with decreasing rates of vaginal birth after cesarean delivery, dystocia is the leading cause of both operative vaginal delivery and cesarean delivery and their accompanying complications.*

*Despite the high prevalence of labor disorders, considerable variability exists in the diagnosis, management, and criteria for dystocia that requires intervention. The purpose of this document is to provide a review of the definition of dystocia, risk factors associated with dystocia, the criteria that require delivery, and approaches to clinical management of labor complicated by dystocia.*

### Background

#### Definitions

The definition of labor is the presence of uterine contractions of sufficient intensity, frequency, and duration to bring about demonstrable effacement and dilation of the cervix. At present, there is much uncertainty about the definition of the latent phase of labor, but there is agreement that women in labor enter the active phase when cervical dilatation is between 3 cm and 4 cm (3). The active phase is characterized by the most rapid changes in cervical dilatation as plotted against time. The active phase of labor includes both an increased rate of cervical dilation and, ultimately, descent of the presenting fetal part. This document focuses on labor subsequent to entering the active phase, diagnosis of active-phase abnormalities, clinical considerations, and management recommendations for the active phase and the second stage of labor.

Dystocia is defined as abnormal labor that results from what have been categorized classically as abnormalities of the power (uterine contractions or maternal expulsive forces), the passenger (position, size, or presentation of the fetus), or the passage (pelvis or soft tissues). The term “cephalopelvic disproportion” has been used to describe a disparity between the size of the maternal pelvis and the fetal head that precludes vaginal delivery. Because dystocia can rarely be diagnosed with certainty, the relatively imprecise term “failure to progress” has been used, which includes lack of progressive cervical dilation or lack of descent of the fetal head or both. The diagnosis of dystocia should not be made before an adequate trial of labor has been achieved. A more practical classification is to categorize labor abnormalities as slower-than-normal (protraction disorders) or complete cessation of progress (arrest disorders).

Augmentation refers to stimulation of uterine contractions when spontaneous contractions have failed to result in progressive cervical dilation or descent of the fetus. Augmentation should be considered if the frequency of contractions is less than 3 contractions per 10 minutes or the intensity of contractions is less than 25 mm Hg above baseline or both. Before augmentation, an assessment of the maternal pelvis and cervix and fetal position, station, and well-being should be performed. Contraindications to augmentation are similar to those for labor induction and may include placenta or vasa previa, umbilical cord presentation, prior classical uterine incision, active genital herpes infection, pelvic structural deformities, or invasive cervical cancer.

### **Second-Stage Arrest**

In a retrospective review of nearly 7,000 women with minimal intervention, the mean length of the second stage of labor was 19 minutes for multiparous women and 54 minutes for nulliparous women, without regard for anesthesia (4). The use of conduction anesthesia increased the mean duration of the second stage by 20–30 minutes (4, 5). In a nulliparous woman, the diagnosis of a prolonged second stage should be considered when the second stage exceeds 3 hours if regional anesthesia has been administered or 2 hours if no regional anesthesia is used. In multiparous women, the diagnosis can be made when the second stage exceeds 2 hours with regional anesthesia or 1 hour without. A prolonged second stage of labor warrants clinical reassessment of the woman, fetus, and expulsive forces. These statistical parameters are useful for defining when labor becomes prolonged and intervention should be considered.

### **Criteria for Arrest that Require Delivery**

Oxytocin administration should be considered when a patient has a protraction or arrest disorder. The goal of oxytocin administration is to effect uterine activity sufficient to produce cervical change and fetal descent while avoiding uterine hyperstimulation and fetal compromise. Minimally effective uterine activity has been defined as 3 contractions per 10 minutes averaging greater than 25 mm Hg above baseline. However, adequate labor encompasses a wide range of uterine activity, as previously noted. The amplitude of each contraction may vary from 25 mm Hg to 75 mm Hg, and contractions may occur for a total of 2–4.5 minutes in every 10-minute window, achieving 95–395 Montevideo units (the peak of contractions in millimeters of mercury multiplied by the frequency per 10 minutes). Typically, a goal of a maximum of 5 contractions in a 10-minute period with resultant cervical dilation is considered adequate. As a general guideline, hyperstimulation may be defined as a persistent pattern of more than 5 contractions in 10 minutes, contractions lasting 2 minutes or more, or contractions of normal duration occurring within 1 minute of each other, and may or may not include nonreassuring fetal heart rate measurements. The term “tachysystole” has been used to define hyperstimulation without corresponding fetal heart rate abnormalities to distinguish this complication from hyperstimulation with fetal heart rate changes.

In a retrospective report of induction of labor with oxytocin, 91% of women achieved at least 200–224 Montevideo units, and 40% achieved at least 300 Montevideo units (6). Accordingly, it has been suggested that before an arrest disorder can be diagnosed in the first stage of labor, the following 2 criteria should be met: 1) the latent phase is completed, and 2) a uterine contraction pattern exceeds 200 Montevideo units for 2 hours without cervical change. However, there is no convincing evidence to demonstrate a reduction in the rate of cesarean deliveries or improvement in perinatal outcome attributable to the use of the sophisticated measurements of uterine activity as compared with external tocodynamometry.

The “2-hour rule” for the diagnosis of arrest in active labor has recently been challenged. In a clinical trial, 542 women were managed by a protocol in which, after active-phase arrest was diagnosed, oxytocin was initiated with the intent to achieve a sustained uterine contraction pattern of greater than 200 Montevideo units (7). Cesarean delivery was not performed for labor arrest until there were at least 4 hours of a sustained uterine contraction pattern of greater than 200 Montevideo units,

or a minimum of 6 hours of oxytocin augmentation if the contraction pattern could not be achieved. The protocol resulted in a high rate of vaginal delivery (92%) with no severe adverse maternal or fetal outcomes. Thus, extending the minimum period of oxytocin augmentation for active-phase arrest from 2 hours to 4 hours appears effective.

Reassessment of the fetus may identify those that are not tolerating labor. Intervention is not necessary for all factors solely based on time (8). Contemporary practice patterns may be associated with more variation in duration of the second stage of labor (5). If progress is being made, the duration of the second stage alone does not mandate intervention by operative delivery. Once a second-stage arrest disorder is diagnosed, the obstetrician has 3 options: 1) continued observation, 2) operative vaginal delivery, or 3) cesarean delivery. The decision to perform an operative delivery in the second stage versus continued observation should be made on the basis of clinical assessment of the woman and the fetus and the skill and training of the obstetrician.

### **Risk Factors for Dystocia**

Cesarean delivery for dystocia or arrest of labor that requires delivery may occur in either the first or second stage of labor. Cesarean delivery rates for dystocia are similar but are associated with different factors when performed in the first or second stage (9, 10). In a retrospective review of nearly 150,000 deliveries, patients with nonprogressive labor in the first stage were significantly older and more likely to have complications, such as previous perinatal death, diabetes, hypertension, infertility treatment, premature rupture of membranes, and amniotic fluid abnormalities, when compared with patients experiencing second-stage arrest (9). Labors that failed to progress during the first stage were significantly associated with nonreassuring fetal heart rate patterns when compared with pregnancies with dystocia in the second stage. The significant increase in cesarean deliveries during the first stage of labor among women at high risk can reflect exaggerated concern of caregivers. A variety of labor interventions and complications have been associated with slow progress in labor, including epidural analgesia, chorioamnionitis, pelvic contractions, and macrosomia (11, 12). Several factors have been shown to be associated with longer duration of the second stage, including epidural analgesia, occiput posterior position, longer first stage of labor, nulliparity, short maternal stature, birth weight, and high station at complete cervical dilation (13).

### **Relationship of Dystocia to Other Adverse Outcomes**

Dystocia may be associated with serious complications for both the woman and the fetus. Infection, namely chorioamnionitis, is a consequence of prolonged labor, especially in the setting of ruptured membranes (14). In one report analyzing more than 500 women, labor was 4.7 hours longer on average when chorioamnionitis was diagnosed late in labor (12). Fetal infection and bacteremia, including pneumonia caused by aspiration of infected amniotic fluid, is linked to prolonged labor. There is debate whether a prolonged second stage may be associated with injuries of the pelvic floor (15, 16). In cases of neglected, obstructed labors (more likely to be seen in developing countries), pressure necrosis after very prolonged second stages may result in vesicovaginal, vesicocervical, or rectovaginal fistulas (17, 18).

In the past, labor, particularly the second stage, was thought to be a time of asphyxial risk for the fetus. In one large study of more than 6,000 women with normal fetal heart rate monitoring tracings in labor, duration in and of itself was not associated with low 5-minute Apgar scores, neonatal seizures, or admission to the neonatal intensive care unit (8).

### **Role of Allied Personnel**

Continuous support during labor from caregivers, including nurses, midwives, or lay individuals, has a number of benefits for women and their newborns, with no apparent harmful effects (19). The continuous presence of a support person may reduce the likelihood of the use of medication for pain relief, operative delivery, and patient dissatisfaction (19–21).

## **Clinical Considerations and Recommendations**

### **► Can dystocia be predicted?**

The ability to accurately predict which women or fetuses will ultimately benefit from operative delivery has been disappointing (13). Generally, orderly, spontaneous progression to full dilation indicates that vaginal delivery most likely will be successful. Abnormal labor or dystocia in the first or second stage of labor can be associated with 1 or more abnormalities of the cervix, uterus, maternal pelvis, or fetus. In addition, advanced maternal age, nulliparity, maternal anxiety, multiple gestation, and intrauterine infections have been reported to be associated with longer active labors (12, 22). Epidural analgesia,

prolonged first stage of labor, nulliparity, large fetuses, and high station at complete cervical dilation are associated with a longer second stage (13).

In an attempt to identify risk factors for difficult delivery among nulliparous women in the second stage of labor, investigators used a multivariate analysis of 1,862 women and found that the risk of difficult delivery was increased for women of short stature (less than 150 cm), age greater than 35 years, gestational age greater than 41 weeks, interval between epidural induction and full cervical dilation of greater than 6 hours, fetal station above +2 cm at full cervical dilation, or occiput posterior fetal position (23). Importantly, a multivariable predictive model of difficult delivery found a sensitivity of only 57%, specificity of 75%, and positive predictive value of 35%.

#### ► *How does epidural analgesia affect the progress of labor?*

In a systematic review of 11 randomized trials involving 3,157 women, epidural analgesia was associated with increases in the duration of the first and second stages of labor, incidence of fetal malpositions, use of oxytocin, and operative vaginal delivery (11). Nevertheless, epidural analgesia was not shown to increase the cesarean delivery rate for dystocia.

Less controversial is the causal role epidural analgesia plays in prolonging labor by 40–90 minutes (24–27) and in the approximate 2-fold increased need for oxytocin augmentation (27, 28). These findings are supported by most prospective studies as well as meta-analyses (11, 25). An increased risk of a second stage of labor longer than 2 hours (24, 26) in women with epidural analgesia likely contributes to the higher rates of operative vaginal delivery seen in most prospective studies. The 4 best prospective studies, in which elective forceps use was not permitted (24, 26–28), yielded a combined relative risk (RR) of 1.9 (95% confidence interval [CI] 1.4, 2.5) of forceps delivery in women who received epidural analgesia. Some investigators have found a decreased risk of operative vaginal delivery with combined spinal epidural when compared with low-dose epidural (29). This finding is difficult to interpret because elective forceps were not excluded in this study, and the rate of forceps use was high (28–40%). High rates of operative vaginal deliveries have been implicated in the increased rate of third- and fourth-degree lacerations seen in women who had epidural analgesia (30).

#### ► *Is there a role for intrauterine pressure catheters in diagnosing dystocia?*

Uterine activity can be monitored by palpation, external tocodynamometry, or internal pressure catheters. Current

evidence does not support routine use of intrauterine pressure catheters for labor management. In a randomized trial of 250 patients undergoing labor augmentation with contractions monitored by either external tocotransducers or intrauterine catheters, there were no significant differences between the groups regarding length of labor, dose of oxytocin, hyperstimulation, cesarean delivery, or neonatal outcomes (31). Nevertheless, intrauterine pressure catheters may be beneficial for women when the evaluation of contractions is difficult because of such factors as obesity or lack of one-on-one nursing care or when response to oxytocin is limited.

#### ► *Does ambulation affect the course of labor?*

Women experiencing normal labor should be encouraged to assume a position in which they are most comfortable. Walking during labor has not been shown to enhance or impair progress in labor. Investigators who randomized more than 1,000 women in active labor at term to either walking or no walking found no differences in the duration of labor, need for oxytocin, use of analgesia, operative vaginal delivery, or cesarean delivery between study groups (32). Neonatal outcomes also were similar, and walking was not harmful to the women or their newborns. Ambulatory epidural analgesia with walking or sitting does not appear to shorten labor duration. In a randomized trial, 160 nulliparous women were assigned to receive epidural either with or without ambulation (33). There was no difference in time from epidural placement to complete dilation between the groups. Thus, ambulation in labor is not harmful, and mobility may result in greater comfort and ability to tolerate labor (34).

#### ► *Is there a role for pelvimetry in the management of dystocia?*

A systematic review that included more than 1,000 women in 4 trials found that women undergoing X-ray pelvimetry were more likely to undergo cesarean delivery (odds ratio [OR], 2.17; 95% CI 1.63, 2.88) without any significant impact on perinatal outcome (35). Although the reasons for the increase in cesarean delivery rates are not clearly defined, the author concluded there is not enough evidence to support the use of X-ray pelvimetry in women whose fetuses have cephalic presentations. Other investigators expanded the use of X-ray pelvimetry by developing the fetal-pelvic index as a predictor of the likelihood of vaginal delivery in women at high risk for cesarean delivery (36). The test incorporates the determination of fetal weight by ultrasonography compared with the size of the pelvis as determined by X-ray pelvimetry. Initial studies in patients at risk for cesarean delivery demonstrated significant diagnostic ability of the test

(37). However, further prospective studies are necessary to establish the usefulness of this diagnostic modality to predict dystocia.

Clinical pelvimetry can be useful to qualitatively identify the general architectural features of the pelvis and identify patients at risk for dystocia. Researchers correlated pelvimetry data from postpartum magnetic resonance imaging (MRI) with fetal and neonatal dimensions to evaluate criteria for diagnosis of cephalopelvic disproportion (38). Fetal head volume estimates exceeded MRI-measured capacity in nearly 90% of nulliparous women who underwent cesarean delivery because of cephalopelvic disproportion. A prospective investigation of MRI has not been performed, and the use of MRI to measure pelvic capacity remains investigational.

► ***Are there data supporting the benefits of caregivers providing continuous support during labor?***

Continuous support during labor from caregivers (nurses, midwives, or lay individuals) may have a number of benefits for women and their newborns. A randomized trial of 413 nulliparous women compared one-on-one nursing care with usual care (1 nurse monitoring 2 or 3 laboring women) and found a reduction in the need for oxytocin stimulation (RR, 0.83%; 95% CI 0.67, 1.04) (21). There were no differences in labor duration, cesarean deliveries, epidural analgesia, or neonatal intensive care admissions. A comparison of continuous support of a doula with an inconspicuous observer found that continuous labor support was associated with a reduction in cesarean deliveries (8% versus 13%) and forceps deliveries (8% versus 21%) (20). A systematic review that included more than 12,000 women in 15 trials found that the continuous presence of a support person reduced the likelihood of medication for pain relief, operative vaginal delivery, cesarean delivery, and 5-minute Apgar scores less than 7 (19, 39). Few data compare differences in benefits on the basis of level of training of support personnel—that is, whether the caregivers were nurses, midwives, or doulas. Continuous support during labor has several benefits without any evidence of harmful effects.

► ***Does the degree of hydration affect the course of labor?***

In many obstetric centers, establishing an intravenous infusion of fluids in early labor has become routine. Although not necessary in all normally laboring women, intravenous fluids are beneficial before epidural analgesia, and the practice provides intravenous access and the ability to administer oxytocin prophylaxis for postpartum

hemorrhage. On the basis of knowledge that increased fluids improve skeletal muscle performance during prolonged exercise, scientists speculated that increased intravenous fluids may affect labor progress (40). Nearly 200 nulliparous women with uncomplicated pregnancies in spontaneous active labor were randomized to receive either 125 mL or 250 mL of intravenous fluid per hour. The frequency of labor lasting longer than 12 hours was higher in the 125-mL group (26% versus 13%). Furthermore, there was a lower frequency of oxytocin administration for dystocia in the higher fluid rate group (49% versus 65%). The potential of natural hydration status to affect the course of labor warrants further investigation.

► ***Is there a role for active management of labor?***

A system of labor management for nulliparous women, termed “active management of labor,” was developed in Ireland (41). Although many obstetricians have focused on the use of high-dose oxytocin as the principal component of the active management of labor, it is important to emphasize that high-dose oxytocin is just one part of this approach. In fact, most women undergoing active management of labor do not receive oxytocin.

Active management of labor is confined to nulliparous women with singleton, cephalic presentations at term that show no evidence of fetal compromise. Active management of labor, as developed and practiced in Ireland, involves several distinct entities: patient education, strict criteria for the diagnosis of labor, strict criteria for the determination of abnormal progress of labor, high-dose oxytocin infusion, one-to-one nursing support in labor, strict criteria for interpretation of fetal compromise, and peer review of operative deliveries.

The safety of active management of labor has been demonstrated by several randomized trials involving more than 3,000 patients (10, 42–44). Active management of labor has not been associated with an increase in maternal or neonatal morbidity and mortality (44, 45). Unfortunately, success in decreasing cesarean delivery rates with active management of labor has not been uniform. One large randomized trial reported a statistically significant reduction in cesarean deliveries only after controlling for numerous confounding variables (43). A meta-analysis of 4 randomized trials failed to show a reduction in cesarean deliveries related to active management of labor (RR, 0.93; 95% CI 0.8, 1.08) (44).

Active management of labor is not associated with untoward maternal or neonatal outcomes. It may lead to shortened labor in nulliparous women but has not consistently led to a reduction in cesarean deliveries.

► **Is low-dose oxytocin superior to high-dose regimens for augmentation?**

Hypocontractile uterine activity is treated with oxytocin, the only medication approved by the U.S. Food and Drug Administration for labor stimulation. Numerous protocols for initial dose, incremental increases, and time intervals between doses have been studied. Regardless of whether a low-dose or high-dose oxytocin regimen is used, oxytocin is infused to titrate dose to effect because prediction of a woman's response to a particular dose is not possible (46). In a blinded, randomized study comparing a high-dose (4.5 mU/min every 30 minutes) with a low-dose (1.5 mU/min every 30 minutes) oxytocin protocol for augmentation, high-dose oxytocin was associated with a significant shortening of labor without a significant difference in cesarean delivery rates (47). No differences in neonatal outcomes were noted between groups. In another randomized trial of more than 300 women, use of high-dose oxytocin for augmentation benefited both nulliparous women and parous women by decreasing the mean time to correct the labor abnormality by nearly 2 hours and decreasing the need for cesarean delivery (10.4% versus 25.7%) (48).

In a prospective trial involving 1,676 women, comparing high-dose (6 mU/min every 20 minutes) with low-dose (1–2 mU/min every 20 minutes) oxytocin regimens for augmentation, the high-dose regimen was associated with fewer cesarean deliveries for dystocia (9% versus 12%), a 3-hour reduction in mean time to delivery, fewer incidences of chorioamnionitis (8% versus 12%), and fewer cases of neonatal sepsis (0.3% versus 2%) (49). The high-dose regimen was associated with an increase in hyperstimulation, but no adverse fetal effects were observed. In another small randomized trial, a high-dose regimen was associated with a shorter second stage of labor without measurable differences in neonatal outcomes (50). Thus, the current data available do not support the notion that low-dose oxytocin regimens are superior to high-dose regimens for augmentation of labor. Low-dose regimens are associated with less uterine hyperstimulation and lower maximum doses. High-dose regimens may be used for multiparous women, but there are no data available to support the use of high-dose oxytocin regimens for augmentation in a woman with a previously scarred uterus. Importantly, a wide variety of oxytocin regimens may be used for labor augmentation provided proper precautions are met (Table 1).

► **Should women with twin gestations undergo augmentation of labor?**

Twin gestation is not a contraindication to augmentation of labor, but it does warrant special attention. In a retrospective report, 62 women with twin gestations were

**Table 1. Labor Augmentation with Oxytocin: Examples of Low-Dose and High-Dose Regimens**

Regimen	Starting Dose (mU/min)	Incremental Increase (mU/min)	Dosage Interval (min)	Maximum Dose (mU/min)
Low-Dose	0.5–1*	1	30–40	20
	1–2†	2	15	40
High-Dose	≈6‡	≈6	15	≈40
	6§	6, 3, 1	20–40	42

\*Seitchik J, Amico JA, Castillo M. Oxytocin augmentation of dysfunctional labor. V. An alternative oxytocin regimen. *Am J Obstet Gynecol* 1985;151:757–61.

†Hauth JC, Hankins GD, Gilstrap LC 3rd, Strickland DM, Vance P. Uterine contraction pressures with oxytocin induction/augmentation. *Obstet Gynecol* 1986;68:305–9.

‡O'Driscoll K, Foley M, MacDonald D. Active management of labor as an alternative to cesarean section for dystocia. *Obstet Gynecol* 1984;63:485–90.

§Satin AJ, Maberry MC, Leveno KJ, Sherman ML, Kline DM. Chorioamnionitis: a harbinger of dystocia. *Obstet Gynecol* 1992;79:913–5.

matched by parity, cervical dilatation at initiation of oxytocin, gestational age, oxytocin dosage regimen, and indications for oxytocin with controls with singleton pregnancies (51). Twenty-seven women received oxytocin for augmentation and 35 for induction. Women with twin pregnancies responded similarly to those with singleton pregnancies regarding the maximum oxytocin dosage, time to delivery, and successful vaginal delivery. The authors concluded that twin gestation has no adverse impact on the effectiveness or efficacy of oxytocin used for labor stimulation. In a small study of women with twin gestations undergoing labor induction and oxytocin augmentation, no adverse neonatal outcomes were observed (52). In a retrospective review of 134 women with twin gestations who underwent a trial of labor, 49 women required augmentation (53). Augmentation was not found to be a significant risk factor for cesarean delivery or adverse outcomes. Thus, twin gestation does not preclude the use of oxytocin for labor augmentation.

► **How does amniotomy affect labor?**

Amniotomy is commonly performed to induce or augment labor. Surprisingly few studies exist focusing on the impact of amniotomy on augmentation. A recent systematic review primarily addressed the effect of amniotomy on the rate of cesarean delivery (54). This review included controlled trials of amniotomy during the first stage of labor. Amniotomy was associated with a reduction in labor duration of 1–2 hours and a decrease in the use of oxytocin (OR, 0.79; 95% CI 0.67, 0.92). In a trial of 459 women randomized to undergo either elective amniotomy (amniotomy group) or no amniotomy unless there were specific indications (intact group), analysis of fetal heart rate patterns revealed more mild or moderate variable

decelerations in the active phase of labor in the amniotomy group (55). Importantly, there was no difference in nonreassuring heart rates or operative deliveries. Amniotomy was associated with a decreased need for oxytocin augmentation (36% versus 76%) and a shorter active phase of labor (4 hours, 35 minutes, versus 5 hours, 56 minutes).

Another randomized trial addressed the impact of amniotomy after an arrest disorder was diagnosed in the active phase (14). Women with an active phase arrest were randomized to receive either oxytocin with intact membranes or oxytocin with amniotomy and internal monitoring. A trend toward longer labor (44 minutes longer) was seen in the intact group with no differences in cesarean deliveries. The amniotomy group had a higher incidence of fever. Thus, amniotomy may enhance progress in the active phase and negate the need for oxytocin augmentation but may increase the risk of chorioamnionitis.

► ***Should electronic fetal monitoring be used during oxytocin augmentation?***

No overwhelming evidence has identified the most effective method of fetal heart rate surveillance when oxytocin is used for augmentation. A systematic review of continuous electronic heart rate monitoring for fetal assessment during labor identified 13 randomized trials addressing efficacy and safety of electronic fetal monitoring (56). Routine electronic fetal monitoring was associated with a statistically significant decrease in neonatal seizures (RR, 0.51; 95% CI 0.32, 0.82). No differences were seen in low Apgar scores, neonatal intensive care unit admissions, perinatal deaths, or cerebral palsy. Electronic fetal monitoring was associated with an increase in cesarean deliveries (RR, 1.41; 95% CI 1.23, 1.61) and operative vaginal deliveries (RR, 1.2; 95% CI 1.11, 1.3). Well-controlled studies of intermittent auscultation of the fetal heart rate have shown it to be equivalent to continuous electronic fetal monitoring when performed at specific intervals with a one-to-one nurse-to-patient ratio (57–61). There are no comparative data indicating the optimal frequency at which intermittent auscultation should be performed in the absence of risk factors.

## Summary of Recommendations

***The following recommendations are based on good and consistent scientific evidence (Level A):***

- Patients should be counseled that walking during labor does not enhance or improve progress in labor nor is it harmful.

- Continuous support during labor from caregivers should be encouraged because it is beneficial for women and their newborns.

***The following recommendations are based on limited or inconsistent scientific evidence (Level B):***

- Active management of labor may shorten labor in nulliparous women, although it has not consistently been shown to reduce the rate of cesarean delivery.
- Amniotomy may be used to enhance progress in active labor, but may increase the risk of maternal fever.
- X-ray pelvimetry alone as a predictor of dystocia has not been shown to have benefit, and, therefore, is not recommended.

***The following recommendations are based primarily on consensus and expert opinion (Level C):***

- Intrauterine pressure catheters may be helpful in the management of dystocia in selected patients, such as those who are obese.
- Women with twin gestations may undergo augmentation of labor.

## References

1. Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM, Sutton PD. Births: final data for 2001. Natl Vital Stat Rep 2002;51(2):1–102. (Level II-3)
2. Gifford DS, Morton SC, Fiske M, Keesey J, Keeler E, Kahn KL. Lack of progress in labor as a reason for cesarean. Obstet Gynecol 2000;95:589–95. (Level II-3)
3. Cunningham FG, Gant NF, Leveno KJ, Gilstrap LC 3rd, Hauth JC, Wenstrom KD. Dystocia: abnormal labor and fetopelvic disproportion. In: Williams Obstetrics. 21st ed. New York (NY): McGraw-Hill; 2001. p. 425–50. (Level III)
4. Kilpatrick SJ, Laros RK Jr. Characteristics of normal labor. Obstet Gynecol 1989;74:85–7. (Level II-3)
5. Zhang J, Yancey MK, Klebanoff MA, Schwarz J, Schweitzer D. Does epidural analgesia prolong labor and increase risk of cesarean delivery? A natural experiment. Am J Obstet Gynecol 2001;185:128–34. (Level II-2)
6. Hauth JC, Hankins GD, Gilstrap LC 3rd, Strickland DM, Vance P. Uterine contraction pressures with oxytocin induction/augmentation. Obstet Gynecol 1986;68:305–9. (Level II-2)
7. Rouse DJ, Owen J, Goldenberg RL, Cliver SP. The effectiveness and costs of elective cesarean delivery for fetal macrosomia diagnosed by ultrasound. JAMA 1996;276:1480–6. (Decision analysis)

8. Menticoglou SM, Manning F, Harman C, Morrison I. Perinatal outcome in relation to second-stage duration. *Am J Obstet Gynecol* 1995;173:906–12. (Level II-3)
9. Sheiner E, Levy A, Feinstein U, HersHKovitz R, Hallak M, Mazor M. Obstetric risk factors for failure to progress in the first versus the second stage of labor. *J Matern Fetal Neonatal Med* 2002;11:409–13. (Level II-2)
10. Frigoletto FD Jr, Lieberman E, Lang JM, Cohen A, Barss V, Ringer S, et al. A clinical trial of active management of labor [published erratum appears in *N Engl J Med* 1995;333:1163]. *N Engl J Med* 1995;333:745–50. (Level I)
11. Howell CJ. Epidural versus non-epidural analgesia for pain relief in labour (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2003. Oxford: Update Software. (Meta-analysis)
12. Satin AJ, Maberry MC, Leveno KJ, Sherman ML, Kline DM. Chorioamnionitis: a harbinger of dystocia. *Obstet Gynecol* 1992;79:913–5. (Level II-2)
13. Piper JM, Bolling DR, Newton ER. The second stage of labor: factors influencing duration. *Am J Obstet Gynecol* 1991;165:976–9. (Level II-3)
14. Rouse DJ, McCullough C, Wren AL, Owen J, Hauth JC. Active-phase labor arrest: a randomized trial of chorioamniotic management. *Obstet Gynecol* 1994;83:937–40. (Level I)
15. Fitzpatrick M, Harkin R, McQuillan K, O'Brien C, O'Connell PR, O'Herlihy C. A randomised clinical trial comparing the effects of delayed versus immediate pushing with epidural analgesia on mode of delivery and faecal continence. *BJOG* 2002;109:1359–65. (Level I)
16. Donnelly V, Fynes M, Campbell D, Johnson H, O'Connell PR, O'Herlihy C. Obstetric events leading to anal sphincter damage. *Obstet Gynecol* 1998;92:955–61. (Level II-2)
17. Hilton P, Ward A. Epidemiological and surgical aspects of urogenital fistulae: a review of 25 years' experience in southeast Nigeria. *Int Urogynecol J Pelvic Floor Dysfunct* 1998;9:189–94. (Level II-3)
18. Kelly J. Vesico-vaginal and recto-vaginal fistulae. *J R Soc Med* 1992;85:257–8. (Level III)
19. Hodnett ED, Gates S, Hofmeyr GJ, Sakala C. Continuous support for women during childbirth (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2003. Oxford: Update Software. (Meta-analysis)
20. Kennell J, Klaus M, McGrath S, Robertson S, Hinkley C. Continuous emotional support during labor in a US hospital. A randomized controlled trial. *JAMA* 1991;265:2197–201. (Level I)
21. Gagnon AJ, Waghorn K, Covell C. A randomized trial of one-to-one nurse support of woman in labor. *Birth* 1997;24:71–7. (Level I)
22. Albers LL, Schiff M, Gorwoda JG. The length of active labor in normal pregnancies. *Obstet Gynecol* 1996;87:355–9. (Level II-3)
23. Fraser WD, Cayer M, Soeder BM, Turcot L, Marcoux S; PEOPLE (Pushing Early or Pushing Late with Epidural) Study Group. Risk factors for difficult delivery in nulliparas with epidural analgesia in second stage of labor. *Obstet Gynecol* 2002;99:409–18. (Level II-2)
24. Gambling DR, Sharma SK, Ramin SM, Lucas MJ, Leveno KJ, Wiley J, et al. A randomized study of combined spinal-epidural analgesia versus intravenous meperidine during labor: impact on cesarean delivery rate. *Anesthesiology* 1998;89:1336–44. (Level I)
25. Halpern SH, Leighton BL, Ohlsson A, Barrett JF, Rice A. Effect of epidural vs. parenteral opioid analgesia on the progress of labor: a meta-analysis. *JAMA* 1998;280:2105–10. (Meta-analysis)
26. Ramin SM, Gambling DR, Lucas MJ, Sharma SK, Sidawi JE, Leveno KJ. Randomized trial of epidural versus intravenous analgesia during labor. *Obstet Gynecol* 1995;86:783–9. (Level I)
27. Sharma SK, Sidawi JE, Ramin SM, Lucas MJ, Leveno KJ, Cunningham FG. Cesarean delivery: a randomized trial of epidural versus patient-controlled meperidine analgesia during labor. *Anesthesiology* 1997;87:487–94. (Level I)
28. Thorp JA, Hu DH, Albin RM, McNitt J, Meyer BA, Cohen GR, et al. The effect of intrapartum epidural analgesia on nulliparous labor: a randomized, controlled, prospective trial. *Am J Obstet Gynecol* 1993;169:851–8. (Level I)
29. Nageotte MP, Larson D, Rumney PJ, Sidhu M, Hollenbach K. Epidural analgesia compared with combined spinal-epidural analgesia during labor in nulliparous women. *N Engl J Med* 1997;337:1715–9. (Level I)
30. Robinson JN, Norwitz ER, Cohen AP, McElrath TF, Lieberman ES. Epidural analgesia and third- or fourth-degree lacerations in nulliparas. *Obstet Gynecol* 1999;94:259–62. (Level II-2)
31. Chua S, Kurup A, Arulkumaran S, Ratnam SS. Augmentation of labor: does internal tocography result in better obstetric outcome than external tocography? *Obstet Gynecol* 1990;76:164–7. (Level I)
32. Bloom SL, McIntire DD, Kelly MA, Beimer HL, Burpo RH, Garcia MA, et al. Lack of effect of walking on labor and delivery. *N Engl J Med* 1998;339:76–9. (Level I)
33. Vallejo MC, Firestone LL, Mandell GL, Jamie F, Makishima S, Ramanathan S. Effect of epidural analgesia with ambulation on labor duration. *Anesthesiology* 2001;95:857–61. (Level I)
34. Lupe PJ, Gross TL. Maternal upright posture and mobility in labor—a review. *Obstet Gynecol* 1986;67:727–34. (Level III)
35. Pattinson RC. Pelvimetry for fetal cephalic presentations at term (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2003. Oxford: Update Software. (Meta-analysis)
36. Morgan MA, Thurnau GR, Fishburne JI Jr. The fetal-pelvic index as an indicator of fetal-pelvic disproportion: a preliminary report. *Am J Obstet Gynecol* 1986;155:608–13. (Level II-3)
37. Morgan MA, Thurnau GR. Efficacy of the fetal-pelvic index in nulliparous women at high risk for fetal-pelvic

- disproportion. *Am J Obstet Gynecol* 1992;166:810–4. (Level II-2)
38. Sporri S, Hanggi W, Braghetti A, Vock P, Schneider H. Pelvimetry by magnetic resonance imaging as a diagnostic tool to evaluate dystocia. *Obstet Gynecol* 1997;89:902–8. (Level II-2)
  39. Thornton JG, Lilford RJ. Active management of labour: current knowledge and research issues [published erratum appears in *BMJ* 1994;309:704]. *BMJ* 1994;309:366–9. (Level III)
  40. Garite TJ, Weeks J, Peters-Phair K, Pattillo C, Brewster WR. A randomized controlled trial of the effect of increased intravenous hydration on the course of labor in nulliparous women. *Am J Obstet Gynecol* 2000;183:1544–8. (Level I)
  41. O’Driscoll K, Foley M, MacDonald D. Active management of labor as an alternative to cesarean section for dystocia. *Obstet Gynecol* 1984;63:485–90. (Level II-3)
  42. Rogers R, Gilson GJ, Miller AC, Izquierdo LE, Curet LB, Qualls CR. Active management of labor: does it make a difference? *Am J Obstet Gynecol* 1997;177:599–605. (Level I)
  43. Lopez-Zeno JA, Peaceman AM, Adashek JA, Socol ML. A controlled trial of a program for the active management of labor. *N Engl J Med* 1992;326:450–4. (Level I)
  44. Sadler LC, Davison T, McCowan LM. A randomised controlled trial and meta-analysis of active management of labour. *BJOG* 2000;107:909–15. (Level II-1)
  45. Cahill DJ, Boylan PC, O’Herlihy C. Does oxytocin augmentation increase perinatal risk in primigravid labor? *Am J Obstet Gynecol* 1992;166:847–50. (Level II-2)
  46. Satin AJ, Leveno KJ, Sherman ML, McIntire DD. Factors affecting the dose response to oxytocin for labor stimulation. *Am J Obstet Gynecol* 1992;166:1260–1. (Level II-2)
  47. Merrill DC, Zlatnik FJ. Randomized, double-masked comparison of oxytocin dosage in induction and augmentation of labor. *Obstet Gynecol* 1999;94:455–63. (Level I)
  48. Xenakis EM, Langer O, Piper JM, Conway D, Berkus MD. Low-dose versus high-dose oxytocin augmentation of labor—a randomized trial. *Am J Obstet Gynecol* 1995;173:1874–8. (Level I)
  49. Satin AJ, Leveno KJ, Sherman ML, Brewster DS, Cunningham FG. High- versus low-dose oxytocin for labor stimulation. *Obstet Gynecol* 1992;80:111–6. (Level II-2)
  50. Bidgood KA, Steer PJ. A randomized control study of oxytocin augmentation of labour. 1. Obstetric outcome. *Br J Obstet Gynaecol* 1987;94:512–7. (Level I)
  51. Fausett MB, Barth WH Jr, Yoder BA, Satin AJ. Oxytocin labor stimulation of twin gestations: effective and efficient. *Obstet Gynecol* 1997;90:202–4. (Level II-2)
  52. Manor M, Blickstein I, Ben-Arie A, Weissman A, Hagay Z. Case series of labor induction in twin gestations with an intrauterine balloon catheter. *Gynecol Obstet Invest* 1999;47:244–6. (Level III)
  53. Grobman WA, Dooley SL, Peaceman AM. Risk factors for cesarean delivery in twin gestations near term. *Obstet Gynecol* 1998;92:940–4. (Level II-2)
  54. Fraser WD, Turcot L, Krauss I, Brisson-Carrol G. Amniotomy for shortening spontaneous labour (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2003. Oxford: Update Software. (Meta-analysis)
  55. Garite TJ, Porto M, Carlson NJ, Rumney PJ, Reimbold PA. The influence of elective amniotomy on fetal heart rate patterns and the course of labor in term patients: a randomized study. *Am J Obstet Gynecol* 1993;168:1827–31; discussion 1831–2. (Level I)
  56. Thacker SB, Stroup D, Chang M. Continuous electronic heart rate monitoring for fetal assessment during labor (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2003. Oxford: Update Software. (Meta-analysis)
  57. Haverkamp AD, Orleans M, Langendoerfer S, McFee J, Murphy J, Thompson HE. A controlled trial of the differential effects of intrapartum fetal monitoring. *Am J Obstet Gynecol* 1979;134:399–412. (Level I)
  58. Renou P, Chang A, Anderson I, Wood C. Controlled trial of fetal intensive care. *Am J Obstet Gynecol* 1976;126:470–6. (Level I)
  59. Kelso IM, Parsons RJ, Lawrence GF, Arora SS, Edmonds DK, Cooke ID. An assessment of continuous fetal heart rate monitoring in labor. A randomized trial. *Am J Obstet Gynecol* 1978;131:526–32. (Level I)
  60. Wood C, Renou P, Oats J, Farrell E, Beischer N, Anderson I. A controlled trial of fetal heart rate monitoring in a low-risk obstetric population. *Am J Obstet Gynecol* 1981;141:527–34. (Level I)
  61. MacDonald D, Grant A, Sheridan-Pereira M, Boylan P, Chalmers I. The Dublin randomized controlled trial of intrapartum fetal heart rate monitoring. *Am J Obstet Gynecol* 1985;152:524–39. (Level I)

The MEDLINE database, the Cochrane Library, and ACOG's own internal resources and documents were used to conduct a literature search to locate relevant articles published between January 1985 and August 2003. The search was restricted to articles published in the English language. Priority was given to articles reporting results of original research, although review articles and commentaries also were consulted. Abstracts of research presented at symposia and scientific conferences were not considered adequate for inclusion in this document. Guidelines published by organizations or institutions such as the National Institutes of Health and the American College of Obstetricians and Gynecologists were reviewed, and additional studies were located by reviewing bibliographies of identified articles. When reliable research was not available, expert opinions from obstetrician-gynecologists were used.

Studies were reviewed and evaluated for quality according to the method outlined by the U.S. Preventive Services Task Force:

- I Evidence obtained from at least 1 properly designed randomized controlled trial.
- II-1 Evidence obtained from well-designed controlled trials without randomization.
- II-2 Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than 1 center or research group.
- II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence.
- III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Based on the highest level of evidence found in the data, recommendations are provided and graded according to the following categories:

Level A—Recommendations are based on good and consistent scientific evidence.

Level B—Recommendations are based on limited or inconsistent scientific evidence.

Level C—Recommendations are based primarily on consensus and expert opinion.

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