CLINICAL PRACTICE GUIDELINE

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First and Second Stage Labor Management

Committee on Clinical Practice Guidelines—Obstetrics. This Clinical Practice Guideline was developed by the ACOG Committee on Clinical Practice Guidelines–Obstetrics in collaboration with Alison G. Cahill, MD, MSCI; Nandini Raghuraman, MD, MSCI; and Manisha Gandhi, MD; with consultation from Anjali J. Kaimal, MD, MAS.

The Society for Maternal-Fetal Medicine (SMFM) supports this document.

PURPOSE: The purpose of this document is to define labor and labor arrest and provide recommendations for the management of dystocia in the first and second stage of labor and labor arrest.

TARGET POPULATION: Pregnant individuals in the first or second stage of labor.

METHODS: This guideline was developed using an a priori protocol in conjunction with a writing team consisting of one maternal–fetal medicine subspecialist appointed by the ACOG Committee on Clinical Practice Guidelines–Obstetrics and two external subject matter experts. ACOG medical librarians completed a comprehensive literature search for primary literature within Cochrane Library, Cochrane Collaboration Registry of Controlled Trials, EMBASE, PubMed, and MEDLINE. Studies that moved forward to the full-text screening stage were assessed by the writing team based on standardized inclusion and exclusion criteria. Included studies underwent quality assessment, and a modified GRADE (Grading of Recommendations Assessment, Development, and Evaluation) evidence-to-decision framework was applied to interpret and translate the evidence into recommendation statements.

RECOMMENDATIONS: This Clinical Practice Guideline includes definitions of labor and labor arrest, along with recommendations for the management of dystocia in the first and second stages of labor and labor arrest. Recommendations are classified by strength and evidence quality. Ungraded Good Practice Points are included to provide guidance when a formal recommendation could not be made because of inadequate or nonexistent evidence.

INTRODUCTION

In 2022, there were more than 3.66 million births in the United States, the vast majority of which were a result of spontaneous or induced labor (1). The most common indication for primary cesarean delivery is labor dystocia (2). Worldwide, the projected average cesarean delivery rate continues to rise, and reducing the number of cesarean deliveries is a priority in the United States (3). In 2022, 32.2% of all births in the United States were cesarean deliveries (1). Although cesarean delivery can be lifesaving for the fetus, the mother, or both in certain cases, the rapid increase in the rate of cesarean births

since 1996, without evidence of concomitant decreases in maternal or neonatal morbidity or mortality, raises significant concerns about contemporary cesarean delivery rates (4). Childbirth by its very nature carries potential risks for the pregnant individual and the newborn, regardless of the route of delivery. For certain clinical conditions —such as placenta previa or uterine rupture—cesarean delivery is firmly established as the safest route of delivery. However, for most low-risk pregnancies, cesarean delivery appears to pose greater risk of maternal morbidity and mortality than vaginal delivery, and labor dystocia is the predominant driver for this intervention (5). This guideline provides definitions for labor arrest, along with recommendations for management of dystocia in the first and second stages of labor that may help optimize labor management and assist with assessment of indication for cesarean delivery for labor dystocia.

SUMMARY OF RECOMMENDATIONS

Labor and Labor Arrest

ACOG recommends that cervical dilation of 6 cm be considered the start of the active phase of labor. **(STRONG RECOMMENDATION, MODERATE-QUALITY EVIDENCE)**

ACOG suggests that *active phase arrest of labor* be defined as no progression in cervical dilation in patients who are at least 6-cm dilated with rupture of membranes despite 4 hours of adequate uterine activity or 6 hours of inadequate uterine activity with oxytocin augmentation. **(CONDITIONAL RECOMMENDATION, LOW-QUALITY EVIDENCE)**

ACOG recommends that *prolonged second stage of labor* be defined as more than 3 hours of pushing in nulliparous individuals and 2 hours of pushing in multiparous individuals. An individualized approach should be used to diagnose second-stage arrest; incorporating information regarding progress, clinical factors that may affect the likelihood of vaginal delivery, discussion of risks and benefits of available interventions, and individual patient preference is recommended when time in the second stage is extended beyond these parameters. **(STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)**

Arrest in the second stage can be identified earlier if there is lack of fetal rotation or descent despite adequate contractions, pushing efforts, and time. **(GOOD PRACTICE POINT)**

ACOG recommends that neuraxial anesthesia be offered for pain relief during any stage of labor. **(STRONG RECOMMENDATION, MODERATE-QUALITY EVIDENCE)**

STRENGTH OF RECOMMENDATION

STRONG

ACOG recommends

Benefits clearly outweigh harms and burdens. Most patients should receive the intervention.

ACOG recommends against

Harms and burdens clearly outweigh the benefits. Most patients should not receive the intervention.

CONDITIONAL

ACOG suggests

The balance of benefits and risks will vary depending on patient characteristics and their values and preferences. Individualized, shared decision making is recommended to help patients decide on the best course of action for them.

QUALITY OF EVIDENCE

HIGH

Randomized controlled trials, systematic reviews, and meta-analyses without serious methodologic flaws or limitations (eg, inconsistency, imprecision, confounding variables)
Very strong evidence from observational studies without serious methodologic flaws or limitations
There is high confidence in the accuracy of the findings and further research is unlikely to change this.

MODERATE

Randomized controlled trials with some limitations
Strong evidence from observational studies without serious methodologic flaws or limitation

LOW

Randomized controlled trials with serious flaws Some evidence from observational studies

VERY LOW

Unsystematic clinical observations
Very indirect evidence from observational studies

GOOD PRACTICE POINTS

Ungraded Good Practice Points are incorporated when clinical guidance is deemed necessary in the case of extremely limited or nonexistent evidence. They are based on expert opinion as well as review of the available evidence.

Management of Dystocia in the First Stage of Labor

ACOG recommends amniotomy for patients undergoing augmentation or induction of labor to reduce the duration of labor. **(STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)**

ACOG recommends either low-dose or high-dose oxytocin strategies as reasonable approaches to the active management of labor to reduce operative deliveries. **(STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)**

ACOG recommends using intrauterine pressure catheters among patients with ruptured membranes to determine adequacy of uterine contractions in those with protracted active labor or when contractions cannot be accurately externally monitored. **(STRONG RECOMMENDATION, LOW-QUALITY EVIDENCE)**

Management of Dystocia in the Second Stage of Labor

ACOG recommends that pushing commence when complete cervical dilation is achieved. **(STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)**

Management of Labor Arrest

ACOG recommends that cesarean delivery be performed in patients with active phase arrest of labor. **(STRONG RECOMMENDATION, LOW-QUALITY EVIDENCE)**

ACOG suggests assessment for operative vaginal delivery before performing cesarean delivery for second-stage arrest. **(CONDITIONAL RECOMMENDATION, LOW-QUALITY EVIDENCE)**

METHODS

ACOG Clinical Practice Guidelines provide clinical management recommendations for a condition or procedure by assessing the benefits and harms of care options through a systematic review of the evidence. This guideline was developed using an a priori protocol in conjunction with a writing team consisting of one maternal–fetal medicine subspecialist appointed by the ACOG Committee on Clinical Practice Guidelines–Obstetrics and two external subject matter experts. A full description of the Clinical Practice Guideline methodology is published separately (6). The following description is specific to this Clinical Practice Guideline.

Literature Search

ACOG medical librarians completed a comprehensive literature search for primary literature within the Cochrane Library, Cochrane Collaboration Registry of Controlled Trials, EMBASE, PubMed, and MEDLINE. Parameters for the search included human-only studies published in English. The search was restricted to studies from 2000 to 2020. The MeSH terms and keywords used to guide the literature search can be found in Appendix A (available online at http://links.lww.com/AOG/D485). An updated literature search was completed in November 2021 and was reviewed by the writing team using the same systematic process as the original literature search. A final supplemental literature search was performed in July 2023 to ensure that any newly published high-level sources were addressed in the final manuscript.

Study Selection

A title and abstract screen of all studies was completed by ACOG research staff. Studies that moved forward to the full-text screening stage were assessed by the writing team based on standardized inclusion and exclusion criteria. To be considered for inclusion, studies had to be conducted in countries ranked very high on the United Nations Human Development Index (7), published in English, and include participants identified as female or women. Although systematic reviews, randomized controlled trials, and observational studies were prioritized, case reports, case series, and narrative reviews were considered for topics with limited evidence. A PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram of the included and excluded studies can be found in Appendix B (available online at http://links.lww.com/AOG/D486). All studies that underwent quality assessment had key details extracted (study design, sample size, details of interventions, outcomes) and descriptions included in the summary evidence tables (Appendix C, available online at http://links.lww.com/AOG/D487).

Recommendation and Manuscript Development

A modified GRADE (Grading of Recommendations Assessment, Development, and Evaluation) evidence-to-decision framework was applied to interpret and translate the evidence into draft recommendation statements, which were classified by strength and evidence quality (8, 9). Ungraded Good Practice Points were incorporated to provide clinical guidance in the case of extremely limited or nonexistent evidence. They are based on expert opinion as well as review of the available evidence (10). The recommendations and supporting evidence tables then were reviewed, revised as appropriate, and affirmed by the Committee on Clinical Practice Guidelines–Obstetrics at a meeting. The guideline manuscript then was written and subsequently reviewed and approved by the Committee on Clinical Practice

Guidelines–Obstetrics and other internal review bodies before continuing to publication.

Use of Language

ACOG recognizes and supports the gender diversity of all patients who seek obstetric and gynecologic care. In original portions of this document, the authors seek to use gender-inclusive language or gender-neutral language. When describing research findings, this document uses gender terminology reported by the investigators. ACOG's policy on inclusive language can be reviewed at https://www.acog.org/clinical-information/policy-and-position-statements/statements-of-policy/2022/inclusive-language.

CLINICAL OVERVIEW

Evidence-based labor management is a crucial step in the efforts to achieve safe vaginal delivery, because labor arrest is the most common indication for cesarean delivery in the United States, accounting for approximately one-third of all cesarean deliveries (11). Ideal labor-management strategies should optimize the likelihood of vaginal delivery and minimize both maternal and neonatal morbidity while also addressing patient preferences and values through a shared decision-making process.

CLINICAL RECOMMENDATIONS AND EVIDENCE SUMMARY

Labor and Labor Arrest Definitions

Normal Labor

The *onset of labor* traditionally is defined as the presence of regular and painful uterine contractions resulting in cervical dilation or effacement or both. However, there is heterogeneity in how labor onset is defined in the literature; retrospective studies often use hospital admission or initial cervical examination as the starting point, which may underestimate the duration of early labor (12).

The *first stage of labor* is defined as the interval between the onset of labor and complete or 10 cm cervical dilation. The first stage is further divided into two phases: latent and active. The *latent phase of labor* is characterized by gradual and relatively slower cervical dilation that starts on perception of regular uterine contractions and ends when rapid cervical change initiates. This phase of rapid cervical change is termed the *active phase of labor* and continues until complete cervical dilation. The *second stage of labor* commences at 10 cm cervical dilation and ends on delivery of the neonate. The *third stage of labor* is the period between delivery of the neonate and delivery of the placenta.

Friedman Compared With Zhang Labor Curves

In the 1950s, Dr. Emanuel Friedman pioneered one of the first objective and graphical descriptions of labor progression (13, 14). By creating cervical dilation time graphs in at-term patients admitted in spontaneous labor, Friedman and colleagues described a sigmoid pattern to labor progression, with distinct divisions of the first stage, including latent, active, and deceleration phases. Using these data, the 95th percentile of latent phase duration was 20 hours in nulliparous patients and 14 hours in multiparous patients (13–15). The transition from latent to active phase was thought to occur at approximately 4 cm cervical dilation. Friedman observed that the 95th percentile rate of active phase cervical dilation ranged from 1.2 cm/hour in nulliparous patients to 1.5 cm/hour in multiparous patients (13–15). The deceleration phase was thought to be a slower rate of cervical change proximal to the end of the first stage of labor.

The 2010 data published by Zhang et al from the Consortium on Safe Labor have been used to refine the definition of normal labor progress (16). In this retrospective study conducted at 19 hospitals in the United States, the duration of labor was analyzed in 62,415 parturients, each of whom delivered a singleton vertex neonate vaginally and had a normal perinatal outcome. In the Consortium on Safe Labor study, the latent phase of labor had a wide range of duration that was dependent on cervical examination at admission and parity, suggesting that a normal latent phase may have wide variation. Additionally, the 95th percentile rate of active-phase dilation was substantially slower than the standard rate derived from Friedman. From 4 cm to 6 cm, nulliparous and multiparous patients dilated at a similar rate. Beyond 6 cm, multiparous individuals dilated more rapidly than nulliparous individuals. The transition to the active phase of labor was achieved at 6 cm compared with the Friedman definition of 4 cm. The Consortium on Safe Labor data did not show a deceleration phase at the end of the first stage of labor. Table 1 summarizes differences between the Friedman and Zhang labor curves.

Since the publication of the Consortium on Safe Labor data, additional studies have demonstrated that labor curves may be affected by maternal obesity, maternal hypertension, age, induction of labor, gestational age, multiple gestations, presence of fetal anomalies, fetal size, and fetal sex (17–25).

Latent Labor

The normal latent phase of labor varies widely among individuals, regardless of parity. Labor may take more than 6 hours to progress from 4 cm to 5 cm of dilation and more than 3 hours to progress from 5 cm to 6 cm of dilation (26). Using Consortium on Safe Labor

Table 1. Comparison of Friedman and Zhang Labor Curves		
	Friedman et al (1950s)	**Zhang et al (2010)**
Cohort	1,000 parturients at term Single center, United States	62,415 parturients at term Multicenter, United States
95th percentile of latent phase	Nulliparous individuals: 20 h Multiparous individuals: 14 h	Nulliparous individuals: 4.5–15.7 h* Multiparous individuals: not defined
Transition from latent to active phase	Dilation greater than 1 cm/h until 3–4 cm	Dilation less than 1 cm/h until 6 cm
95th percentile for rate of cervical dilation in active phase	Nulliparous individuals: 1.2 cm/h Multiparous individuals: 1.5 cm/h	Nulliparous individuals: 0.5–0.7 cm/h* Multiparous individuals: 0.5–1.3 cm/h*
2nd stage duration	Nulliparous individuals: 0.95±0.8 h without epidural Multiparous individuals: 0.29±0.01 h without epidural	Nulliparous individuals: 1.1 (3.6) h with epidural, 0.6 (2.8) h without epidural Multiparous individuals: 0.3 (1.6)† to 0.4 (2.0)‡ h with epidural, 0.1 (1.1)† to 0.2 (1.3)‡ h without epidural

Data are mean±SD or median (95th percentile) unless otherwise specified.

*Depending on cervical examination on admission.

†Parity 1.

‡Parity 2 or more.

Data from: Friedman E. The graphic analysis of labor. Am J Obstet Gynecol 1954;68:1568–75. doi: 10.1016/0002-9378(5490311-7); *and* Friedman EA. Primigravid labor; a graphicostatistical analysis. Obstet Gynecol 1955;6:567–89. doi: 10.1097/00006250-195512000-00001; *and* Friedman EA, Sachtleben MR. Amniotomy and the course of labor. Obstet Gynecol 1963;22:755–70; *and* Friedman EA. An objective approach to the diagnosis and management of abnormal labor. Bull N Y Acad Med 1972;48:842–58 *and* Zhang J, Landy HJ, Ware Branch D, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Obstet Gynecol 2010;116:1281–7. doi: 10.1097/AOG.0b013e3181fdef6e

norms, the median latent-phase duration in nulliparous patients ranges anywhere from 0.6 to 6.0 hours based on the initial cervical examination findings. The most conservative estimate for the 95th percentile for duration between admission and active phase (ie, the latent phase) in nulliparous patients is 16 hours. Hence, a *prolonged latent phase* may be defined as longer than 16 hours. Although some have suggested that abnormal phases of labor could be defined as lengths associated with increased risk of morbidity rather than greater than the 90th–95th percentile in duration (27, 28), no suggested definitions have been published relative to the latent phase. Some data indicate that there may be differences by parity in the rate of dilation before 6 cm (29), but generally, consideration of latent-phase length has not been stratified by parity. Although a prolonged first stage of labor is associated with adverse maternal and neonatal outcomes (29–32), it is important to note that most pregnant individuals with prolonged latent phase ultimately will enter the active phase with expectant management. With few exceptions, the remainder either will cease contracting or, with amniotomy or oxytocin (or both), achieve the active phase (33). There is no evidence-based definition for latent phase arrest. Thus, cesarean delivery performed for a prolonged latent phase in the setting of reassuring maternal and fetal status should be avoided. Among patients undergoing induction of labor, "failed induction of labor" should be the preferred terminology when there is no progression in latent phase (see "Induced Labor" section).

Active Labor

ACOG recommends that cervical dilation of 6 cm be considered the start of the active phase of labor. **(STRONG RECOMMENDATION, MODERATE-QUALITY EVIDENCE)**

Based on the 2010 Zhang labor curve, the inflection point at which latent labor transitions to active labor is at approximately 6 cm dilation (16, 26). Although this reflects an average starting point, there may be a range of dilation between 4 cm and 6 cm at which the rate of cervical change rapidly increases. However, standards of active-phase management and active-phase arrest should not be applied until at least 6 cm dilation.

Active Phase Protraction and Arrest Disorder

ACOG suggests that active phase arrest of labor **be defined as no progression in cervical dilation in patients who are at least 6-cm dilated with rupture of membranes despite 4 hours of adequate uterine activity or 6 hours of inadequate uterine activity with oxytocin augmentation.** (CONDITIONAL RECOMMENDATION, LOW-QUALITY EVIDENCE)

Labor protraction refers to labor progress that is slower than normal, and *labor arrest* is defined as cessation of labor progress despite best attempts at augmentation. Risk factors for protracted or arrested labor include, but are not limited to, nulliparity, large for gestational age fetus, maternal obesity, advanced maternal age, fetal cephalic position (ie, occiput posterior), and cephalopelvic disproportion (34–37). Protraction and arrest disorders are associated with an increased risk of adverse maternal and neonatal outcomes, including cesarean delivery, chorioamnionitis, postpartum hemorrhage, fetal acidemia, and neonatal intensive care unit (NICU) admission (27, 28, 32).

Contemporary data demonstrate that the rate of cervical dilation in the active phase of labor is slower than what was observed historically. The 95th percentile for active-phase dilation ranges from 0.5 cm/hour to 1.3 cm/hour (16); thus, a *protracted active phase* may be conservatively defined as less than 1 cm dilation in 2 hours. However, this range is affected by the patient's admission cervical examination and parity, and these factors should be considered when protracted labor is suspected.

Several studies have evaluated the optimal duration of oxytocin augmentation in the face of labor protraction or arrest. A prospective study of 319 pregnant women with dysfunctional labor found that, with 4 additional hours of oxytocin, 50.7% of nulliparous individuals and 41.7% of multiparous individuals delivered vaginally. In nulliparous patients, a period of 8 hours of augmentation resulted in an 18% cesarean delivery rate. In contrast, if the period of augmentation had been limited to 4 hours, the cesarean delivery rate would have been almost twice as high at 35.5% (38). Thus, a slow but progressive active phase of labor demonstrating cervical change at least every 4 hours in the setting of reassuring maternal and fetal status should not be an indication for cesarean delivery.

A study of more than 500 pregnant women found that extending the minimum period of oxytocin augmentation for active-phase arrest from 2 hours to at least 4 hours allowed the majority of women who had not progressed at the 2-hour mark to give birth vaginally without adversely affecting neonatal outcome (39). The vaginal delivery rate for patients who had not progressed despite 2 hours of oxytocin augmentation was 91% for multiparous individuals and 74% for nulliparous individuals. For those who had not progressed despite 4 hours of oxytocin (and in whom oxytocin was continued at the judgment of the health care professional), the subsequent vaginal delivery rates were 88% in multiparous individuals and 56% in nulliparous individuals. Other subsequent studies have validated these results (40, 41).

These data led to ACOG's 2014 recommendations to liberalize the duration required for *active-phase arrest*, which was defined as no progression in cervical dilation despite 4 hours of adequate uterine activity (more than 200 Montevideo units [MVUs] by intrauterine pressure catheter) or 6 hours of inadequate uterine activity with oxytocin augmentation in patients who are at least 6-cm dilated with rupture of membranes (42). It is important to note that the threshold of 200 MVUs for adequate uterine activity is primarily derived from an observational study of 109 patients performed in 1986, in which the majority (91%) of women with spontaneous vaginal deliveries who underwent oxytocin induction or augmentation achieved greater than 200 MVUs (43).

There are mixed data on whether changes to guidelines and recommendations based on this evidence improved cesarean delivery rates. In a multicenter cluster randomized trial in Norway, labor management using the World Health Organization partograph based on Friedman data was compared with management using Consortium on Safe Labor data (44). There was no difference in cesarean delivery rate or adverse outcomes between the two groups. However, the interpretation of these results is limited by patient characteristics that are different from those of the U.S. population and preexisting evidence that using a partograph may not affect outcomes (45). A cluster randomized trial to determine the effect of the revised ACOG guidelines in 26 hospitals in Alberta, Canada, found no difference in cesarean delivery rates. There was a statistically significant increase in spontaneous vaginal delivery rates among those in the arm adopting the new guidelines, but the clinical benefit was modest: 54.8% to 56.8% (baseline adjusted odds ratio [OR] 1.09; 95% CI, 1.01–1.18) (46). Observational studies on the effect of the revised ACOG guidelines on cesarean delivery rates have shown mixed results, some demonstrating reduction and others demonstrating no effect (30, 47). These studies performed in the United States were limited by their retrospective designs and varied in the way cesarean delivery rates were assessed (primary cesarean delivery rate vs global rate). Thus, the true effect of the 2014 changes in ACOG definitions and guidance for management of labor arrest remains unclear, particularly regarding maternal and neonatal morbidity. However, these suggestions provide a general framework for clinicians to reasonably balance the risks of prolonged labor with the potential benefit of avoiding cesarean delivery, with room for individualization.

Second Stage

***ACOG recommends that prolonged second stage of labor* be defined as more than 3 hours of pushing in nulliparous individuals and 2 hours of pushing in multiparous individuals. An individualized approach should be used to diagnose second-stage arrest; incorporating information regarding progress, clinical factors that may affect the likelihood of vaginal delivery, discussion of risks and benefits of available interventions, and individual patient preference is recommended when time in the second stage is extended beyond these parameters.** (STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)

Arrest in the second stage can be identified earlier if there is lack of fetal rotation or descent despite adequate contractions, pushing efforts, and time. (GOOD PRACTICE POINT)

Parity, delayed pushing, use of epidural analgesia, maternal body mass index, birth weight, occiput posterior position, and fetal station at complete dilation all have been shown to affect the length of the second stage of labor (48). In the Consortium on Safe Labor study, the 95th percentile threshold was approximately 1 hour longer in patients who received epidural analgesia than in those who did not receive epidural analgesia (16).

In an observational study of 53,285 individuals with singleton pregnancies who reached complete dilation, the probability of vaginal delivery decreased as the duration of the second stage increased (49). However, even at more than 4 hours of pushing, the chance of a vaginal delivery for a nulliparous individual was 78%; at more than 2 hours of pushing, the chance of a vaginal delivery for a multiparous individual was 82%. A longer duration of pushing was statistically associated with a rise in composite neonatal morbidity (including mechanical ventilation, proven sepsis, brachial plexus palsy, clavicular fracture, skull fracture, other fracture, seizures, hypoxic-ischemic encephalopathy, and death). However, the absolute difference in neonatal risks was small, approximately 1% or less. As the duration of pushing increased, the odds of postpartum hemorrhage, cesarean delivery, operative vaginal delivery, and third-degree or fourth-degree lacerations also increased (49). In a secondary analysis of the Consortium on Safe Labor study of 43,810 nulliparous individuals and 59,605 multiparous individuals with singleton pregnancies who reached complete dilation, the chance of vaginal delivery after prolonged second stage was 79.9% for nulliparous women with epidurals and 88.7% for multiparous women with epidurals. However, a prolonged second stage was associated with increased chorioamnionitis, third-degree or fourth-degree lacerations, and neonatal morbidity, including sepsis and asphyxia (50).

Several additional studies have demonstrated an association between the duration of the second stage of labor and adverse maternal outcomes but conflicting results for neonatal outcomes. In a secondary analysis of a multicenter randomized study of 4,126 nulliparous women who reached the second stage of labor, longer duration of the second stage was significantly associated with higher odds of chorioamnionitis, uterine atony, and third-degree and fourth-degree perineal laceration, but there was no association with adverse neonatal outcomes, including 5-minute Apgar score less than 4, umbilical artery pH less than 7.0, intubation in the delivery room, need for admission to the NICU, and neonatal sepsis (51). Similarly, in a secondary analysis of 1,862 women enrolled in an early compared with delayed pushing trial, a longer duration of active pushing was not associated with adverse neonatal outcomes, even in those who pushed for more than 3 hours (52). A similar lack of association was found in a large, retrospective cohort study of 15,759 nulliparous women, even in a group whose second stage progressed beyond 4 hours (53). In one retrospective study of 5,158 multiparous women, when the duration of the second stage of labor exceeded 3 hours, the risk of a 5-minute Apgar score less than 7, admission to the NICU, and a composite of neonatal morbidity were all significantly increased (54). A population-based study of 58,113 multiparous women yielded similar results when the duration of the second stage was greater than 2 hours (55).

It is important to consider maternal and neonatal risks of a prolonged second stage of labor in the context of the potential benefit of vaginal delivery. To potentially optimize the chance of vaginal delivery while acknowledging the small absolute risk of maternal and neonatal morbidity, the 2014 ACOG guidelines recommended considering extending the traditional definition of second stage limits by 1 hour—at least 2 hours of pushing in multiparous women and at least 3 hours of pushing in nulliparous women—while also allowing individualized extension as long as progress in fetal descent is being observed and documented (42).

In a randomized trial of 78 nulliparous patients with epidurals and a prolonged second stage of labor longer than 3 hours, extension of labor by 1 hour was associated with a 50% decrease in the cesarean delivery rate. However, the study was not powered to assess differences in neonatal outcomes (56). In a retrospective cohort study of more than 19,000 patients comparing traditional definitions of second-stage arrest (longer than 3 hours in nulliparous individuals with regional anesthesia or longer than 2 hours without it, and longer than 2 hours in multiparous individuals with regional anesthesia and longer than 1 hour without it) with contemporary standards that allow for the continuation of the second stage

for an additional 1 hour, the contemporary definition was associated with a decreased rate of cesarean delivery but increased rates of neonatal acidemia, NICU admission, and third-degree and fourth-degree lacerations (57). A systematic review and meta-analysis that included the previous study and four other retrospective cohort studies as well as two randomized controlled trials with 20,165 nulliparous women compared the Zhang with the Friedman labor curve for the second stage of labor (10,861 with the Zhang labor curve vs 9,304 with the Friedman labor curve) and showed similar cesarean delivery rates when either curve was used in the second stage (pooled OR 0.86; 95% CI, 0.47–1.57; I^2=93%), with comparable rates of adverse maternal and neonatal outcomes (58). Thus, shared decision making with the patient regarding extending the second stage of labor should include a discussion of the maternal and neonatal risks associated with increasing length of the second stage and decreasing likelihood of vaginal delivery (Table 2). Ongoing management of the second stage of labor also assumes the demonstration of fetal descent. In a 2014 study of more than 4,500 vaginal deliveries, 95% of all women were 0 station or lower at complete cervical dilation (59). Thus, a fetal station that remains at 0 despite pushing is unusual.

Induced Labor

The latent phase of labor is significantly longer in induced labor compared with spontaneous labor; the active phase of labor is similar between the two groups (60). Several studies support that a substantial proportion of patients undergoing induction who remain in the latent phase of labor for 12–18 hours with oxytocin administration and ruptured membranes will give birth vaginally if

Table 2. Odds of Adverse Outcomes and Proportion of Vaginal Deliveries by Duration of Second Stage of Labor

Outcome	Laughon et al (N=103,415) [aOR (95% CI)]	Grobman et al (N=53,285) [OR (95% CI)]	
Nulliparous patients	More than 180 min*	180–239 min†	240 min or more†
Vaginal delivery	79.9%	75.8%	77.6%
Chorioamnionitis	3.01; 2.65–3.43	—	—
Postpartum hemorrhage	1.50; 1.27–1.78	4.0; 2.7–6.0	3.8; 2.1–6.9
3rd- or 4th-degree laceration	1.80; 1.58–2.05	2.9; 2.4–3.6	3.5; 2.6–4.6
NICU admission	1.39; 1.20–1.60	—	—
Neonatal sepsis	2.08; 1.60–2.70	—	—
Neonatal composite adverse outcome‡	—	2.1; 1.4–3.3	2.2; 1.2–4.2
Multiparous patients	More than 120 min*	120–179 min†	
Vaginal delivery	88.7%	81.8%	
Chorioamnionitis	4.78; 3.46–6.61	—	
Postpartum hemorrhage	1.50; 1.07–2.10	5.6; 3.2–9.6	
3rd- or 4th-degree laceration	3.85; 2.65–5.60	5.5; 3.5–8.6	
NICU admission	1.57; 1.22–2.03	—	
Neonatal sepsis	1.73; 0.99–3.05	—	
Neonatal composite adverse outcome‡	—	2.7; 1.5–4.8	

Abbreviations: aOR, adjusted odds ratio; OR, odds ratio; NICU, neonatal intensive care unit.

*With epidural, referent is 180 minutes or less in nulliparous individuals and 120 minutes or less in multiparous individuals.

†With and without epidural, referent is less than 60 minutes.

‡Mechanical ventilation, proven sepsis, brachial plexus injury, clavicular fracture, skull fracture, other fracture, seizures, hypoxic-ischemic encephalopathy, or death (within 120 days of delivery).

Data from: Laughon SK, Berghella V, Reddy UM, Sundaram R, Lu Z, Hoffman MK. Neonatal and maternal outcomes with prolonged second stage of labor [published erratum appears in Obstet Gynecol 2014;124:842]. Obstet Gynecol 2014;124:57–67. doi: 10.1097/AOG.0000000000000278; *and* Grobman WA, Bailit J, Lai Y, Reddy UM, Wapner RJ, Varner MW, et al. Association of the duration of active pushing with obstetric outcomes. *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units (MFMU) Network. Obstet Gynecol 2016;127:667–73. doi: 10.1097/AOG.0000000000001354.

induction is continued (61–63). In one study, 17% of pregnant women were still in the latent phase of labor after 12 hours, and 5% remained in the latent phase beyond 18 hours (62). In another study, of those pregnant people who were in the latent phase for longer than 12 hours and achieved the active phase of labor, approximately 40% gave birth vaginally (63). In a cohort of 10,677 nulliparous women undergoing induction of labor, 96.4% reached the active phase by 15 hours. More than 40% of people whose latent phase lasted 18 hours or more still had vaginal deliveries (64).

Therefore, if the maternal and fetal status remain reassuring, cesarean deliveries for failed induction of labor in the latent phase can be avoided by recommending that oxytocin be administered for at least 12–18 hours after membrane rupture before deeming the induction to be unsuccessful. Depending on clinical characteristics, patient preference, and discussion of the risks and benefits, the decision to continue past 18 hours may be individualized (64).

Epidural Analgesia

ACOG recommends that neuraxial anesthesia be offered for pain relief during any stage of labor. (STRONG RECOMMENDATION, MODERATE-QUALITY EVIDENCE)

Regional anesthesia is a highly effective mode of pain relief for individuals in labor. For pregnant women electing regional pain management in labor, a systematic review demonstrated that neither type of neuraxial analgesia (epidural vs combined spinal epidural) nor timing affected the risk of cesarean delivery (65).

Management of Dystocia in the First Stage of Labor

Various strategies to manage abnormal labor progression in the first stage have been investigated. In the 1960s, O'Driscoll et al (66) in Ireland proposed a comprehensive approach to labor management, now termed active management of labor, to decrease the duration of labor. This approach included standardized criteria for the diagnosis of labor, early rupture of membranes, administration of oxytocin for protracted labor, and one-to-one nursing. In the largest randomized trial (n=1,934) comparing active with routine labor management, Frigoletto et al concluded that active management was associated with a shorter duration of labor and lower incidence of maternal fever, with no difference in the cesarean delivery rate. A subsequent meta-analysis of four trials demonstrated that active management is not associated with a significant reduction in the incidence of cesarean delivery (67). Given the known risks of prolonged labor (27, 32), active management of labor is preferred over expectant management; this approach may be tailored based on patient preference after discussion regarding the known risks.

Amniotomy

ACOG recommends amniotomy for patients undergoing augmentation or induction of labor to reduce the duration of labor. (STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)

Multiple studies have investigated the use of amniotomy compared with no intervention, other interventions, or adjunctive to other interventions during spontaneous labor and induction of labor.

A 2020 systematic review published by the Agency for Healthcare Research and Quality (AHRQ) included five randomized controlled trials from 2007 to 2010 investigating amniotomy in pregnant women undergoing spontaneous labor compared with various control treatments (65). The specific control treatment was under the obstetrician's discretion, without intentional amniotomy in the absence of other indications such as fetal scalp electrode or intrauterine pressure catheter placement. The review determined that amniotomy in spontaneous labor decreased the total duration of time in labor for nulliparous individuals without increasing the risk for cesarean delivery, maternal infection, hemorrhage, or trauma to the pelvic floor. Neonatal outcomes were not routinely evaluated in all of the included trials, but no significant differences were noted. None of the randomized controlled trials demonstrated an increased risk of cord prolapse with amniotomy.

Early Compared With Late Amniotomy

Amniotomy has also been investigated in patients undergoing induction of labor. Multiple studies have shown shorter time intervals to delivery in those who had early amniotomy. A retrospective matched cohort study of 546 nulliparous women with singleton viable gestations undergoing cervical ripening with Foley balloon catheter compared *early amniotomy* (defined as artificial rupture of membranes less than 1 hour after Foley removal) with no artificial rupture of membranes in the first hour after cervical ripening and demonstrated higher odds of vaginal delivery within 24 hours and a shorter duration of labor induction with early amniotomy (68). A randomized controlled trial of 143 women admitted for induction were randomized to early amniotomy (concomitant with the beginning of oxytocin infusion) or late amniotomy (4 hours after the beginning of oxytocin) showed shorter labor time in nulliparous women (12 hours vs 15 hours), with no effect on the risk of cesarean delivery in nulliparous and multiparous women (69). A systematic review in 2020 of four trials from 2002 to 2017 that included 1,273 patients undergoing induction of labor after cervical ripening with either Foley catheter

or prostaglandins at any dose demonstrated that early amniotomy compared with late amniotomy or spontaneous rupture of membranes had a shorter interval from induction to delivery of approximately 5 hours (mean difference [MD] −4.95 hours; 95% CI, −8.12 to −1.78), with a similar risk for cesarean delivery (31.1% vs 30.9%; risk ratio [RR] 1.05; 95% CI, 0.71–1.56) (70). The largest study in this systematic review randomized 585 pregnant women undergoing induction to early amniotomy (artificial rupture of membranes at less than 4 cm) compared with standard treatment and demonstrated that early amniotomy shortened the time to delivery by more than 2 hours (19.0±9.1 vs 21.3±10.1 hours, *P*=.04) and increased the proportion of induced nulliparous individuals who delivered within 24 hours (68% vs 56%; 95% CI, 0.59–0.89; *P*=.002), without significant differences in cesarean delivery, amnioinfusion, chorioamnionitis, cord prolapse, abruption, or postpartum hemorrhage (71).

There is high-quality evidence to recommend early amniotomy as adjunctive to the labor process to decrease time to delivery without increasing the cesarean delivery rate or other maternal or neonatal complications.

Oxytocin

ACOG recommends either low-dose or high-dose oxytocin strategies as reasonable approaches to the active management of labor to reduce operative deliveries. **(STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)**

When the first stage of labor is protracted or arrested, oxytocin is commonly recommended. Several studies have evaluated the optimal timing of initiation and duration of oxytocin augmentation in the face of labor protraction or arrest.

Early augmentation, defined as oxytocin administration when dystocia is identified, has been examined in multiple randomized controlled trials by meta-analysis (72). Early oxytocin was associated with a modest increase in the probability of spontaneous vaginal delivery (RR 1.09; 95% CI, 1.03–1.17). The meta-analysis concluded that, for every 20 patients treated with early oxytocin augmentation, one additional spontaneous vaginal delivery would be expected. There was a decrease in antibiotic use (RR 0.45; 95% CI, 0.21–0.99) but also an increased risk of hyperstimulation (now termed tachysystole) (RR 2.90; 95% CI, 1.21–6.94), without evidence of adverse neonatal effects. In addition, patients in the early oxytocin group reported higher levels of pain and discomfort in labor. A follow-up systematic review of 14 trials found that, in prevention trials, early augmentation was associated with a modest reduction in the number of cesarean births (11 trials; n=7,753) (RR 0.87; 95% CI, 0.77–0.99) (73). A policy of early oxytocin and early amniotomy was associated with a shortened duration of labor (eight trials, n=4,816 patients) (average MD −1.28 hours; 95% CI, −1.97 to −0.59). There were no significant effects on maternal or neonatal morbidities. The 2020 AHRQ systematic review similarly showed that early administration of oxytocin is associated with a shorter duration of labor but does not affect the overall cesarean delivery rate compared with delayed administration of oxytocin (65).

A systematic review and meta-analysis including nine randomized controlled trials (1,538 pregnant women) evaluated the benefits and harms of discontinuation of oxytocin after the active phase of labor is reached (74). Pregnant women who were randomized to have discontinuation of oxytocin infusion after the active phase was reached had a significantly lower risk of cesarean delivery (9.3% vs 14.7%) (RR 0.64; 95% CI, 0.48–0.87) and of uterine tachysystole (6.2% vs 13.1%) (RR 0.53; 95% CI, 0.33–0.84) compared with those who were randomized to have continuation of oxytocin infusion until delivery. Discontinuation of oxytocin infusion was associated with a modest increase in the duration of the active phase of labor (MD 27.65 minutes; 95% CI, 3.94–51.36). The authors of the systematic review acknowledged the heterogeneity of the included trials from multiple different countries, along with their small sample sizes. A similar Cochrane database systematic review evaluated 10 randomized controlled trials and showed similar findings of reduced cesarean delivery rates after discontinuation of intravenous oxytocin stimulation in the active phase of labor but determined the evidence to be of low certainty due to flawed study designs (RR 0.69; 95% CI, 0.56–0.86). When the analysis was restricted to trials that separately reported participants who reached the active phase or labor, no difference was noted between the groups (RR 0.92; 95% CI, 0.65–1.29) (75). Further research is needed to determine whether oxytocin cessation after the active phase of labor is reached decreases the cesarean delivery rate.

High-Dose Compared With Low-Dose Oxytocin Regimens

Multiple studies have reviewed dosing regimens for oxytocin administration. These are typically referred to as high-dose compared with low-dose regimens, although the actual dosing regimen frequently varies across studies.

A systematic review investigated an oxytocin protocol for induction of labor at term in which *high-dose oxytocin* (defined as at least 100 milliunits oxytocin in the first 40 minutes, with increments delivering at least 600 milliunits in the first 2 hours) was compared with *low-dose oxytocin* (defined as less than 100 milliunits oxytocin in the first 40 minutes and increments delivering less than 600 milliunits total in the first 2 hours) (76). Results of primary outcomes revealed no significant differences in

Table 3. Low-Dose and High-Dose Oxytocin Infusion Protocols			
Regimen	**Starting Dose (mU/min)**	**Incremental Increase (mU/min)**	**Dosage Interval (min)**
Low-Dose	0.5–2	1–2	15–40
High-Dose	4 or higher	3–6	15–40

Abbreviations: mU/min, milliunits per minute; min, minutes.

Reprinted from: Myers ER, Sanders GD, Coeytaux RR, McElligott KA, Moorman PG, Hicklin K, et al. Labor dystocia. Comparative effectiveness review No. 226. AHRQ publication no. 29. Agency for Healthcare Research and Quality. 2020. doi: 10.23970/AHRQEPCCER226.

rates of vaginal delivery not achieved within 24 hours (two trials, n=1,339 women) (RR 0.94; 95% CI, 0.78–1.14) or cesarean delivery (eight trials, n=2,023 women) (RR 0.96; 95% CI, 0.81–1.14). There was no difference in serious maternal morbidity or death (one trial, n=523 women) (RR 1.24; 95% CI, 0.55–2.82) and no difference in serious neonatal morbidity or perinatal death (one trial, n=781 neonates) (RR 0.84; 95% CI, 0.23–3.12) (76).

The AHRQ 2020 systematic review determined that, in nulliparous women, high-dose oxytocin is associated with a lower cesarean delivery rate compared with low-dose oxytocin protocols, with no difference in maternal hemorrhage (65). Table 3 outlines the typical high-dose and low-dose oxytocin regimens identified in the AHRQ systematic review.

Current research suggests no significant differences in maternal or neonatal outcomes with different oxytocin dosing regimens; therefore, either low-dose or high-dose oxytocin strategies are reasonable approaches to the active management of labor to reduce operative deliveries. A maximum dose of oxytocin has not been established.

Special Adjunctive Considerations

Multiple nonpharmacologic supportive care measures have been suggested to have the potential to assist labor progression during labor dystocia. These include, but are not limited to, continuous emotional support, peanut ball, hydration, perineal massage, water immersion, acupuncture, ambulation, and positioning strategies. There is considerable heterogeneity in the type and timing of interventions, which can make them a challenge to study in a systematic fashion.

Continuous Support in Labor

Published data indicate that one of the most effective tools to improve labor and delivery outcomes is the continuous presence of support personnel or the continuous presence of a one-on-one person for support (77). Support may include emotional support, information about labor progress, advice about coping techniques, comfort measures, and speaking up when needed on behalf of the pregnant individual.

One large systematic review demonstrated that pregnant women allocated to continuous support were more likely to have spontaneous vaginal births (RR 1.08; 95% CI, 1.04–1.12) and less likely to report negative ratings of or feelings about their childbirth experiences (RR 0.69; 95% CI, 0.59–0.79) or to use any intrapartum analgesia (RR 0.90; 95% CI, 0.84–0.96) (78). In addition, their labors were shorter (MD –0.69 hours; 95% CI, –1.04 to –0.34) and they were less likely to have cesarean births (average RR 0.75; 95% CI, 0.64–0.88) or instrumental vaginal births (RR 0.90; 95% CI, 0.85–0.96), regional analgesia (average RR 0.93; 95% CI, 0.88–0.99), or to deliver neonates with a low 5-minute Apgar scores (RR 0.62; 95% CI, 0.46–0.85) (78). The subsequent 2020 AHRQ review also examined supportive adjunctive measures for labor dystocia (65). The review acknowledges that continuous emotional support did not show a benefit in reducing the duration of the first or second stage of labor, although prior systematic reviews and meta-analyses, including the one discussed above, showed a benefit in total labor duration. As with the previous systematic review, the AHRQ review showed that emotional support interventions reduced cesarean deliveries and instrumental deliveries and remain one of the key interventions for adjunctive therapies. Patients with continuous emotional support also appear to be less likely to have negative birth experiences.

Given these benefits and the absence of demonstrable risks, patients, obstetrician–gynecologists and other obstetric care clinicians, and health care organizations may want to develop programs and policies to integrate trained support personnel into the intrapartum care environment to provide continuous one-to-one emotional support to individuals undergoing labor (77).

Peanut Ball

The peanut ball is a type of birthing ball shaped like a peanut shell with an elongated shape that is placed between a patient's legs during labor, while the patient is lying in the lateral recumbent position. Use of the peanut ball is suggested to facilitate the widening of the pelvis and fetal descent by mimicking an upright position. A systematic review and meta-analysis of four randomized controlled trials with 648 nulliparous women in spontaneous or induced labor that investigated the efficacy of the peanut ball showed that there was no significant

difference in time in labor (MD 79.1 minutes; 95% CI, −204.9 to 46.7) or incidence of vaginal delivery (RR 1.1; 95% CI, 1.0–1.2) or cesarean delivery (RR 0.8; 95% CI, 0.6–1.0) (79). Overall, the use of the peanut ball does not appear to show significant differences in maternal outcomes.

Hydration

Hydration modalities also have been investigated as adjunctive interventions during labor. Different rates of intravenous fluids and comparison of intravenous fluid compared with oral hydration have been investigated. Pregnant individuals in spontaneously progressing labor may not require routine continuous infusion of intravenous fluids. Although safe, intravenous hydration limits freedom of movement and may not be necessary. Oral hydration can be encouraged to meet hydration and caloric needs (77).

A systematic review in 2017 examined different rates of intravenous fluids and showed that individuals who received intravenous fluids at 250 mL/hour, compared with those who received intravenous fluids at 125 mL/hour, had a lower incidence of cesarean delivery for any indication (12.5% vs 18.1%) (RR 0.70; 95% CI, 0.53–0.92) and for dystocia (4.9% vs 7.7%) (RR 0.60; 95% CI, 0.38–0.97), shorter mean duration of labor of approximately 1 hour (MD −64.38 minutes; 95% CI, −121.88 to −6.88), and shorter mean length of the second stage of labor (MD −2.80 minutes; 95% CI, −4.49 to −1.10), without increased maternal or neonatal morbidities and no increase in pulmonary edema (80). The review supported increased hydration for nulliparous women when oral intake is restricted but recommended further study regarding risks and benefits of increased hydration among women with unrestricted oral intake, those undergoing induction of labor, and those with medical comorbidities (80). The 2020 AHRQ systematic review and meta-analysis, which included the previous review, showed that administration of intravenous fluids compared with oral intake alone demonstrated a reduction in the duration of labor, although not increasing cesarean delivery rates, maternal hemorrhage, or operative vaginal delivery rates (65).

Position Changes and Ambulation

Observational studies of maternal position during labor have found that patients spontaneously assume many different positions during labor (81). A meta-analysis that compared upright positioning (including sitting, standing, and kneeling), ambulation, or both with recumbent, lateral, or supine positions during the first stage of labor found that upright positions shortened the duration of the first stage of labor by approximately 1 hour and 22 minutes (MD −1.36; 95% CI, −2.22 to −0.51). Women in upright positions also were less likely to undergo cesarean delivery (RR 0.71; 95% CI, 0.54–0.94). The 2020 AHRQ review found no differences in duration of labor or cesarean delivery rates for patients using differing positioning interventions, although those in kneeling positions were more likely than those in sitting positions to have reduced trauma to the pelvic floor (65). Frequent position changes during labor to enhance maternal comfort and promote optimal fetal positioning should be supported by adopting positions to allow appropriate maternal and fetal monitoring and treatments. Ambulation was associated with a shorter duration of labor in the AHRQ 2020 systematic review, although the strength of evidence was low (65).

Other Interventions

The 2020 AHRQ systematic review and meta-analysis examined multiple supportive adjunctive measures for labor dystocia. No significant differences were noted in rates of cesarean delivery or duration of labor when investigated for perineal massage, water immersion, or acupuncture or acupressure (65); however, there are few data to comment on potential for increased patient satisfaction with these interventions.

Propranolol also has been investigated as an agent in addition to oxytocin to assist with uterine contractility. Propranolol, a beta-adrenergic receptor–blocking drug, has been shown to reverse the inhibitory effect of the beta agonist isoproterenol on human uterine motility and has been shown to increase uterine activity (82, 83). A 2016 meta-analysis evaluated six randomized controlled trials (n=609 parturients) involving the use of propranolol in the first stage of labor, in either the latent stage or the active stage (84). Propranolol reduced the number of cesarean deliveries when it was administered for induction of labor (OR 0.49; 95% CI, 0.27–0.89); however, this reduction was not observed when it was administered during the active phase of labor. No difference in adverse neonatal outcomes was noted. The authors acknowledged that the low number of participants and methodologic heterogeneity precluded them from making conclusions. A 2023 randomized trial of 164 patients with prolonged labor found no difference in cesarean delivery rate (RR 0.99; 95% CI, 0.76–1.29) between those who received propranolol and those who received placebo (85). Additional data are needed to provide guidance on this intervention, and routine use is not recommended.

Cervical Examinations

Cervical examinations are indicated to determine labor progress, but there is insufficient evidence to provide guidance on the frequency of cervical examinations in labor to assist with labor progress or dystocia (65). However, there is evidence through a retrospective cohort study of 2,395 pregnant women over 4 years that showed no significant association between the number of

cervical examinations in labor and intrapartum fever, whether before or after amniotomy (86). It is reasonable to perform cervical examinations as often as needed when clinically indicated.

Intrauterine Pressure Catheters

ACOG recommends using intrauterine pressure catheters among patients with ruptured membranes to determine adequacy of uterine contractions in those with protracted active labor or when contractions cannot be accurately externally monitored. (STRONG RECOMMENDATION, LOW-QUALITY EVIDENCE)

Intrauterine pressure catheters are frequently used after amniotomy when there is evidence of protraction of labor or an inability to adequately monitor contractions. A 2013 systematic review evaluated three randomized controlled trials including 1,945 pregnant women that showed no difference in maternal or neonatal outcomes with the use of intrauterine pressure catheters, although no trials specifically addressed the question of harms or benefits of use with labor dystocia (87). No significant differences were noted in duration of labor, cesarean or instrumental vaginal delivery rates, hyperstimulation, or infection when an intrauterine catheter was used. No serious complications, such as placenta or vessel perforation or placental abruption, were reported. The 2020 AHRQ systematic review included only this systematic review, with no additional randomized control trials, and concluded that there were no statistically significant differences between intrauterine pressure catheters and external uterine monitoring for the outcomes of mode of delivery, mean time to delivery, neonatal acidemia, and admission to the NICU (65).

Historically, 200 MVU of uterine contraction pressure has been used as the cutoff to suggest adequacy of contraction efforts (43, 88). A secondary analysis of one of the randomized controlled trials in the 2013 systematic review examined the amount of intrauterine pressure affecting labor outcomes and showed that the risk of cesarean delivery was higher in individuals who had low intrauterine pressure during labor (likelihood ratio 1.6 for intrauterine pressure less than 100 milliunits and 0.41 for intrauterine pressure greater than 300 milliunits), without effect on neonatal outcomes (89).

Other observational studies have shown conflicting results regarding the effect of contractile patterns based on intrauterine pressure catheter use on neonatal outcomes (90, 91). Although there are insufficient data to guide the use of intrauterine pressure catheters in the setting of labor dystocia, it can be useful when there is an inability to monitor the frequency or strength of contractions externally to allow for potential use of oxytocin augmentation.

Management of Dystocia in the Second Stage of Labor

Delayed or Immediate Pushing

ACOG recommends pushing commence when complete cervical dilation is achieved. (STRONG RECOMMENDATION, HIGH-QUALITY EVIDENCE)

Among nulliparous patients with regional anesthesia, one aspect of management of the second stage of labor involves timing the initiation of pushing. The theoretical advantage of delaying the initiation of pushing (sometimes referred to as "laboring down") once complete dilation occurs would be to allow the force of uterine contractions to accomplish fetal descent and reduce the need for patient exertion. Immediate pushing once complete dilation occurs more closely mimics the instinctive initiation of pushing when the second stage begins among individuals without regional anesthesia. A meta-analysis of 12 trials comparing immediate with delayed pushing found that delayed pushing was associated with an increased rate of spontaneous vaginal delivery (61.5% vs 56.9%) (pooled RR 1.09; 95% CI, 1.03–1.15) (92). However, among only high-quality studies, there was no difference in the rate of spontaneous vaginal delivery (59.0% vs 54.9%) (pooled RR 1.07; 95% CI, 0.98–1.26). Delayed pushing was associated with prolongation of the second stage of labor (weighted MD 56.92 minutes; 95% CI, 42.19–71.64) and shortened duration of active pushing (weighted MD −21.98 minutes; 95% CI, −31.29 to −12.68), regardless of study quality. In 2018, a multicenter randomized controlled trial in the United States of nulliparous individuals with neuraxial anesthesia comparing immediate with delayed pushing found no difference in rate of spontaneous delivery but noted an increased length of the second stage of labor with delayed pushing (31.8 minutes; 95% CI, 36.7–26.9; $P<.001$) (93). The study was stopped early due to an increased risk of postpartum hemorrhage, chorioamnionitis, and neonatal acidemia in the delayed pushing arm. These data support the recommendation to initiate pushing once complete dilation is reached to avoid prolonging the second stage of labor as well as the adverse outcomes associated with delayed pushing. Delayed pushing has not been studied among multiparous individuals or those without regional anesthesia; however, similar risks are anticipated, and, therefore, this approach should be avoided for these patients as well.

Manual Rotation

Compared with a fetal head position of occiput anterior, other fetal head positions have been associated with an increased risk of operative vaginal delivery and cesarean delivery (36). *Manual rotation*, the process by which a clinician assists in rotating the fetal head to

accomplish a more favorable presentation and a reduced fetal head diameter to move through the maternal pelvis, has been examined as an approach to treat second-stage dystocia. In a U.S. study of 3,258 women with fetuses in the occiput posterior or occiput transverse position, 731 underwent an attempt of manual rotation (94). Compared with expectant management, individuals in the attempted manual rotation group had lower rates of cesarean delivery, perineal laceration, hemorrhage, and chorioamnionitis; the number of patients undergoing attempted manual rotation needed to prevent one cesarean delivery was estimated to be four. In another study of 2,522 deliveries in France, occiput posterior fetal head position occurred in 233 individuals (9.2%) (95). Manual rotation was successful in 71.7% of cases, and the rates of cesarean and operative vaginal delivery were significantly lower after successful manual rotation. A meta-analysis of data from 1,402 women demonstrated a modest but statistically significant increase in vaginal delivery rates when manual rotations were performed in patients with occiput posterior fetuses (96). In contrast, a randomized controlled trial of 160 individuals with term pregnancies with occiput transverse fetal head position comparing manual rotation with sham rotation did not find any difference in the rate of need for operative vaginal delivery, but the study was not powered to evaluate for potential for harm (97). Studies have demonstrated factors associated with successful manual rotation, which include spontaneous labor, fetal engagement, and attempt after complete dilation but before arrest is diagnosed (95, 98).

One small, randomized controlled parallel single-center trial of 58 nulliparous individuals in the second stage of labor with fetuses in occiput posterior position comparing clinician knowledge of fetal spine location before attempted manual rotation with lack of knowledge suggested that knowing the fetal spine position was associated with a significantly higher success rate (82.8% vs 41.4%; $P<.001$) and a higher rate of spontaneous vaginal delivery (69.0% vs 27.6%; $P=.01$) (99).

The timing of a manual rotation in the second stage of labor has been debated, with some clinicians opting for an earlier rotation and others opting to see whether rotation occurs with maternal pushing. In a systematic review of this question, earlier, prophylactic rotation was associated with a shorter second stage but did not demonstrate a change in the rate of vaginal delivery (100).

These data suggest that manual rotation in the second stage of labor from occiput posterior or occiput transverse position to occiput anterior may be associated with decreased cesarean and operative vaginal delivery rates, as well as the associated morbidities, without evidence of increased maternal or neonatal risk.

Management of Labor Arrest

Active Phase Arrest of Labor

ACOG recommends that cesarean delivery be performed in patients with active phase arrest of labor. (STRONG RECOMMENDATION, LOW-QUALITY EVIDENCE)

Arrest of the active phase of labor is the most common indication for primary cesarean delivery (2). One retrospective cohort study of 1,014 women with *active phase arrest*, defined as absence of cervical change during the active phase of labor (4 cm or greater cervical dilation) for at least 2 hours in the presence of adequate uterine contractions (200 MVUs or greater per 10-minute period, as measured by an intrauterine pressure catheter), demonstrated that 33% went on to deliver vaginally and the rest delivered by cesarean (41). Cesarean delivery was associated with an increased risk of chorioamnionitis, endomyometritis, and postpartum hemorrhage, and vaginal delivery was associated with an increased risk for chorioamnionitis and shoulder dystocia. Other studies have shown increased maternal and neonatal morbidities with prolonged first stage of labor duration above the 90th percentile (27, 28). Prolonged first stage of labor has been associated with an increased likelihood of composite maternal morbidity, maternal fever, postpartum transfusion, prolonged second stage of labor duration, third-degree or fourth-degree perineal laceration, and cesarean or operative vaginal delivery in the second stage of labor ($P\leq.02$) and an increased likelihood of composite neonatal morbidity, respiratory distress syndrome, need for mechanical ventilation, and confirmed or suspected neonatal sepsis ($P\leq.03$) (27). The potential etiology for these associations is likely multifactorial in nature and not solely due to the length of the labor.

These data suggest that, although vaginal delivery can be achieved in some patients after prolonged first stage of labor, there is an increase in associated maternal and neonatal comorbidities that can be seen after vaginal or cesarean delivery. In the absence of another maternal or fetal indication for delivery, once a protracted active phase of labor has been diagnosed, counseling regarding available interventions and potential outcomes while incorporating the patient's preferences and values should inform decision making regarding continuing labor compared with proceeding to cesarean delivery. Once a diagnosis of arrest of labor in the active phase has been made, cesarean delivery is indicated.

Second-Stage Arrest of Labor

ACOG suggests assessment for operative vaginal delivery before performing a cesarean delivery for second-stage arrest. (CONDITIONAL RECOMMENDATION, LOW-QUALITY EVIDENCE)

Labor arrest in the second stage should be managed with operative vaginal delivery or cesarean delivery. The decision to offer an operative vaginal delivery should be made by the clinician, taking into consideration clinician training and skill, hospital setting, available resources, patient preferences, and candidacy for an operative vaginal delivery of the pregnant individual (101). In contrast to the increasing rate of cesarean delivery, the rates of operative vaginal delivery (by either vacuum or forceps) have decreased significantly during the past 15 years (102). Yet, comparison of the outcomes of operative vaginal delivery and unplanned cesarean delivery shows reduced maternal morbidity after successful operative vaginal delivery and no difference in serious neonatal morbidity (eg, intracerebral hemorrhage or death). In a large, retrospective cohort study, the rate of intracranial hemorrhage associated with vacuum extraction did not differ significantly from that associated with either forceps delivery (OR 1.2; 95% CI, 0.7–2.2) or cesarean delivery (OR 0.9; 95% CI, 0.6–1.4) (103). In a more recent study, forceps-assisted vaginal deliveries were associated with a reduced risk of the combined outcome of seizure, intraventricular hemorrhage, and subdural hemorrhage as compared with either vacuum-assisted vaginal delivery (OR 0.60; 95% CI, 0.40–0.90) or cesarean delivery (OR 0.68; 95% CI, 0.48–0.97), with no significant difference between vacuum delivery or cesarean delivery (104). In a retrospective cohort study of 990 women undergoing operative delivery in the second stage, comparing those undergoing vacuum or forceps delivery with those undergoing cesarean delivery, there was no difference in rates of fetal acidemia between the groups (105). A 2023 systematic review comparing cesarean delivery and vacuum delivery in the second stage of labor that included this retrospective cohort study and 14 other studies from high-resource and lower-resource settings concluded that vacuum delivery is associated with lower maternal and perinatal mortality (106).

Fewer than 3% of patients in whom operative vaginal delivery has been attempted go on to deliver by cesarean (107). Some have advocated using ultrasonography to assess fetal position to reduce maternal and neonatal morbidity associated with operative delivery. However, a randomized controlled trial of 514 nulliparous women undergoing operative vaginal delivery, comparing ultrasound assistance with usual care, found that, although ultrasonography improved the correct diagnosis of fetal head position, it did not reduce morbidity (108). A randomized controlled trial of 1,903 pregnant women at or beyond 8 cm dilation at term, comparing digital examination with ultrasound evaluation with digital examination alone, actually found a higher rate of operative delivery overall, as well as cesarean delivery, when ultrasonography was added to the evaluation (109). Although attempts at operative vaginal delivery from a mid-pelvic station (0 and +1 on the –5 to +5 scale) or from an occiput transverse or occiput posterior position with rotation are reasonable in selected cases (101), these procedures require a higher level of skill, are more likely to be unsuccessful than low (+2 or greater) or outlet (scalp visible at the introitus) operative vaginal deliveries, and are infrequent in obstetric practice in the United States. In addition, the number of clinicians who are adequately trained to perform any forceps or vacuum deliveries is decreasing. In a survey of 507 obstetrician–gynecologist resident physicians in training, most (more than 55%) did not feel competent to perform a forceps delivery on completion of residency, although more than 90% felt competent to perform vacuum deliveries (110). Hence, prioritizing training in operative vaginal delivery, particularly forceps delivery, remains an important initiative. In summary, operative vaginal delivery in the second stage of labor for labor arrest by experienced and well-trained physicians should be considered a safe, acceptable alternative to cesarean delivery.

Cesarean delivery is also a treatment for second-stage labor arrest. Cesarean delivery in the second stage of labor is associated with increased maternal morbidity compared with cesarean delivery during the first stage. In one retrospective cohort study comparing 400 women undergoing cesarean delivery in the second stage with 2,105 women undergoing cesarean delivery in the first stage, endometritis occurred significantly more frequently after second-stage cesarean delivery (4.25% vs 1.52%) (adjusted OR 2.78; 95% CI, 1.51–5.09) (111). Another retrospective cohort study of 383 pregnant women comparing morbidity of cesarean delivery in the second stage of labor with cesarean delivery in the first stage found a significantly increased risk of hysterotomy extensions (112). These data can be used for operative planning and mobilization of necessary resources.

In summary, both operative vaginal delivery in the appropriate candidate with an appropriately skilled clinician and cesarean delivery are evidence-based treatments for arrest of labor in the second stage of labor.

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APPENDICES

Supplemental Digital Content

A. Literature search strategy: available online at http://links.lww.com/AOG/D485

B. PRISMA diagram: available online at http://links.lww.com/AOG/D486

C. Evidence tables: available online at http://links.lww.com/AOG/D487

CONFLICT OF INTEREST STATEMENT

All ACOG committee members and authors have submitted a conflict of interest disclosure statement related to this published product. Any potential conflicts have been considered and managed in accordance with ACOG's Conflict of Interest Disclosure Policy. The ACOG policies can be found on acog.org. For products jointly developed with other organizations, conflict of interest disclosures by representatives of the other organizations are addressed by those organizations. The American College of Obstetricians and Gynecologists has neither solicited nor accepted any commercial involvement in the development of the content of this published product.

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