

Is there an upper time limit for the management of the second stage of labor?

Aaron B. Caughey, MD, PhD

The epidemiology of the length of labor was notoriously reported by Emmanuel Friedman^{1,2} in several landmark articles >50 years ago. These studies changed modern obstetrics; most specifically, they led to specific normative guidelines on the length of the first and second stages of labor. These normative guidelines generally have become prescriptive and have led to operative deliveries if the length of labor crosses some specific time threshold. However, more recently, a variety of authors have challenged this paradigm for both the first and second stages of labor. This seems reasonable, given that, although basic human biology has not likely changed since Friedman's studies, the management of labor has, most notably with the widespread use of epidural analgesia.

With regard to the first stage of labor, although several authors have concluded that the labor norms that were described by Friedman may not fit many current obstetric populations,^{3,4} the standard curve still is used widely to guide labor interventions. For example, in a 1999 Albers³ found, in a descriptive study of spontaneous, term, vertex labor in women without epidural analgesia, that both nulliparous and multiparous women experienced labors that were considerably longer than those described in Friedman's studies. Similarly, Kilpatrick and Laros⁵ and Zhang et al⁴ also found lengths of spontaneous labor to be longer than those described in Friedman's cohort. Again, although changes in obstetric management may be responsible for some of these differences, demographic changes of the obstetric population may also be somewhat responsible because there have been differences in the length of labor that have been demonstrated by race/ethnicity⁶ and maternal age.⁷

These differences would not matter particularly if clinicians were not using the norms that were defined by Friedman^{1,2} to guide practice. However, 1 of the most common indications for a cesarean delivery is active phase arrest, which is established commonly as no progress in the active phase of labor for 2 hours, despite adequate uterine contractions. However, Rouse et al⁸ demonstrated that, by simply extending the time interval from 2-4 hours, >50% of women in spontaneous labor would proceed to a vaginal delivery. Further, in a recent study by Henry et al,⁹ it was demonstrated that the women who

went on to achieve a vaginal delivery after an active phase arrest diagnosis also had better maternal outcomes because of less infectious and bleeding morbidity with no difference demonstrated in neonatal outcomes.

With regard to the second stage of labor, again Friedman's studies^{1,2} have provided the standard thresholds that have been used, often with hour modifications added for epidural use. However, more recent studies have been in disagreement with the norms that were described by Friedman. For example, the women studied by Albers³ had lengths twice as long as those described by Friedman for both nulliparous (54 min vs 33 min) and multiparous (18 min vs 9 min) women; similar to Friedman's study, the women in this study did not have epidural analgesia.³ In the setting of epidural use, the second stage has been described as lasting even longer.^{6,7}

As of 2000, the American College of Obstetricians and Gynecologists (ACOG) defined a *prolonged second stage of labor in nulliparous women* as the lack of continuing progress for 3 hours with regional anesthesia or 2 hours without regional anesthesia; *prolonged second stage of labor in multiparous women* was defined as the lack of progress for 2 hours with or 1 hour without regional anesthesia.¹⁰ To be clear, however, these guidelines are not based on prospective, randomized trials. Fundamentally, the ideal management of the second stage should maximize the probability of vaginal delivery while minimizing the risks of maternal and neonatal morbidity and death. It appears that, with intensive intrapartum surveillance, timely identification of fetuses who are intolerant of labor can occur and actions subsequently can be taken to avoid fetal asphyxia.¹⁰ Thus, ACOG has advised that "the length of the second stage of labor is not in itself an absolute or even strong indication for operative termination of labor."¹⁰

In the current edition of the *American Journal of Obstetrics and Gynecology*, 2 articles add further information to guide management decisions regarding the second stage of labor with slightly different conclusions to guide the clinician. Both studies are secondary analyses of prospectively collected data from randomized, controlled trials. In the study by Rouse et al,¹¹ which was based on data collected in the study of the fetal pulse oximeter, the study demonstrated no difference in neonatal outcomes, although several maternal outcomes (eg, chorioamnionitis, 3rd- and 4th-degree perineal lacerations, and uterine atony) were reported to have increased with a longer second stage. The study by LeRay et al,¹² which is an analysis of data from a randomized clinical trial of passive descent, also reported a higher rate of chorioamnionitis, even after the data were controlled for potential confounders.

Because these studies are observational with respect to the length of the second stage and the outcomes reported, one

From the Department of Obstetrics, Gynecology and Reproductive Sciences, University of California, San Francisco.

Reprints not available from the author.

0002-9378/free

© 2009 Published by Mosby, Inc.

doi: 10.1016/j.ajog.2009.08.001

➤ See related articles, pages 357 and 361

must consider whether the relationship between length of second stage and chorioamnionitis is causal. I would propose that, although it seems that a certain percentage of the increase in chorioamnionitis may be due to the frequent examinations in the second stage and the longer exposure to ruptured membranes, it may also be that women in whom chorioamnionitis was developing would, in turn, be more likely to demonstrate a dysfunctional labor pattern, weaker uterine contractions, and, thus, experience a prolonged second stage of labor. This reverse causality therefore would not be prevented necessarily by earlier intervention in the second stage.

In addition to the unadjusted findings from these studies, the finding of uterine atony and findings from other studies of the second stage that demonstrate more maternal hemorrhage¹³⁻¹⁵ should also undergo consideration of causality. It may be that women who are predisposed to a longer second stage of labor because of dysfunctional labor or decreased uterine contractility are also more likely to have uterine atony and postpartum hemorrhage. Essentially, it may be that the prolonged labor and postpartum hemorrhage are both a product of a common cause, as opposed to the latter being caused by the former.

The other outcome that may not be related causally to a prolonged labor in a biologic sense is the 3rd- or 4th-degree perineal laceration rate. In fact, it is likely that the obstetric intervention of an operative vaginal delivery at 2, 3, or whatever arbitrarily defined threshold may increase such outcomes as perineal lacerations, obstetric hemorrhage, and shoulder dystocia. Thus, it is likely that the finding in the study of LeRay et al,¹² that the chances of a spontaneous vaginal delivery falls to <10% beyond 3 hours of the second stage is related to obstetric intervention and an overall rate of operative vaginal delivery of 40% in their study. This calls into question their conclusion that consideration should be given to even earlier intervention. Certainly, this is not supported by the findings of Rouse et al,¹¹ who agree with the ACOG conclusions regarding the lack of evidence to support an absolute time threshold to end the second stage with intervention.

Thus, as with many of the most intriguing studies, these 2 articles inspire more research questions and encourage the design of specific studies to determine whether we can improve outcomes in the second stage. First, even these prospective studies, as with Friedman's,^{1,2} do not truly address the epidemiologic function of the second stage of labor. Because of intervention with operative vaginal delivery, it is unclear what the chance of actually progressing to a spontaneous vaginal delivery is as the second stage progresses. Given this, the findings from these 2 studies and others¹⁶ that the neonatal outcomes do not appear to worsen with a longer second stage and that intervention with an operative vaginal delivery does likely worsen maternal outcomes, the stage is set to conduct a prospective, randomized, controlled trial of operative vaginal delivery in nulliparous women at 2 or 3 hours of the second stage vs expectant management. Only with such a study can the

question of which management leads to better outcomes be truly answered.

Given that 1 of the most common indications for an operative vaginal delivery is a prolonged second stage of labor, it seems worthy of study. Such a study should not only examine the short-term outcomes of maternal infectious morbidity, hemorrhage, and perineal lacerations but also should investigate the potential effect of operative vaginal delivery vs expectant management on urogynecologic outcomes. Until such a time that such an interventional study is completed, the recommendations from ACOG appear to be supported by the existing literature. Thus, although as obstetricians many of us have been trained to consider a prolonged second stage to be an indication for operative delivery, we must maintain a careful awareness of the benefits and risks of intervention vs continued expectant management of the second stage. ■

REFERENCES

1. Friedman EA. The graphic analysis of labor. *Am J Obstet Gynecol* 1954;68:691-703.
2. Friedman EA. Primigravid labor: a graphicostatistical analysis. *Obstet Gynecol* 1955;6:567-89.
3. Albers LL. The duration of labor in healthy women. *J Perinatol* 1999;19:114-9.
4. Zhang J, Troendle JF, Yancey MK. Reassessing the labor curve in nulliparous women. *Am J Obstet Gynecol* 2002;187:824-8.
5. Kilpatrick SJ, Laros RK. Characteristics of normal labor. *Obstet Gynecol* 1989;74:85-7.
6. Greenberg MB, Cheng YW, Hopkins LM, Stotland NE, Bryant AS, Caughey AB. Are there ethnic differences in the length of labor? *Am J Obstet Gynecol* 2006;195:743-8.
7. Greenberg MB, Cheng YW, Sullivan M, Norton ME, Hopkins LM, Caughey AB. Does the length of labor vary by maternal age? *Am J Obstet Gynecol* 2007;197:428.e1-7.
8. Rouse DJ, Owen J, Savage KG, Hauth JC. Active phase arrest: revisiting the 2 hour minimum. *Obstet Gynecol* 2001;98:550-4.
9. Henry DM, Cheng YW, Shaffer BL, Kaimal AJ, Bianco K, Caughey AB. Perinatal outcomes in active phase arrest and vaginal delivery. *Obstet Gynecol* 2008;112:1109-15.
10. American College of Obstetricians and Gynecologists. Operative vaginal delivery: ACOG practice bulletin no. 17. Washington, DC: American College of Obstetricians and Gynecologists; 2000.
11. Rouse DJ, Weiner SJ, Bloom SL, et al. Second-stage labor duration in nulliparous women: relationship to maternal and perinatal outcomes. *Am J Obstet Gynecol* 2009;201:357.e1-7.
12. Le Ray C, Audibert F, Goffinet F, Fraser W. When to stop pushing: effects of duration of second-stage expulsion efforts on maternal and neonatal outcomes in nulliparous women with epidural analgesia. *Am J Obstet Gynecol* 2009;201:361.e1-7.
13. Cheng YW, Hopkins LM, Caughey AB. How long is too long: is a prolonged second stage of labor associated with worse maternal and neonatal outcomes? *Am J Obstet Gynecol* 2004;191:933-8.
14. Allen VM, Baskett TF, O'Connell CM, McKeen D, Allen AC. Maternal and perinatal outcomes with increasing duration of the second stage of labor. *Obstet Gynecol* 2009;113:1248-58.
15. Lu MC, Muthengi E, Wakeel F, Fridman M, Korst LM, Gregory KD. Prolonged second stage of labor and postpartum hemorrhage. *J Matern Fetal Neonatal Med* 2009;22:227-32.
16. Myles TD, Santolaya J. Maternal and neonatal outcomes in patients with a prolonged second stage of labor. *Obstet Gynecol* 2003;102:52-8.