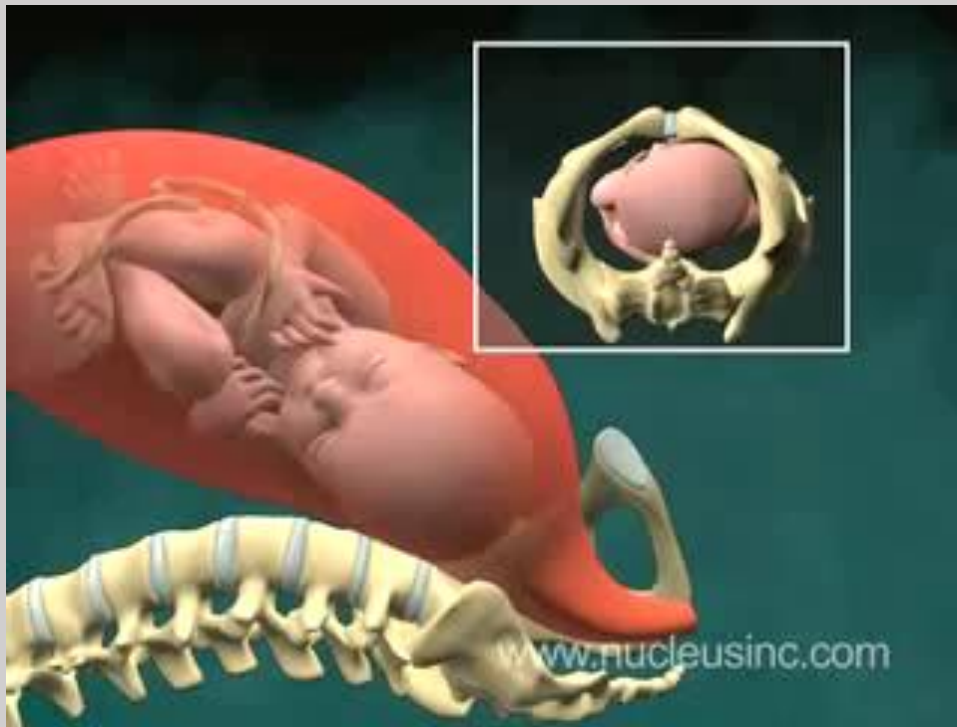
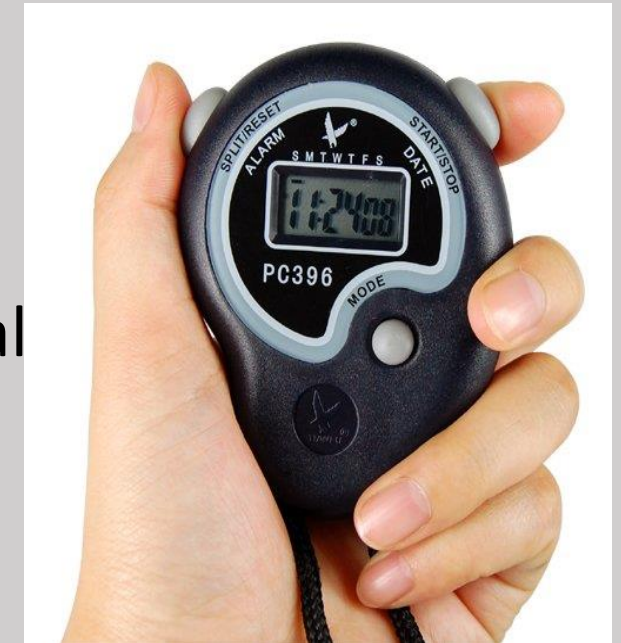


The maximal length of the latent and active phases
of the first and second stages of the labor



Semir Köse M.D
Buca Maternity Hospital
Perinatology



What is the importance of this issue?

The **inexorable increase** in **cesarean delivery rates**

The most common indication for **primary** cesarean delivery is **labor dystocia**

What is the expectation?

Better understanding of labor process

Safe prevention of the primary cesarean deliveries

EXPLAINER

Is Giving Birth Easier for Other Animals?

Dolphins have it easy, but hyenas sure don't.

By FORREST WICKMAN

SEPT 27, 2012 • 6:14 PM



Is giving birth easier for nonhuman animals?

Labor times for other animals tend to be **much shorter than for humans**.

It can take more than **24 hours** for a **woman** to give birth.

Cattle take about two to three hours.

Horses can give birth within 30 minutes, but with great force; if the foal isn't positioned correctly, the uterus may rupture.

TABLE 3. Length of labor in selected primate species¹

Species	First stage (min)	Second stage (min)	Third stage (min)	Total (min)
Sifaka ²	ca.42		15	
Marmoset ³	30-300	10-30		10-24
Langur ⁴	21	4		
Colobus ⁵	240	20		
Guenon ⁶	30	30	32	
Macaque ⁷	23-210	1-2	1-711	14-270
Squirrel monkey ⁸				62
Mona monkey ⁸				54
Baboon ⁹	42-67	4	4	
Hamadryas baboon ¹⁰				45
Orangutan ¹¹	120	30		
Gorilla ¹²	18-155	1-18	2	<30
Chimpanzee ¹³	ca. 120	7	8	
Humans ¹⁴	800 (450)	57 (18)	5	>862

YEARBOOK OF PHYSICAL ANTHROPOLOGY 35:89-124 (1992)

The Evolution of Modern Human Childbirth

KAREN R. ROSENBERG
 Department of Anthropology, University of Delaware,
 Newark, Delaware 19716

Labor follow-up history of our **art-science**

1940 Leroy A. Calkins

The first obstetrician who made the first analyses on the labor process

Described the STAGES

1.Stage – 2.Stage

Calkins LA. On predicting the length of labor: I. First stage. Am J Obstet Gynecol. **1941**;42:802–11.

Calkins LA. Second stage of labor: The descent phase. Am J Obstet Gynecol. **1944**;48:798–803.

Labor follow-up history of our art-science

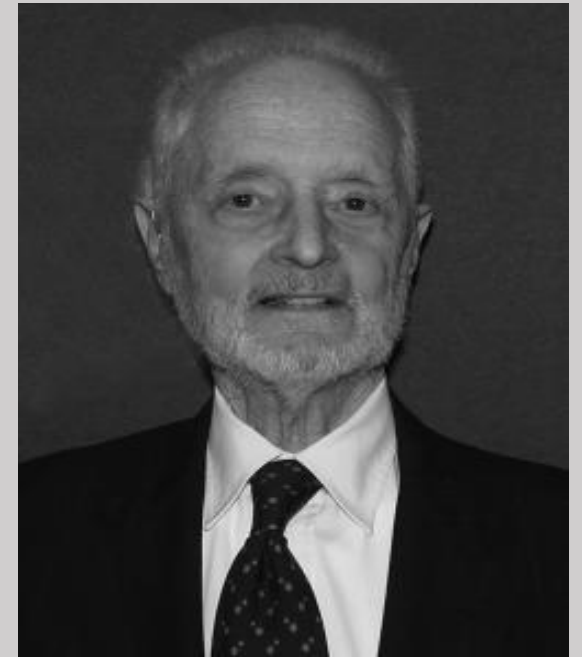
1954 Friedman described the Partogram

use the terms of

Cervical dilation and **Fetal descent** in his reports

Divided the 1.Stage as **Latent Phase** and **Active Phase**

Whenever he placed the cervical dilation and fetal descent variables
against the TIME function in a graphic
he always found an **S curve (Friedman Curve)**



Friedman EA. The graphic analysis of labor. Am J Obstet Gynecol. 1954;68:1568–75.

Friedman EA. Cervimetry: an objective method for the study of cervical dilatation in labor. Am J Obstet Gynecol. 1956;71:1189–93.

Friedman EA, Sachtleben MR. Station of the fetal presenting part. III. Interrelationship with cervical dilatation. Am J Obstet Gynecol. 1965;93:537–42.

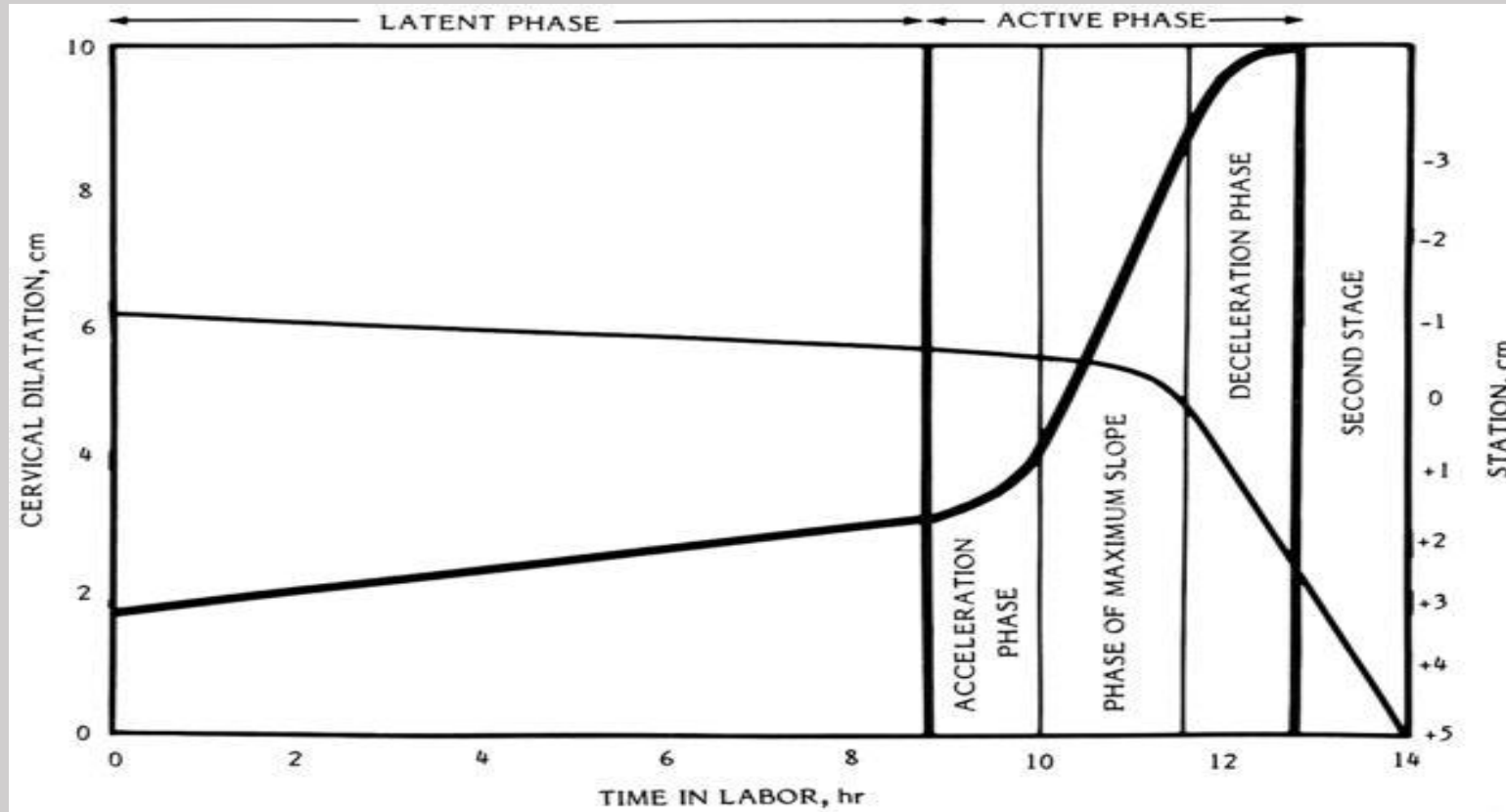
Friedman EA, Sachtleben MR. Station of the fetal presenting part. II. Effect on the course of labor. Am J Obstet Gynecol. 1965;93:530–36.

Friedman EA, Sachtleben MR. Station of the fetal presenting part. I. **Pattern of descent**. Am J Obstet Gynecol. 1965;93:522–29.

Friedman EA, Sachtleben MR. Station of the fetal presenting part. IV. **Slope of descent**. Am J Obstet Gynecol. 1970;107:1031–34.

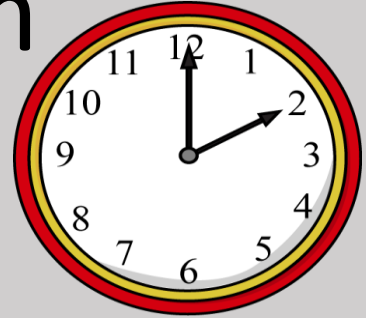
The first revolution in labor art-science

Friedman –Partogram 1954



Using hours For diagnosing **abnormal labor progression**

is a very special application among medical practices



The definitions of “normal labor” and “labor arrest” have profound effects on labor management and cesarean delivery rate.

And these definitions are mainly based on the duration (hours) of the stages

Never let the sun set twice on a laboring woman

Tuuli MG, Odibo AO, Caughey AB, Roehl K, Macones GA, Cahill AG. Are there differences in the first stage of labor between Black and White women? Am J Perinatol. 2015 Feb;32(3):233-8.

Normal labor progression

STAGES and **PHASES**

3 Stages

First stage ~ Latent & Active phases

Second stage ~ Passive & Active phases

Third stage

First Stage

Time

from the onset of the labor to complete cervical dilation

In fact, the precise time of both the start of labor and of complete dilation are **impossible to determine**

First stage = Latent phase + Active phase

Latent phase ~ Gradual cervical changes

Active phase ~ Rapid cervical changes

First stage

Latent phase: begins with maternal **perception** of regular contractions
(very subjective)

Friedman EA. An objective approach to the diagnosis and management of abnormal labor. Bull N Y Acad Med 1972; 48:842–58.

Active phase: begins when the change of cervical dilation significantly increase

(a little bit subjective and a retrospective diagnosis= it is difficult to exactly know when this point is reached)

From Friedman to Zhang

changing the labor curves

Friedman's main observation and his key sentence was

Normal labor should progress at a rate of

at least 1 cm cervical dilation per hour, starting at 3-4 cm of dilation

However these observations have challenged

Changes in obstetric, in anesthesia practices and in women themselves (especially increased BMI) in recent decades have resulted in changes in the average progress of labor

What was abnormal 2 hours

Abnormal labor **progression** in the **active phase** was defined as
cervical dilation

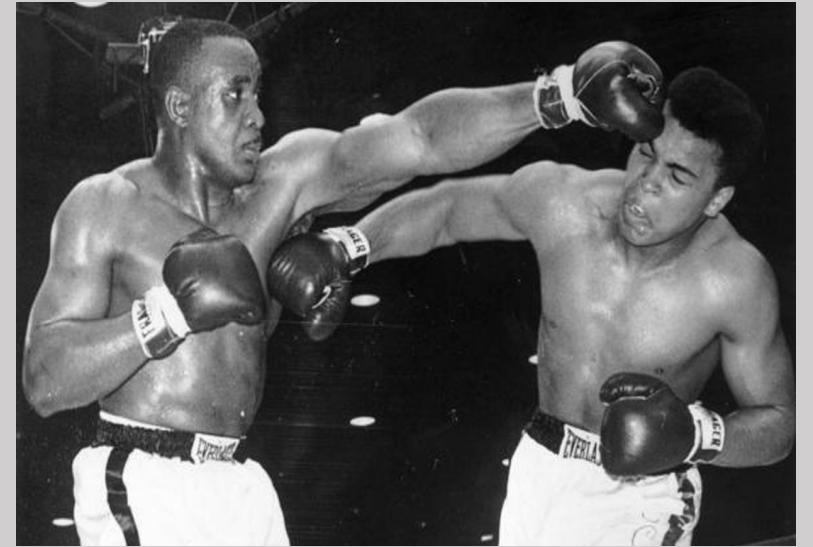
less than 1.2 cm /hour in nulliparous women

less than 1.5 cm /hour in multiparous women

in the presence of adequate uterine contraction and cervical dilation of
>4 cm

no appreciable **change** in cervical dilation

more than 2 hours was considered as labor arrest.



These criteria created 50 years ago may no longer be applicable to contemporary obstetric populations and for current obstetric management.

Zhang J, Landy HJ, Branch DW, et al. Consortium on Safe Labor. Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstet Gynecol*. 2010 Dec;116(6):1281-7.

Friedman's data vs Zhang's data

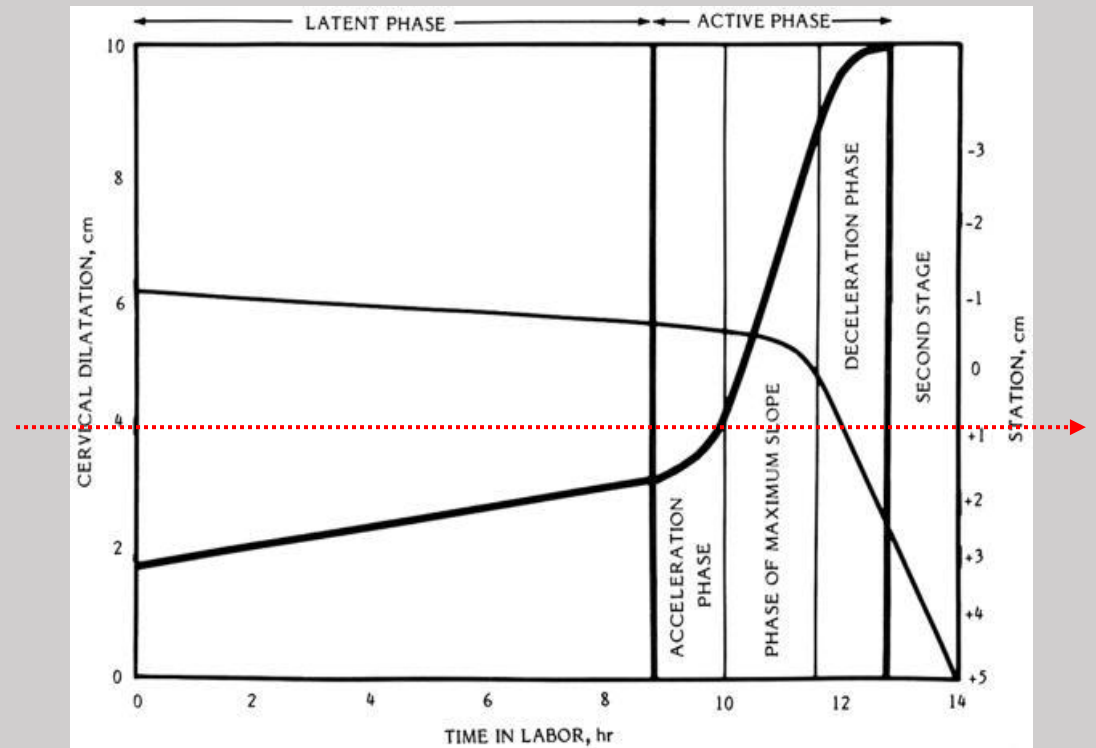
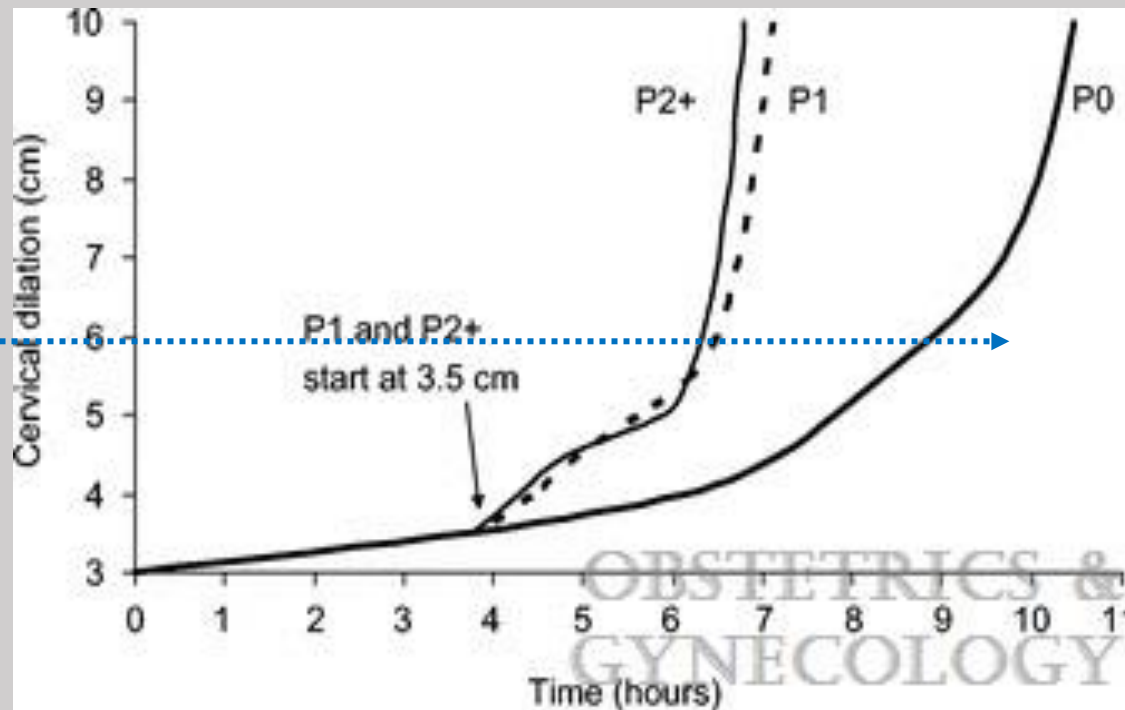
Zhang's curve also demonstrate an increase in the rate of cervical dilation as labor progress, but the increase is more gradual

>50% of pregnant women did not dilate

>1cm/hour until reaching 5-6 cm

a deceleration phase at the end of the 1.stage was not observed

Friedman's curve depicts a relatively slow rate of cervical dilation until approx. **4 cm** (latent phase), followed by an abrupt acceleration (active phase) until entering a deceleration phase at approx. **9 cm**



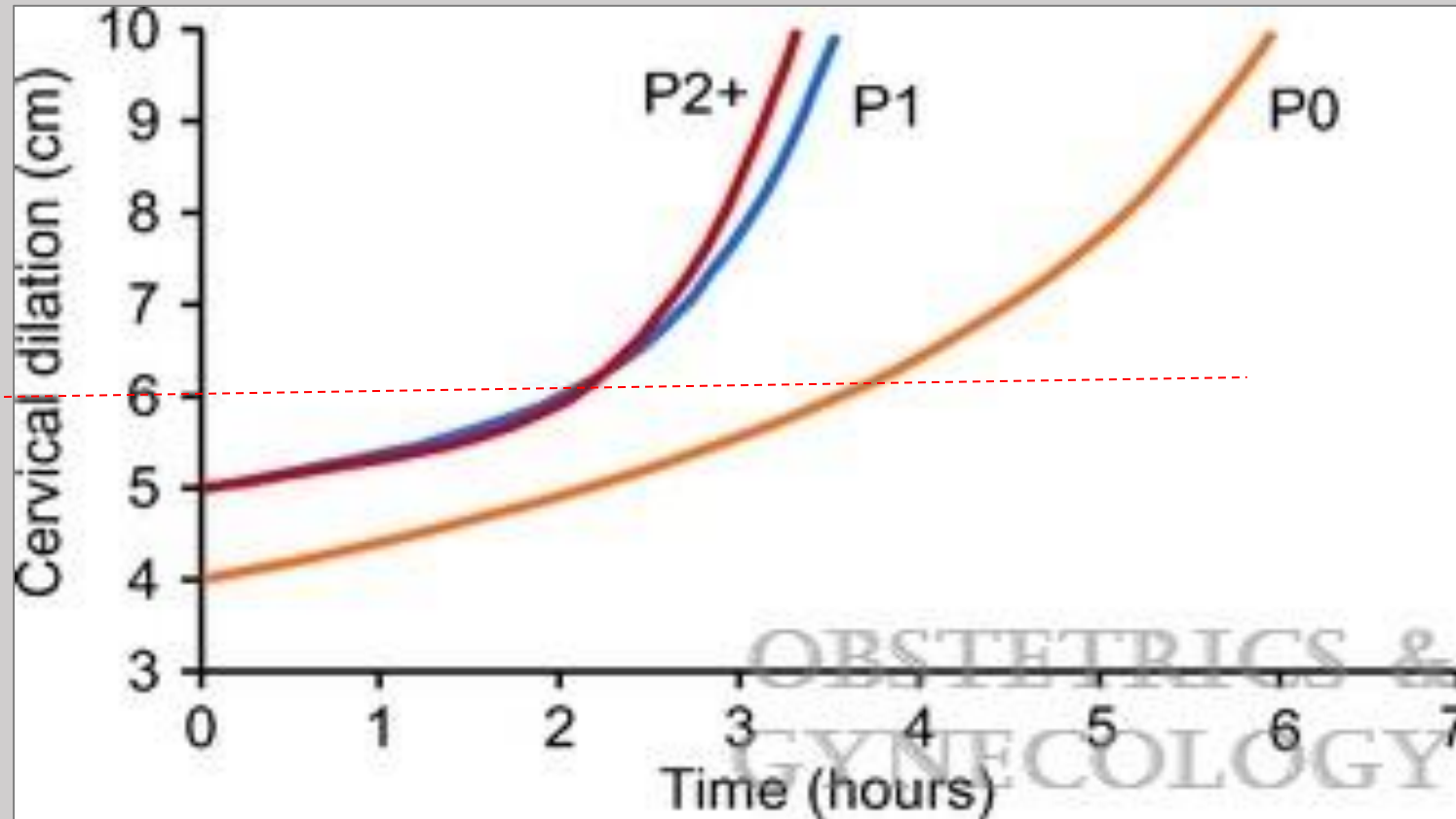
Fig

[Contemporary Patterns of Spontaneous Labor With Normal Neonatal Outcomes](#)

Zhang, Jun; Landy, Helain J.; Ware Branch, D.; Burkman, Ronald; Haberman, Shoshana; Gregory, Kimberly D.; Hatjis, Christos G.; Ramirez, Mildred M.; Bailit, Jennifer L.; Gonzalez-Quintero, Victor H.; Hibbard, Judith U.; Hoffman, Matthew K.; Kominiarek, Michelle; Learman, Lee A.; Van Veldhuisen, Paul; Troendle, James; Reddy, Uma M.

Obstetrics & Gynecology 116(6):1281-1287, December 2010.

doi: 10.1097/AOG.0b013e3181fdef6e



In **multiparous** women, **labor** appears to **accelerate** after **6 cm** of cervical dilation. In contrast, the average labor curve for nulliparous women did not show a clear inflection point.

Fig. 2.Zhang. Contemporary Labor Patterns. Obstet Gynecol 2010.

Data from 1959-1966

National Collaborative Perinatal Project

Table 2. Duration of Labor (in Hours) by Parity, National Collaborative Perinatal Project, 1959–1966

Cervical Dilation (cm)	Parity 0	Parity 1	Parity 2+
From 3 to 4	1.2 (6.6)		
From 4 to 5	0.9 (4.5)	0.7 (3.3)	0.7 (3.5)
From 5 to 6	0.6 (2.6)	0.4 (1.6)	0.4 (1.6)
From 6 to 7	0.5 (1.8)	0.4 (1.2)	0.3 (1.2)
From 7 to 8	0.4 (1.4)	0.3 (0.8)	0.3 (0.7)
From 8 to 9	0.4 (1.3)	0.3 (0.7)	0.2 (0.6)
From 9 to 10	0.4 (1.2)	0.2 (0.5)	0.2 (0.5)
From 4 to 10	3.7 (16.7)	2.4 (13.8)	2.2 (14.2)

Data are median (95th percentile).

Zhang J, Troendle J, Mikolajczyk R, Sundaram R, Beaver J, Fraser W. The natural history of the normal first stage of labor. Obstet Gynecol. 2010 Apr;115(4):705-10.

Data from 2002-2008

Consortium on Safe Labor

Table 2. Duration of Labor in Hours by Parity in Spontaneous Onset of Labor

Cervical Dilation (cm)	Parity 0 (n=25,624)	Parity 1 (n=16,755)	Parity 2+ (n=16,219)
3–4	1.8 (8.1)	–	–
4–5	1.3 (6.4)	1.4 (7.3)	1.4 (7.0)
5–6	0.8 (3.2)	0.8 (3.4)	0.8 (3.4)
6–7	0.6 (2.2)	0.5 (1.9)	0.5 (1.8)
7–8	0.5 (1.6)	0.4 (1.3)	0.4 (1.2)
8–9	0.5 (1.4)	0.3 (1.0)	0.3 (0.9)
9–10	0.5 (1.8)	0.3 (0.9)	0.3 (0.8)
Second stage with epidural analgesia	1.1 (3.6)	0.4 (2.0)	0.3 (1.6)
Second stage without epidural analgesia	0.6 (2.8)	0.2 (1.3)	0.1 (1.1)

Data are median (95th percentile).

Zhang J, Landy HJ, Branch DW, et al. Consortium on Safe Labor. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Obstet Gynecol. 2010 Dec;116(6):1281-7.

Friedman (Historic) criteria vs Zhang (Contemporary) criteria

	Friedman's data	Zhang's data
Transition from the latent phase to active phase	3-4 cm	In Nulliparas there may be no transition or at 5- 6 cm
Statistical minimum rate (5th centile) of normal cervical dilation during the active phase	Nulliparous 1.2 cm/hour Multiparous 1.5 cm/hour	Zhang suggest using the 95th centiles instead of the 5th centiles
Prolonged second stage	Nulliparous 2.5 hours Multiparous 1 hour	Nulliparous with epidural analgesia 3.6 hours without epidural analgesia 2.8 hours



The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS



Society for
Maternal-Fetal
Medicine

OBSTETRIC CARE CONSENSUS

Number 1 • March 2014

Safe Prevention of the Primary Cesarean Delivery

This document was developed jointly by the American College of Obstetricians and Gynecologists (the College) and the Society for Maternal-Fetal Medicine with the assistance of Aaron B. Caughey, MD, PhD; Alison G. Cahill, MD, MSCI; Jeanne-Marie Guise, MD, MPH; and Dwight J. Rouse, MD, MSPH. The information reflects emerging clinical and scientific advances as of the date issued, is subject to change, and should not be construed as dictating an exclusive course of treatment or procedure. Variations in practice may be warranted based on the needs of the individual patient,

Abstract: In 2011, one in three women who gave birth in the United States did so by cesarean delivery. Cesarean birth can be life-saving for the fetus, the mother, or both in certain cases. However, the rapid increase in cesarean birth rates from 1996 to 2011 without clear evidence of concomitant decreases in maternal or neonatal morbidity or mortality raises significant concern that cesarean delivery is overused. Variation in the rates of nulliparous, term, singleton, vertex cesarean births also indicates that clinical practice patterns affect the number of cesarean births performed. The most common indications for primary cesarean delivery include, in order of frequency, labor dystocia, abnormal or indeterminate (formerly, nonreassuring) fetal heart rate tracing, fetal malpresentation, multiple gestation, and suspected fetal macrosomia. Safe reduction of the rate of primary cesarean deliveries will require different approaches for each of these, as well as other, indications. For example, it may be necessary to revisit the definition of labor dystocia because recent data show that contemporary labor progresses at a rate substantially slower than what was historically taught. Additionally, improved and standardized fetal heart rate interpretation and management may have an effect. Increasing women's access to nonmedical interventions during labor, such as continuous labor and delivery support, also has been shown to reduce cesarean birth rates. External cephalic version for breech presentation and a trial of labor for women with twin gestations when the first twin is in cephalic presentation are other of several examples of interventions that can contribute to the safe lowering of the primary cesarean delivery rate.

Table 2

<i>Cervical Dilation (cm)</i>	<i>Median Elapsed Time (h)</i>		
	<i>Parity 0 (95th percentile)</i>	<i>Parity 1 (95th percentile)</i>	<i>Parity 2 or Greater (95th percentile)</i>
3–4	1.8 (8.1)	—	—
4–5	1.3 (6.4)	1.4 (7.3)	1.4 (7.0)
5–6	0.8 (3.2)	0.8 (3.4)	0.8 (3.4)
6–7	0.6 (2.2)	0.5 (1.9)	0.5 (1.8)
7–8	0.5 (1.6)	0.4 (1.3)	0.4 (1.2)
8–9	0.5 (1.4)	0.3 (1.0)	0.3 (0.9)
9–10	0.5 (1.8)	0.3 (0.9)	0.3 (0.8)

Modified from Zhang J, Landy HJ, Branch DW, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Consortium on Safe Labor. Obstet Gynecol 2010;116:1281–7.

OBSTETRICS & GYNECOLOGY

Obstetric Care Consensus No. 1: Safe Prevention of the Primary Cesarean Delivery

Obstetrics & Gynecology 123(3):693-711, March 2014.

The new guidelines
promulgated jointly by the
American College of
Obstetricians and Gynecologists
(**ACOG**) and
the Society for Maternal-Fetal
Medicine (**SMFM**)

Spontaneous Labor Progress Stratified by Cervical Dilation
and Parity

New guideline ACOG &SMFNM 2014

	Grade of Recommendations
First stage of labor	
A prolonged latent phase (eg, greater than 20 hours in nulliparous women and greater than 14 hours in multiparous women) should not be an indication for cesarean delivery.	1B Strong recommendation, moderate quality evidence
Cervical dilation of 6 cm should be considered the threshold for the active phase of most women in labor. Thus, before 6 cm of dilation is achieved, standards of active phase progress should not be applied.	1B Strong recommendation, moderate quality evidence
Cesarean delivery for active phase arrest in the first stage of labor should be reserved for women at or beyond 6 cm of dilation with ruptured membranes who fail to progress despite 4 hours of adequate uterine activity, or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change.	1B Strong recommendation, moderate quality evidence

New guideline ACOG &SMFNM 2014

Recommendations	Grade of Recommendations
Second stage	
<p>A specific <u>absolute</u> maximum length of time spent in the second stage of labor beyond which all women should undergo operative delivery <u>has not been identified</u>.</p> <p>Before diagnosing arrest of labor in the second stage, if the maternal and fetal conditions permit, allow for the following:</p> <ul style="list-style-type: none">• At least 2 hours of pushing in multiparous women (1B)• At least 3 hours of pushing in nulliparous women (1B)	<p>1C Strong recommendation, low quality evidence</p> <p>1B Strong recommendation, moderate quality evidence</p>
Longer durations may be appropriate on an individualized basis (eg, with the use of epidural analgesia or with fetal malposition) as long as progress is being documented. (1B)	<p>1B Strong recommendation, moderate quality evidence</p>

Contemporary labor statistics and norms

The differences in study population and obstetric practice may partly explain why the contemporary labor curves differ substantially from those from 50 years ago

Nowadays, women are **older and heavier**, and these factors are known to affect labor progress and duration.

Labor appears to **progress more slowly** now than before, even though more labors are being treated with oxytocin for augmentation.

The new milestone = 6 cm

At ≥ 6 cm, **nearly all** women should be in active labor

= **slow dilation** ($< 1-2$ cm/hour) **beyond the 6 cm** level is a deviation from the slope of the contemporary normal labor curve

= is ABNORMAL if persists.



Time

Contemporary observations ~ **longer** duration of the First stage than described by Friedman

Event		Friedman	Zhang
		Mean (95th centile)	Median (95th centile)
From 4 to 10 cm (~First stage active phase)	Nulliparas	4.6 hours (11.7 hours)	5.3 hours (16.4 hours)
	Multiparas	2.4 hours (5.2 hours)	3.8 hours (15.7 hours)

6 hours beyond the 6 cm

Box 1. Definition of Arrest of Labor in the First Stage ⇐

Spontaneous labor: More than or equal to 6 cm dilation with membrane rupture and one of the following:

- 4 hours or more of adequate contractions (eg, more than 200 Montevideo units)
- 6 hours or more of inadequate contractions and no cervical change

[Obstetric Care Consensus No. 1: Safe Prevention of the Primary Cesarean Delivery](#)
Obstetrics & Gynecology 123(3):693-711, March 2014.

Second stage

Descent

At full cervical dilation, fetal station is typically ≥ 0 station

From +1/3 to +2/3 station **16 minutes** (3 hours)

From +2/2 to +3/3 station **7 minutes** (38 minutes)

Second stage duration Median (95th centile)

Nulliparas 0.6 hours (2.8 hours)

+Epidural anesthesia 1.1 hours (3.6 hours)

Multiparas 0.2 hours (1.3 hours)

+Epidural anesthesia 0.4 hours (2.0 hours)

In the era of electronic fetal monitoring, among neonates born to **nulliparous** women, adverse neonatal outcomes generally have **not** been **associated** with the duration of the second stage of labor.

[Obstetric Care Consensus No. 1: Safe Prevention of the Primary Cesarean Delivery](#) Obstetrics & Gynecology 123(3):693-711, March 2014.

Prolonged Second Stage Labor Nulliparous

1.862 nulliparous women

early versus delayed pushing

longer duration of the active pushing was **not associated with adverse neonatal outcomes**

even in women pushed more than **3 hours**

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.e1–361.e7.

15.759 nulliparous women

longer duration of the active pushing was **not associated with adverse neonatal outcomes**

even in women whose second stage progressed beyond **4 hours**

Cheng YW, Hopkins LM, Caughey AB. **How long is too long**: Does a prolonged second stage of labor in nulliparous women affect maternal and neonatal outcomes? Am J Obstet Gynecol 2004;191:933–8.

Prolonged Second Stage Labor Multiparous

5.158 **multiparous** women

When the duration of the second stage of labor >3 hours

the risk of a 5-minute Apgar score of less than 7

admission to the neonatal intensive care unit

and a composite of neonatal morbidity were all significantly increased

Cheng YW, Hopkins LM, Laros RK, Jr, Caughey AB. Duration of the second stage of labor in **multiparous** women: maternal and neonatal outcomes. Am J Obstet Gynecol 2007;196:585.e1–585.e6.

A population-based study of 58,113 **multiparous** women yielded similar results

when the duration of the second stage was greater than 2 hours.

Allen VM, Baskett TF, O'Connell CM, et al. Maternal and perinatal outcomes with increasing duration of the second stage of labor. Obstet Gynecol 2009;113:1248–58.

A longer duration of the second stage of labor is associated with adverse maternal outcomes, such as higher rates of puerperal infection, third-degree and fourth degree perineal lacerations, and postpartum hemorrhage

Rouse DJ, Weiner SJ, Bloom SL, et al. Second-stage labor duration in nulliparous women: relationship to maternal and perinatal outcomes. Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Am J Obstet Gynecol 2009;201:357. e1–357.e7.

Prolonged Second Stage hopelessness

After a 3-hour or more second stage of labor, only one in four nulliparous women and one in three multiparous women give birth spontaneously.

Up to 30–50% may require operative delivery to give birth vaginally in the current second stage of labor threshold environment.

Rouse DJ, Weiner SJ, Bloom SL, et al. Second-stage labor duration in nulliparous women: relationship to maternal and perinatal outcomes. Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Am J Obstet Gynecol 2009;201:357. e1–357.e7.

Cheng YW, Hopkins LM, Laros RK, Jr, Caughey AB. Duration of the second stage of labor in multiparous women: maternal and neonatal outcomes. Am J Obstet Gynecol 2007;196:585.e1–585.e6.

Zhang's reforms

1. Not averages but the upper limits

Judging whether a woman is having labor protraction and arrest should not be based on a research definition of an **average starting point** or **average duration of labor**.

Instead, an **upper limit** of what is considered “normal labor” should be used in patient management.

Zhang's reforms

2. Graduated approach

Cervical dilation accelerates as labor advance

= a **graduated approach** based on the level of cervical dilation to diagnose labor protraction and arrest is proposed

Table 2. Duration of Labor in Hours by Parity in Spontaneous Onset of Labor

Cervical Dilation (cm)	Parity 0 (n=25,624)	Parity 1 (n=16,755)	Parity 2+ (n=16,219)
3–4	1.8 (8.1)	—	—
4–5	1.3 (6.4)	1.4 (7.3)	1.4 (7.0)
5–6	0.8 (3.2)	0.8 (3.4)	0.8 (3.4)
6–7	0.6 (2.2)	0.5 (1.9)	0.5 (1.8)
7–8	0.5 (1.6)	0.4 (1.3)	0.4 (1.2)
8–9	0.5 (1.4)	0.3 (1.0)	0.3 (0.9)
9–10	0.5 (1.8)	0.3 (0.9)	0.3 (0.8)
Second stage with epidural analgesia	1.1 (3.6)	0.4 (2.0)	0.3 (1.6)
Second stage without epidural analgesia	0.6 (2.8)	0.2 (1.3)	0.1 (1.1)

Data are median (95th percentile).

From Friedman to Zhang

what postulates we changed

Concepts	Friedman	Zhang
Active phase When starts ?	3-4 cm	6 cm
Measure of normalcy	Averages	Upper limits (95th centiles)
4 hours criterion for progression 2 examinations 2 hours apart	Linear	Nonlinear 4 hours may be normal in early labor but is probably too long after 6 cm Different time limits for different dilation intervals

A **prospective study** evaluating the effect of the new guideline

A **prospective cohort** study from **Washington University**

2010-2014

7845 eligible patient

(term, non-anomalous vertex singleton no prior history of CD)

Rosenbloom JI, Stout MJ, Tuuli MG, Woolfolk CL, López JD, Macones GA, Cahill AG. New labor management guidelines and changes in cesarean delivery patterns. Am J Obstet Gynecol. 2017 Dec;217(6):689.e1-689.e8.

Results

=what changed with the new guidelines

Clinical parameters	2010	2014	p-trend
The CD rate	15.8%	17.7%	0.51
CD for arrest of dilation			
the median cervical dilation at the time of CD	5.5 cm	6.0 cm	0.94
the time spent at last dilation before CD	3.8 hours	5.2 hours	0.02
the frequency of patients diagnosed with arrest of dilation at <6 cm	51.4%	48.6%	0.56
CD for arrest of descent			
The median pushing time Multiparous	1.1 h	3.4 h	0.009
The median pushing time Nulliparous	2.7 h	3.8	0.09
increasing adverse neonatal and maternal outcomes			<0.001 For each

Washington University prospective cohort

Despite significant changes in labor management that have occurred over the initial years **since publication of the new labor curves and associated guidelines**, **the primary CD rate was not reduced** and there has been **an increase in maternal and neonatal morbidity** in our institution. A randomized controlled trial is needed.

Rosenbloom JL, Stout MJ, Tuuli MG, Woolfolk CL, López JD, Macones GA, Cahill AG. New labor management guidelines and changes in cesarean delivery patterns. Am J Obstet Gynecol. **2017** Dec;217(6):689.e1-689.e8.

My impression :

The change seems to be started from the second stage attitudes

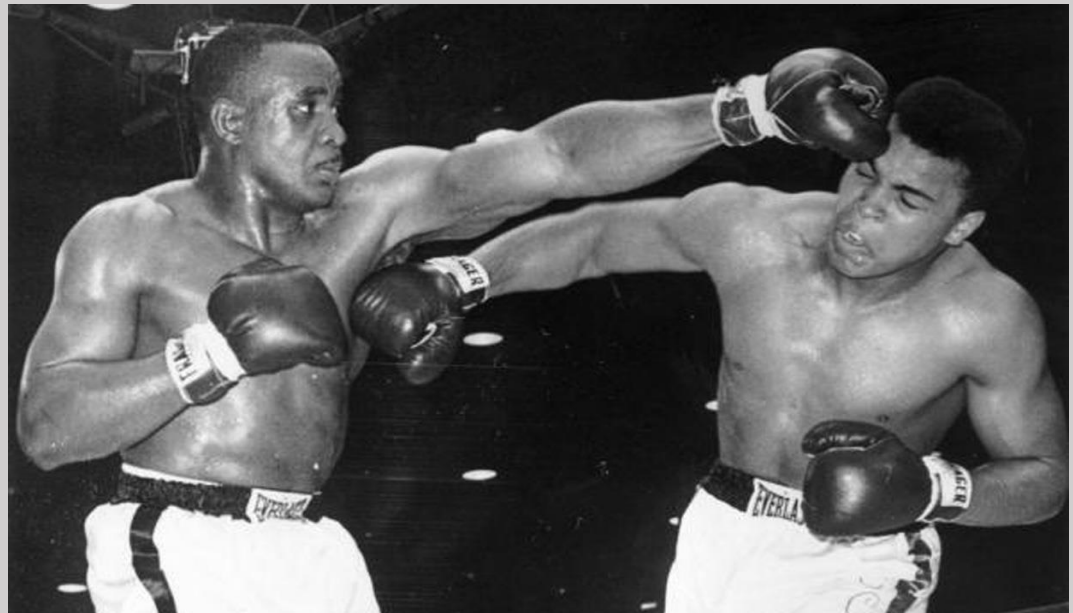
We have started to allow longer pushing periods

New guidelines for assessing labor progress

ACOG

SMFNM

the patterns of labor originally described by **Friedman** are incorrect and, further, are inapplicable to modern obstetric practice.



Perils of the new labor management guidelines

Wayne R. Cohen, MD; Emanuel A. Friedman, Med ScD



We believe the new ACOG/SMFM recommendations however well intentioned, are likely to impose undue risk on mother and fetus.

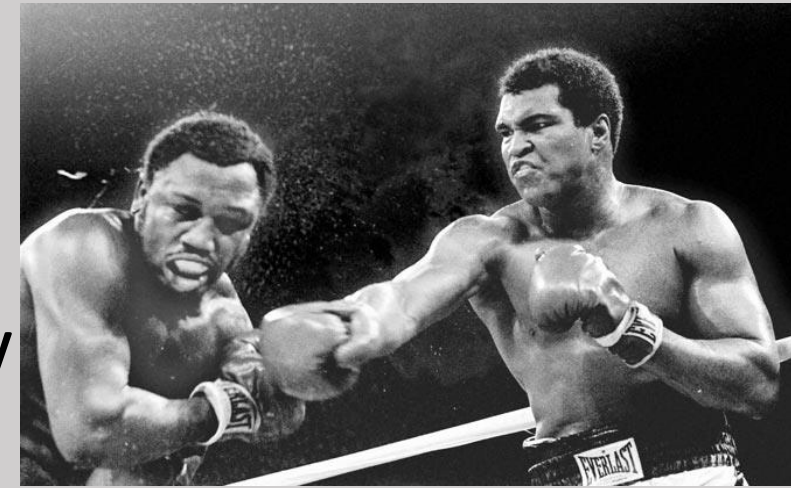
The **new guidelines** are based heavily on **unvalidated notions** of labor progress and **ignore** clinical parameters (cranial molding, head position and attitude, and the bony architecture and capacity of the pelvis) that should remain cornerstones of intrapartum decision-making.

Friedman counterattacked

1. Biases on Zhang's studies

it is difficult to believe that labor progresses very differently today from how it was originally described.

Clearly, what had changed was not the nature of progress in labor, but how the data were analyzed.



Zhang et al excluded women whose cervix was >6 cm dilated at admission, probably thus **excluding many of the most rapid labors** and contributing to **the overall appearance of slow average dilatation**.

Zhang and colleagues used sophisticated statistical analyses

high-order polynomial curvefitting program

interval-censored regression

etc.

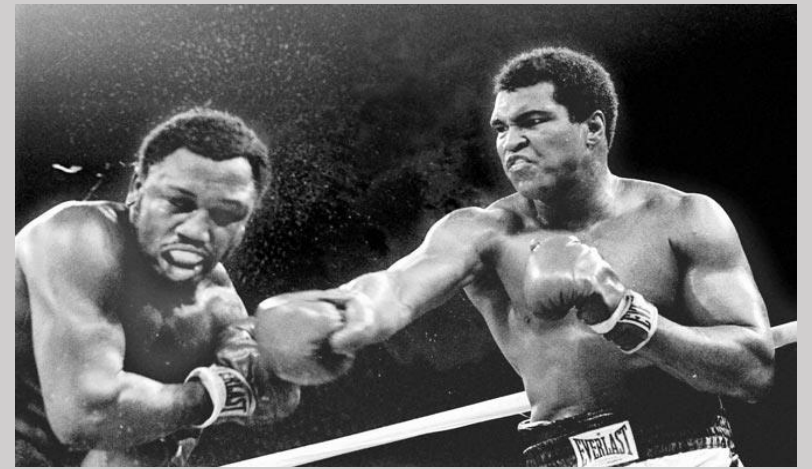
We have concerns about the application of these techniques to labor.

Friedman counterattacked

2. Transition to active phase

We are misunderstood

Neither 4 cm Nor 6 cm



It is widely, but **erroneously**, concluded from the Friedman dilatation curve that the active phase of labor begins at 4 cm.

We, in fact, have never suggested that the active phase begins at either 4 or 3 cm of cervical dilatation;

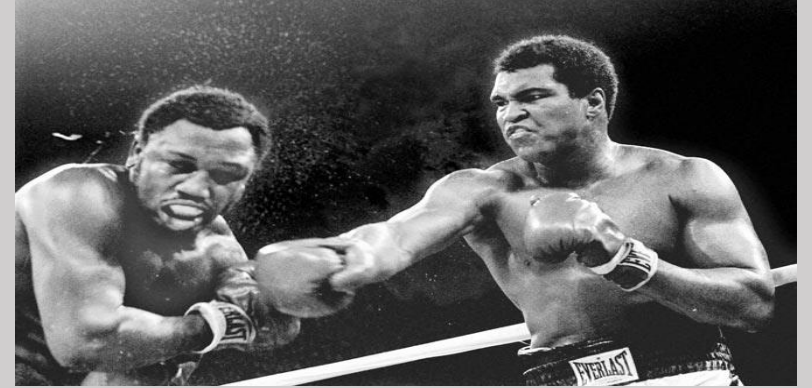
on the contrary, we have expressly discouraged the use of any specific degree of dilatation for the identification of the active phase.

the active phase can begin anywhere from 3-6 cm, and, occasionally, earlier or later, depending on the individual labor

Using an arbitrary cut-off sacrifices accuracy for ease, and this unnecessary oversimplification risks incorrect diagnosis.

Example case by Friedman

Does the active phase
really begin at 6 cm ?



Consider, for example,

a labor that begins with the cervix 2 cm dilated for several hours.

It then **dilates rapidly to 5 cm in 1 hour, but fails to dilate further over the next 2 hours.**

According to the new guidelines, that would be normal latent-phase labor.

To us it is an arrest of dilatation in active-phase labor that requires thorough evaluation to search for a cause.

Friedman criticize New guidelines First Stage

The new guidelines allow a labor arrested at 8 cm with strong uterine contractions to continue at least 4 hours

And even for an additional 4 hours if the membranes were not ruptured until after the first 4 hours

Friedman criticize New guidelines Second stage

The new guidelines define normal limits for the second stage by elapsed **time** after full cervical dilatation, and **take no account of the rate of fetal descent**.

Using only elapsed time is problematic

There is evidence that morbidity associated with a very long second stage is largely confined to those with abnormal **descent** patterns.

Cohen WR, Mahon T, Chazotte C. Very long second stage of labor: characteristics and outcome. In: Cosmi EV, ed. Labor and delivery: the proceedings of the second world congress on labor and delivery. New York: Parthenon Publishing Group; 1998:348-51.

no doubt

Using the time alone is problematic

Each case should be evaluated in its special circumstances and context

contemporary **labor progresses** at a rate substantially **slower** than what was historically taught

+ We should safely lower the primary cesarean delivery rate

= We should **revisit the definition** of labor dystocia

Despite the critics, the **6 cm** threshold seems to be the new criterion

We should use the **95th centiles (=Maximal durations)** instead of the medians for clinical decision-making in labor progression

Table 2

Cervical Dilation (cm)	Median Elapsed Time (h)		
	Parity 0 (95th percentile)	Parity 1 (95th percentile)	Parity 2 or Greater (95th percentile)
3–4	1.8 (8.1)	—	—
4–5	1.3 (6.4)	1.4 (7.3)	1.4 (7.0)
5–6	0.8 (3.2)	0.8 (3.4)	0.8 (3.4)
6–7	0.6 (2.2)	0.5 (1.9)	0.5 (1.8)
7–8	0.5 (1.6)	0.4 (1.3)	0.4 (1.2)
8–9	0.5 (1.4)	0.3 (1.0)	0.3 (0.9)
9–10	0.5 (1.8)	0.3 (0.9)	0.3 (0.8)

Modified from Zhang J, Landy HJ, Branch DW, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Consortium on Safe Labor. Obstet Gynecol 2010;116:1281–7.

OBSTETRICS & GYNECOLOGY

Obstetric Care Consensus No. 1:
Safe Prevention of the Primary
Cesarean Delivery

Obstetrics & Gynecology123(3):693-711, March 2014.

The new guidelines
promulgated jointly by the
American College of
Obstetricians and Gynecologists
(**ACOG**) and
the Society for Maternal-Fetal
Medicine (**SMFM**)

Spontaneous Labor Progress Stratified by Cervical Dilation
and Parity

The problems

We do not have an active phase definition

= We do not totally agree on When the active phase starts

Definition	Author - Study
3-4 cm	Friedman EA. Labor: clinical evaluation and management. 2nd ed. New York (NY): Appleton-Century-Crofts; 1978.
When the cervix dilate faster than 1.2 cm/h in Nulliparas and 1.5 cm/h in Multiparas	Peisner DB, Rosen MG. Transition from latent to active labor. Obstet Gynecol 1986;68:448–51.
4 cm dilation + at least 90 % effacement or 5 cm dilation regardless of the effacement	Lin MG, Rouse DJ. What is a failed labor induction? Clin Obstet Gynecol 2006;49:585–93.
6 cm	Zhang J, Troendle J, Mikolajczyk R, Sundaram R, Beaver J, Fraser W. The natural history of the normal first stage of labor. Obstet Gynecol. 2010 Apr;115(4):705-10.

‘a naturel process of labor’
no longer exists

Our understanding of a ‘normal labor progress’ is still INCOMPLETE

Particularly the first stage of labor

Owing to various interventions in contemporary obstetric practice,
a naturel process of labor progression no longer can be studied in large
population

IV fluids, digital examinations, medications, hospital conditions

Pure observation is impossible

= Zhang et al. studied the data from 1959-1966

45% vaginal exams **%45 rectal exams** %10 unknown route

Zhang's results

Labor may take **more than 6 hours** to progress **from 4 to 5 cm** and **more than 3 hours** to progress **from 5 to 6 cm** of dilation.

Nulliparous and multiparous women appeared to progress at a similar pace before 6 cm. However, after 6 cm, labor accelerated much faster in multiparous than in nulliparous women.

The 95th percentiles of the second stage of labor in nulliparous women with and without epidural analgesia were **3.6** and **2.8 hours**, respectively.

Allowing labor to continue for a longer period before 6 cm of cervical dilation may reduce the rate of cesarean deliveries.

Zhang J, Landy HJ, Branch DW, et al. Consortium on Safe Labor. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Obstet Gynecol. 2010 Dec;116(6):1281-7.

For the Questions

Factors that affect the length of second stage

- Parity
- delayed pushing
- use of epidural analgesia
- maternal body mass index
- birth weight
- occiput posterior position
- fetal station at complete dilation

Piper JM, Bolling DR, Newton ER. The second stage of labor: factors influencing duration. Am J Obstet Gynecol 1991;165:976–9.

Contemporary data sets indicate

Labor curves differ from Friedman's curve

No abrupt change in the rate of cervical dilation

= No clear transition from latent to active phase

No deceleration phase at the end of the 1st stage

The normal rate cervical change between 3-6 cm **much slower** than described by Friedman (at least 1 cm/hour).

Many women (who go on to deliver vaginally) have rates of cervical dilation <1 cm/hour before reaching **6 cm** dilation

Both in Nulliparas and in Multiparas,

From 4 to 5 cm it can take more than 6 hours

From 5 to 6 cm it can take more than 3 hours

BEYOND 6 cm, cervical dilation is rapid both in nulliparas and in multiparas

Normal progression in induced labor

The time to dilate 1 cm in **latent phase ($\leq 6\text{cm}$)** is significantly longer in women undergoing induction than in those in spontaneous labor

Progression	Induced labor Median (95th centile)	Spontaneous labor Median (95th centile)
3 to 4 cm	1.4 hours (8.1 hours)	0.4 hours (2.3 hours)
4 to 5 cm	1.3 hours (6.8 hours)	0.5 hours (2.7 hours)
5 to 6 cm	0.6 hours (4.3 hours)	0.4 hours (2.7 hours)

Normal progression in induced labor

The active phase (from 6 to 10 cm) is similar in both induced and spontaneous labor

The length of the second stage is also similar in induced and spontaneous labor

= Because the latent phase is longer in induced labor, the duration of the First stage (latent plus active phases) is significantly longer in induced labor than in spontaneous labor

Event		Induced labor Median (95th centile)	Spontaneous labor Median (95th centile)
First stage	Nulliparas	5.5 hours (16.8 hours)	3.8 hours (11.8 hours)
	Multiparas	4.4 hours (16.2 hours)	2.4 hours (8.8 hours)

Other contemporary studies on labor progression

Peisner and Rosen examined 1,699 labors with approximately two thirds nulliparas and one third multiparas.

The transition from the latent to active phase of labor was defined as time when the cervix dilated faster than 1.2 cm/h in nulliparas and 1.5 cm/h in multiparas.

They found that among women who had no active phase arrest, **50% of them entered active phase by 4 cm dilation; 74% by 5 cm and 89% by 6 cm.**

(= in fact the transition to the active phase is a retrospective finding)

Unfortunately, mixing women with various parities makes the application of their findings to nulliparas as well as multiparas difficult.

Peisner DB, Rosen MG. Transition from latent to active labor. Obstet Gynecol 1986;68:448–51.

Parity is not only the parity

Does the parity is solely the number of the deliveries?

No. With increasing parity, both maternal age and body mass increase
+ the **nulliparous pregnant tend to be hospitalized at earlier dilation and effacement**

= Does **the dilation at admission** is **a hidden factor** in labor progress

A fact or a tautology ?

Table 3. Duration of Labor in Hours in Nulliparous Women With Spontaneous Onset of Labor

Cervical Dilation (cm)	Admitted at 2 or 2.5 cm (n=4,247)	Admitted at 3 or 3.5 cm (n=6,096)	Admitted at 4 or 4.5 cm (n=5,550)	Admitted at 5 or 5.5 cm (n=2,764)
Admitted to 3	0.9 (7.1)	NA	NA	NA
Admitted to 4	3.2 (11.2)	1.0 (6.5)	NA	NA
Admitted to 5	5.0 (13.9)	2.9 (11.0)	0.9 (6.5)	NA
Admitted to 6	6.0 (15.7)	4.2 (12.5)	2.2 (9.7)	0.6 (4.5)
Admitted to 7	6.6 (16.6)	5.0 (13.8)	3.2 (11.6)	1.5 (7.7)
Admitted to 8	7.1 (17.5)	5.6 (14.9)	3.9 (13.0)	2.4 (9.6)
Admitted to 9	7.6 (18.3)	6.1 (15.7)	4.5 (14.3)	3.0 (10.8)
Admitted to 10	8.4 (20.0)	6.9 (17.4)	5.3 (16.4)	3.8 (12.7)

NA, not applicable.

Data are median (95th percentile).

Zhang J, Landy HJ, Branch DW, et al. Consortium on Safe Labor.
Contemporary patterns of spontaneous labor with normal neonatal outcomes.
Obstet Gynecol. 2010 Dec;116(6):1281-7.

The transition from the latent to active phase

In fact this 'time point' is a retrospective finding

Based on the Friedman curve in primigravid, the transition appeared to occur between 3 and 4 cm.

Friedman EA. Primigravid labor: a graphicostatistical analysis. Obstet Gynecol 1955;6:567–89.

A more commonly used definition is that the active phase starts at 4 cm dilation.

Albers LL, Schiff M, Gorwoda JG. The length of active labor in normal pregnancies. Obstet Gynecol 1996;87:355–9.

Rouse DJ, Owen J, Hauth JC. Active-phase labor arrest: oxytocin augmentation for at least 4 hours. Obstet Gynecol 1999;93:323–8.

But as Peisner and Rosen conclude, “a patient who is not progressing in labor at 4 cm cervical dilation is not necessarily abnormal.”

Peisner DB, Rosen MG. Transition from latent to active labor. Obstet Gynecol 1986;68:448–51.

A multicenter randomized study of fetal pulse oximetry, of 4,126 nulliparous women who reached the second stage of labor,

none of the following neonatal outcomes

was found to be **related** to the duration of the second stage (which in some cases was 5 hours or more)

5-minute Apgar score of less than 4

umbilical artery pH less than 7.0

intubation in the delivery room

need for admission to the neonatal intensive care unit

or neonatal sepsis

Rouse DJ, Weiner SJ, Bloom SL, et al. Second-stage labor duration in nulliparous women: relationship to maternal and perinatal outcomes. Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. Am J Obstet Gynecol 2009;201:357.e1–357.e7.

The progression is **non-monotonic**
= cervical dilation accelerates as labor advance

Nulliparous women had the longest and most gradual labor curve;
multiparous women of different parities had very similar curves.

The median time needed to progress from one centimeter to the next
became shorter as labor advanced

(eg, from 1.2 hours at 3-4 cm to 0.4 hours at 7-8 cm in nulliparas)

Nulliparas may start active phase after 5 cm of cervical dilation and may not necessarily have a clear active phase characterized by precipitous dilation.

The deceleration phase in the late active phase of labor may be an artifact in many cases.

Thresholds instead of the curve + graduated thresholds

Despite the fact that the average labor curve is easy to understand its clinical utility in managing individual patients is limited

Instead

Zhang et al. proposed the use of **median and 95th centiles of duration** of labor from one dilation level to the next

More objective assessment of whether labor arrest has occurred

This '**graduated time thresholds**' approach suggested that

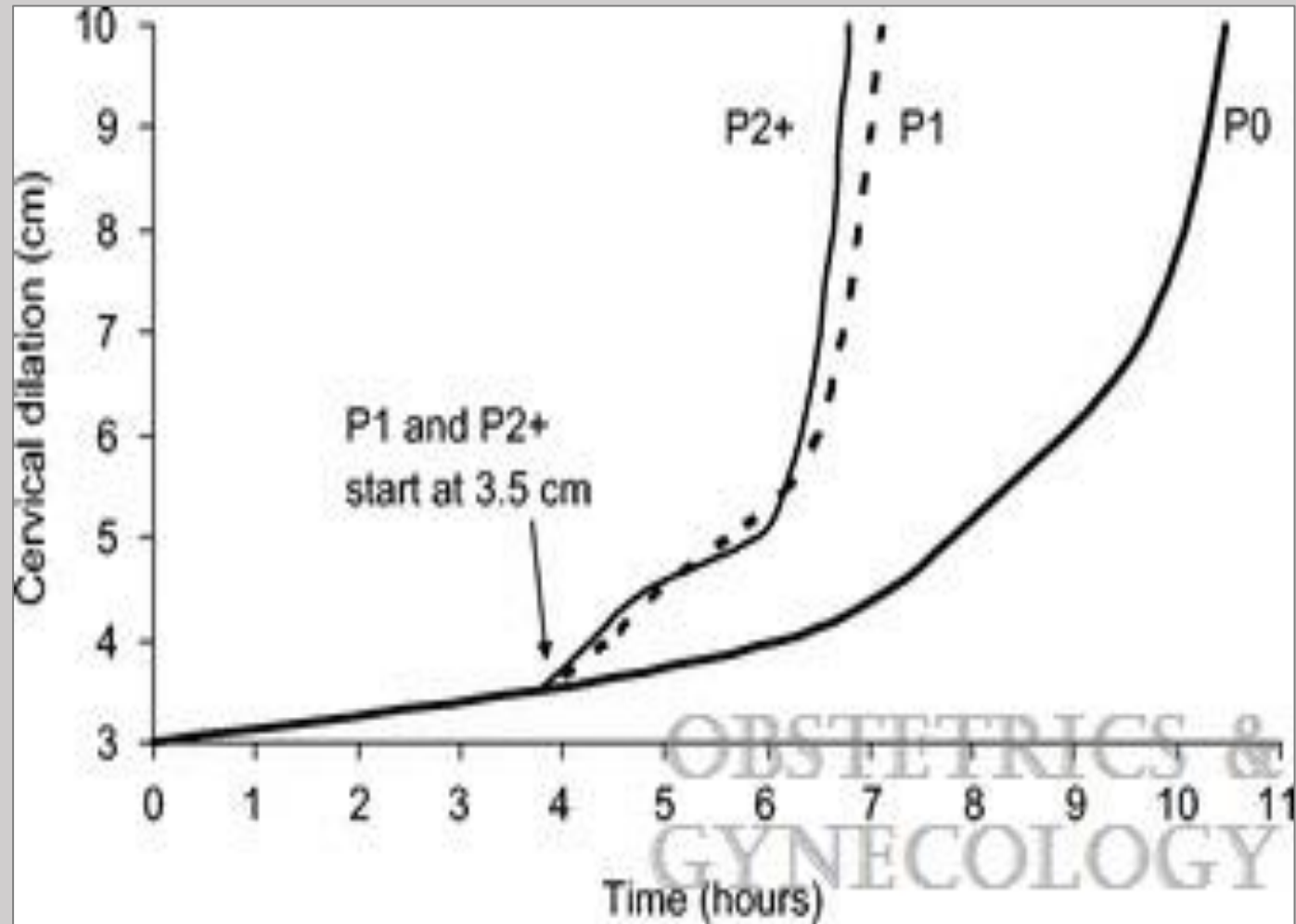
2-hour threshold may be too short before 6 cm

Whereas

4-hour limit may be too long after 6 cm

= the speed of cervical dilation is not constant, a graduated threshold approach may be more appropriate **to defining labor arrest**

Fig



[The Natural History of the Normal First Stage of Labor](#)

Zhang, Jun; Troendle, James; Mikolajczyk, Rafael;
Sundaram, Rajeshwari; Beaver, Julie; Fraser, William

Obstetrics & Gynecology 115(4):705-710, April 2010.

doi: 10.1097/AOG.0b013e3181d55925

Fig. 1. Zhang. The First Stage of Labor. Obstet Gynecol 2010.

Active phase dilation rates

	Friedman	Zhang
Nulliparous	1.2 cm/hour	0.5-0.7 cm/hour
Multiparous	1.5 cm/hour	0.5-1.3 cm/hour

Friedman E. The graphic analysis of labor. Am J Obstet Gynecol 1954;68:1568–75.

Zhang J, Landy HJ, Branch DW, et al.
Contemporary patterns of spontaneous labor with normal neonatal outcomes. Consortium on Safe Labor. Obstet Gynecol 2010;116:1281–7.

Table 2

[The Natural History of the Normal First Stage of Labor](#)

Zhang, Jun; Troendle, James; Mikolajczyk, Rafael;
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Table 2. Duration of Labor (in Hours) by Parity, National Collaborative Perinatal Project, 1959–1966			
Cervical Dilation (cm)	Parity 0	Parity 1	Parity 2+
From 3 to 4	1.2 (6.6)		
From 4 to 5	0.9 (4.5)	0.7 (3.3)	0.7 (3.5)
From 5 to 6	0.6 (2.6)	0.4 (1.6)	0.4 (1.6)
From 6 to 7	0.5 (1.8)	0.4 (1.2)	0.3 (1.2)
From 7 to 8	0.4 (1.4)	0.3 (0.8)	0.3 (0.7)
From 8 to 9	0.4 (1.3)	0.3 (0.7)	0.2 (0.6)
From 9 to 10	0.4 (1.2)	0.2 (0.5)	0.2 (0.5)
From 4 to 10	3.7 (16.7)	2.4 (13.8)	2.2 (14.2)
Data are median (95th percentile).			

Duration of Labor (in Hours) by Parity, National
Collaborative Perinatal Project, 1959–1966

Table 3-a

Recommendations	Grade of Recommendations
<i>First stage of labor</i>	
A prolonged latent phase (eg, greater than 20 hours in nulliparous women and greater than 14 hours in multiparous women) should not be an indication for cesarean delivery.	1B Strong recommendation, moderate quality evidence
Slow but progressive labor in the first stage of labor should not be an indication for cesarean delivery.	1B Strong recommendation, moderate quality evidence
Cervical dilation of 6 cm should be considered the threshold for the active phase of most women in labor. Thus, before 6 cm of dilation is achieved, standards of active phase progress should not be applied.	1B Strong recommendation, moderate quality evidence
Cesarean delivery for active phase arrest in the first stage of labor should be reserved for women at or beyond 6 cm of dilation with ruptured membranes who fail to progress despite 4 hours of adequate uterine activity, or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change.	1B Strong recommendation, moderate quality evidence
<i>Second stage of labor</i>	
A specific absolute maximum length of time spent in the second stage of labor beyond which all women should undergo operative delivery has not been identified.	1C Strong recommendation, low quality evidence
Before diagnosing arrest of labor in the second stage, if the maternal and fetal conditions permit, allow for the following: <ul style="list-style-type: none"> • At least 2 hours of pushing in multiparous women (1B) • At least 3 hours of pushing in nulliparous women (1B) Longer durations may be appropriate on an individualized basis (eg, with the use of epidural analgesia or with fetal malposition) as long as progress is being documented. (1B)	1B Strong recommendation, moderate quality evidence
Operative vaginal delivery in the second stage of labor by experienced and well trained physicians should be considered a safe, acceptable alternative to cesarean delivery. Training in, and ongoing maintenance of, practical skills related to operative vaginal delivery should be encouraged.	1B Strong recommendation, moderate quality evidence
Manual rotation of the fetal occiput in the setting of fetal malposition in the second stage of labor is a reasonable intervention to consider before moving to operative vaginal delivery or cesarean delivery. In order to safely prevent cesarean deliveries in the setting of malposition, it is important to assess the fetal position in the second stage of labor, particularly in the setting of abnormal fetal descent.	1B Strong recommendation, moderate quality evidence
<i>Fetal heart rate monitoring</i>	
Amnioinfusion for repetitive variable fetal heart rate decelerations may safely reduce the rate of cesarean delivery.	1A Strong recommendation, high quality evidence
Scalp stimulation can be used as a means of assessing fetal acid–base status when abnormal or indeterminate (formerly, nonreassuring) fetal heart patterns (eg, minimal variability) are present and is a safe alternative to cesarean delivery in this setting.	1C Strong recommendation, low quality evidence
<i>Induction of labor</i>	
Before 41 0/7 weeks of gestation, induction of labor generally should be performed based on maternal and fetal medical indications. Inductions at 41 0/7 weeks of gestation and beyond should be performed to reduce the risk of cesarean delivery and the risk of perinatal morbidity and mortality.	1A Strong recommendation, high quality evidence
Cervical ripening methods should be used when labor is induced in women with an unfavorable cervix.	1B Strong recommendation, moderate quality evidence
If the maternal and fetal status allow, cesarean deliveries for failed induction of labor in the latent phase can be avoided by allowing longer durations of the latent phase (up to 24 hours or longer) and requiring that oxytocin be administered for at least 12–18 hours after membrane rupture before deeming the induction a failure.	1B Strong recommendation, moderate quality evidence
OBSTETRICS & GYN (continued)	

Obstetric Care Consensus No. 1: Safe Prevention of the Primary Cesarean Delivery

Obstetrics & Gynecology 123(3):693-711,
March 2014.

Recommendations for the Safe Prevention of the Primary
Cesarean Delivery