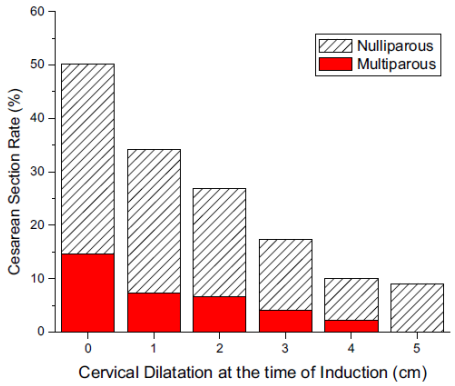
Safe Labor Management

- Promote maternal and fetal wellbeing
- Avoid unnecessary interventions
- Maintain careful assessment
- Communicate often and effectively
- Include mother and support persons
- If cesarean is needed based maternal or fetal condition, perform in a timely manner

ACOG / SMFM Recommendations

- Induction of labor < 41 0/7 weeks generally should be limited to women with maternal/ fetal indications
- Induction of labor at ≥ 41 0/7 weeks is recommended to minimize risk of cesarean and perinatal morbidity and mortality
- Cervical ripening should be used for induction with unfavorable cervix



Initial cervical dilatation and cesarean rate among women undergoing induction of labor at term.
Clark et al. (2009) Neonatal and maternal outcomes associated with elective term delivery. AJOG.

ACOG / SMFM Recommendations

- Active labor is more accurately defined as beginning at 6 cm cervical dilation
- Neither active phase labor protraction nor labor arrest should be diagnosed before 6 cm
- Most women with a prolonged latent phase will eventually begin active phase of labor with expectant management

- **6 cm is the new definition of the beginning of active labor**

ACOG / SMFM Recommendations

- A prolonged latent phase (e.g., > 20 hours in nullips and > 14 hours in multips) should not be an indication for cesarean birth
- Slow but progressive labor in first stage should not be an indication for cesarean birth

Labor Progress: Nulliparous Women

cm	Spontaneous (Hours) (5th / 95th percentiles)		Induction (Hours) (5th / 95th percentiles)		Augmented (Hours) (5th / 95th percentiles)	
3-10	4.2	(1.3, 13.1)	6.9	(2.0, 24.9)	6.6	(2.0, 23.6)
3-4	0.4	(0.1, 2.3)	1.4	(0.2, 8.1)	1.2	(0.2, 6.8)
4-5	0.5	(0.1, 2.7)	1.3	(.02, 6.8)	1.4	(.03, 7.6)
5-6	0.4	(0.06, 2.7)	0.6	(0.1, 4.3)	0.7	(0.1, 4.9)
6-7	0.3	(0.03, 2.1)	0.4	(0.05, 2.8)	0.5	(0.06, 3.9)
7-8	0.3	(0.04, 1.7)	0.2	(0.03, 1.5)	0.3	(0.05, 2.2)
8-9	0.2	(0.03, 1.3)	0.2	(0.03, 1.3)	0.3	(0.03, 2.0)
9-10	0.3	(0.04, 1.8)	0.3	(0.04, 1.9)	0.3	(0.05, 2.4)

Harper et al., 2012 Normal progress of induced labor. *Obstetrics and Gynecology 119*(6),1113–8

ACOG / SMFM Recommendations

- Women with ≥ 6 cm of cervical dilation and ROM who do not progress after 4 hours of adequate uterine activity, or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change, may have active phase arrest in first stage labor and may need cesarean
- Intrauterine resuscitation measures may be useful in maintaining fetal wellbeing and thus avoiding cesarean birth for abnormal or indeterminate fetal status

ACOG / SMFM Recommendations

- Ideal length of second stage labor is unknown.
- Diagnosis of arrest of second stage labor should not be made until at least 2 hrs of pushing in multips and at least 3 hrs of pushing in nullips.
- Epidurals may be associated with longer second stage.
- Operative vaginal birth and manual rotation of the fetal occiput in the context of fetal malposition in second stage may be viable alternatives to cesarean birth.

Things Have Changed

Collaborative Perinatal Project (n = 39,491 births 1959-1966)

Consortium on Safe Labor (n = 98,359 births 2002-2008)

RESEARCH

OBSTETRICS

Changes in labor patterns over 50 years

S. Katherine Laughon, MD, MS; D. Ware Branch, MD; Julie Beaver, MS; Jun Zhang, PhD, MD

OBJECTIVE: The objective of the study was to examine differences in labor patterns in a modern cohort compared with the 1960s in the United States.

STUDY DESIGN: Data from pregnancies at term, in spontaneous labor, with cephalic, singleton fetuses were compared between the Collaborative Perinatal Project (CPP; n = 39,491 delivering 1959-1966) and the Consortium on Safe Labor (CSL; n = 98,359 delivering 2002-2008).

RESULTS: Compared with the CPP, women in the CSL were older (26.8 ± 6.0 vs 24.1 ± 6.0 years), heavier (body mass index 29.9 ± 5.0 vs 26.3 ± 4.1 kg/m²), had higher epidural (55% vs 4%) and oxytocin use (31% vs 12%), and cesarean delivery (12% vs 3%). First stage of labor in the CSL was longer by a median of 2.6 hours in nulliparas and 2.0 hours in multiparas, even after adjusting for maternal and pregnancy characteristics, suggesting that the prolonged labor is mostly due to changes in practice patterns.

CONCLUSION: Labor is longer in the modern obstetrical cohort. The benefit of extensive interventions needs further evaluation.

Key words: labor, labor curve, labor duration

Cite this article as: Laughon SK, Branch DW, Beaver J, et al. Changes in labor patterns over 50 years. Am J Obstet Gynecol 2012;206:419.e1-9.

The original labor curve was created by Friedman in the 1950s.[1,2] Zhang et al[3] derived a labor curve from a much larger cohort of women from the 1960s using data from the National Collaborative Perinatal Project (CPP). Differences between these 2 labor curves are apparent, most notably that the nulliparous in a large, contemporary cohort of women who presented in spontaneous labor.[4] The CSL analysis found that the rate of cervical dilation was slower in all parities compared with that described by Friedman, especially from 4 to 6 cm, with an acceleration point suggesting active phase that occurred much later (around 6 cm).

longer labor.[6,7] Epidurals and induction have also been shown to be associated with longer labor.[8,9] Because maternal characteristics are less modifiable, it is important to know the effects of current obstetric practice on the changes in labor patterns. Thus, we used data from the contemporary CSL study and data from

Conclusions

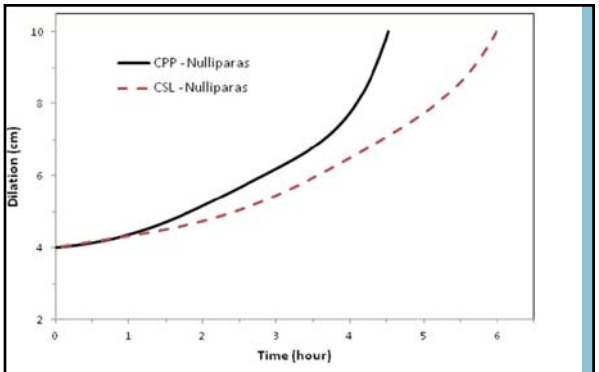
When compared to women who spontaneously labored 50 years ago (CPP), women in the CSL:

- Older (26.8 vs 24.1 years)
- Heavier (BMI 29.9 vs 26.34. kg/m2)
- Higher epidural rates (55% vs 4%)
- Higher oxytocin use (31% vs 12%)
- Higher cesarean birth rates (12% vs 3%)

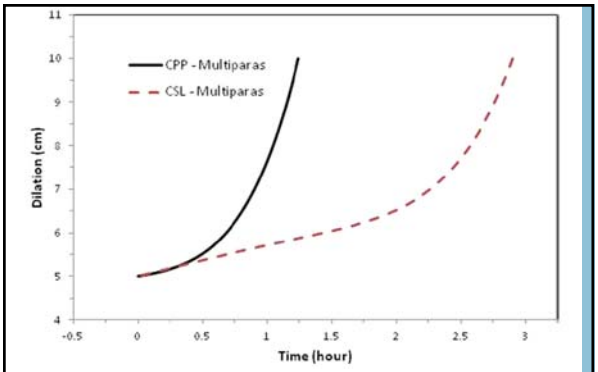
Conclusions

First stage labor now, compared to 50 years ago:

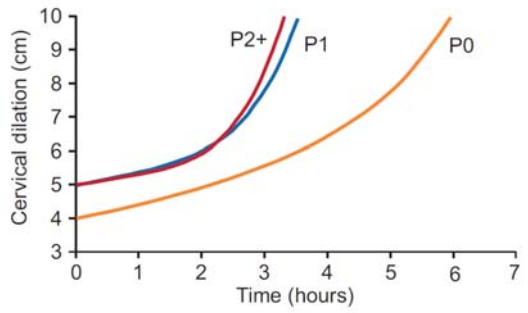
- Longer by 2.6 hours in nulliparous women
- Longer by 2.0 hours in multiparous women
- Even after adjusting for maternal and pregnancy characteristics
- Prolonged labor is mostly due to changes in practice patterns



Average labor curves for nulliparous women with singleton term pregnancies in spontaneous labor with vaginal birth.
Laughon et al.,. 2012 Changes in labor patterns over 50 years. AJOG.



Average labor curves for multiparous women with singleton term pregnancies in spontaneous labor with vaginal birth.
Laughon et al.,. 2012 Changes in labor patterns over 50 years. AJOG.



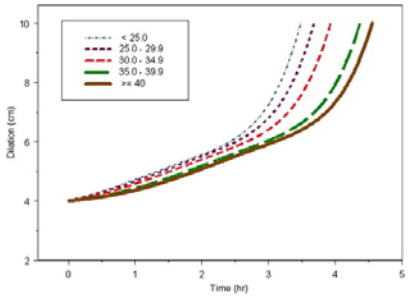
Average labor curves by parity in singleton term pregnancies with spon onset of labor, vaginal birth, and normal neonatal outcomes. P0, nulliparous; women; P1, women of parity 1; P2, women of parity 2 or higher.
Zhang et al. Contemporary Labor Patterns. Obstetrics & Gynecology, 2010.

Labor Progress Nulliparous Women

CMs	Spontaneous Mean (5% / 95% percentiles)	Augmented Mean (5% / 95% percentiles)	Induction Mean (5% / 95% percentiles)
3-10	4.2 (1.3, 13.1)	6.6 (2.0, 23.6)	6.9 (2.0, 24.9)

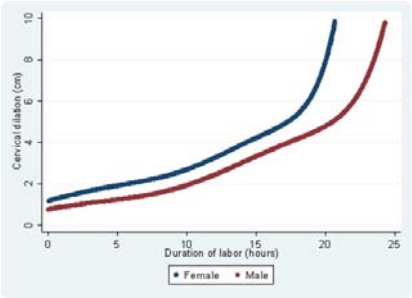
Harper et al., 2012 Normal progress of induced labor. *Obstetrics and Gynecology 119*(6),1113–8

Labor Curves of Nulliparous Women by BMI



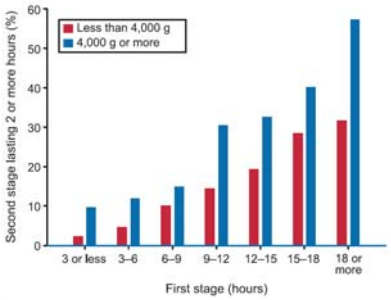
Labor curves in nulliparous women by body mass index category
Kominiarek et al., (2011). Labor patterns by BMI.

Labor Curve Based on Fetal Gender



Cahill et al. (2012) Impact of fetal gender on the labor curve. AJOG, 206:335.e1-5.

Length of Labor Based on Fetal Size



Nelson et al. (2013) Relationship of the Length of the First Stage of Labor to the Length of the Second Stage. Obstetrics and Gynecology

THE COST OF HAVING A BABY IN THE UNITED STATES

TRUVEN HEALTH ANALYTICS MARKETSCAN® STUDY

Prepared for:

Childbirth Connection
Catalyst for Payment Reform
Center for Healthcare Quality and Payment Reform

January 2013

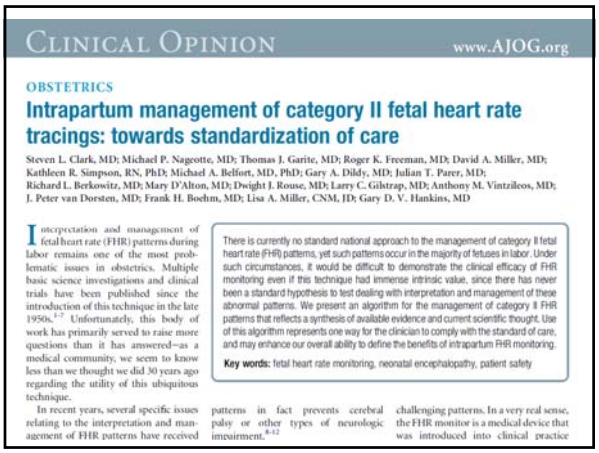
Hospital Reimbursement

Type	Payer	Amount
Vaginal	Medicaid	$5,387
Cesarean	Medicaid	$8,969
Vaginal	Commercial	$10,814
Cesarean	Commercial	$18,392

Cost of Having a Baby in the US (2013)

Hospital Reimbursement

$10,814 / $5,387	$10,814 / $5,387
Spontaneous labor (in-patient labor~6 hr)	Cervidil 12 hr / Oxytocin 10 hr (in-patient labor~ 22 hr)
External monitoring	Internal monitoring
Vaginal birth	Vaginal birth
Postpartum LOS 36 hr	Postpartum LOS 46 hr
Least costly care	Most costly care



CLINICAL OPINION www.AJOG.org

OBSTETRICS

Intrapartum management of category II fetal heart rate tracings: towards standardization of care

Steven L. Clark, MD; Michael P. Nageotte, MD; Thomas J. Garite, MD; Roger K. Freeman, MD; David A. Miller, MD; Kathleen R. Simpson, RN, PhD; Michael A. Belfort, MD, PhD; Gary A. Dildy, MD; Julian T. Parer, MD; Richard L. Berkowitz, MD; Mary D'Alton, MD; Dwight J. Rouse, MD; Larry C. Gilstrap, MD; Anthony M. Vintzileos, MD; J. Peter van Dorsten, MD; Frank H. Boehm, MD; Lisa A. Miller, CNM, JD; Gary D. V. Hankins, MD

There is currently no standard national approach to the management of category II fetal heart rate (FHR) patterns, yet such patterns occur in the majority of fetuses in labor. Under such circumstances, it would be difficult to demonstrate the clinical efficacy of FHR monitoring even if this technique had immense intrinsic value, since there has never been a standard hypothesis to test dealing with interpretation and management of these abnormal patterns. We present an algorithm for the management of category II FHR patterns that reflects a synthesis of available evidence and current scientific thought. Use of this algorithm represents one way for the clinician to comply with the standard of care, and may enhance our overall ability to define the benefits of intrapartum FHR monitoring.

Key words: fetal heart rate monitoring, neonatal encephalopathy, patient safety

Interpretation and management of fetal heart rate (FHR) patterns during labor remains one of the most problematic issues in obstetrics. Multiple basic science investigations and clinical trials have been published since the introduction of this technique in the late 1950s.[1-7] Unfortunately, this body of work has primarily served to raise more questions than it has answered—as a medical community, we seem to know less than we thought we did 30 years ago regarding the utility of this ubiquitous technique.

In recent years, several specific issues relating to the interpretation and management of FHR patterns have received

patterns in fact prevents cerebral palsy or other types of neurologic impairment.[8-12]

challenging patterns. In a very real sense, the FHR monitor is a medical device that was introduced into clinical practice

Indeterminate (Category II)

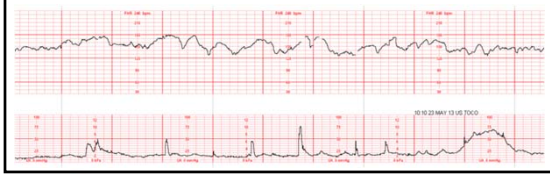
- **Wide range of clinical implications associated with various types of FHR patterns within category II**
- **Imprecise nature of category II as it relates to fetal wellbeing makes it challenging / not always useful for clinical decisions during labor**

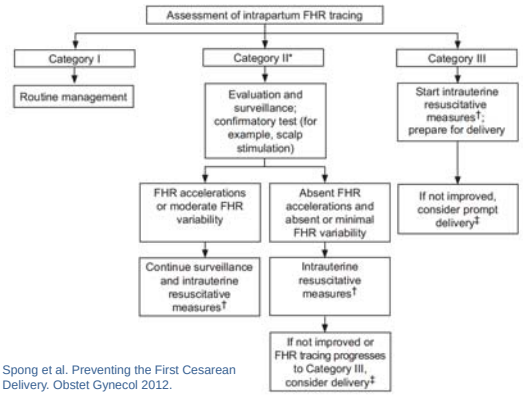
Indeterminate (Category II)

Indeterminate (Category II)

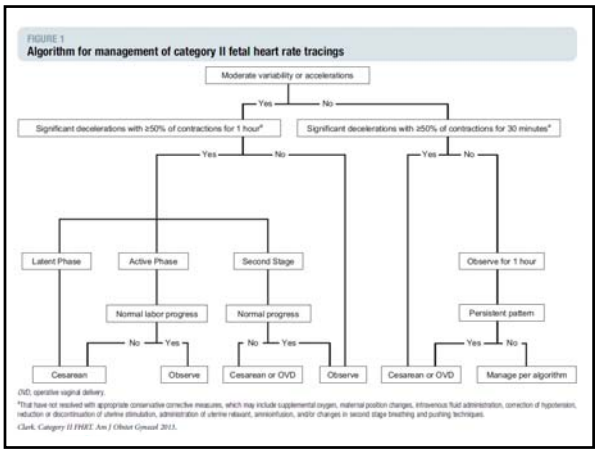
Promoting Fetal Wellbeing

- **Supporting a woman in giving birth vaginally within the upper normal limits of labor duration must be in the context of a well fetus**
- **Assessment of fetal status should be considered relative to the likelihood and timing of vaginal birth**





Spong et al. Preventing the First Cesarean Delivery. Obstet Gynecol 2012.

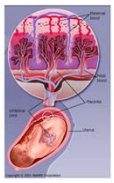


Promoting Fetal Wellbeing

- Adequate maternal cardiac output, blood pressure, hemoglobin levels, and oxygen saturation
- Adequate blood flow to the uterus and placenta (volume, hemoglobin levels and oxygen saturation)
- Adequate placental function
- Normal uterine activity
- Uninterrupted blood flow to fetus

Uteroplacental Perfusion

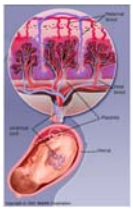
Factors that May Decrease



- Maternal conditions
  - (Hypertensive disorders of pregnancy; diabetes)
- Maternal hypotension
- Excessive uterine activity or hypertonus
- Placental changes
  - (decreased surface area, edema, degeneration, calcifications, infarcts, infection)
- Vasoconstriction

Excessive Uterine Activity

- Tachysystole
- Decreased Uteroplacental Perfusion
- Decreased Fetal Oxygenation



Deteriorating Fetal Status

Normal Oxygenation
↓
Hypoxia
↓
Acidosis
↓
Tissue Damage / Death

Moderate Variability

- Highly predictive of baby that is
  - Vigorous
  - Well oxygenated
  - Normal pH

(Parer et al., 2006)

Evolving Deterioration

- Moderate variability
  - 98% Apgar ≥7 at 5 min and pH >7.15
- Absent or minimal
  - 23% fetal acidemia

- Fetal acidemia with decreasing variability in combination with decelerations develops over a period of time approximating 1 hr

(Parer et al., 2006)

Maternal-Fetal Assessment

- Maternal Vital Signs based on condition
- Fetal heart rate
  - Baseline rate
  - Variability
  - Presence or absence of accelerations
  - Presence or absence of decelerations
  - Evolution over time
- Uterine Activity
  - Contraction frequency
  - Contraction duration
  - Contraction intensity
  - Uterine resting tone

Team Communication

- Concise
- Clear
- What's going on / situation
- Context or background
- Appraisal / assessment
- Request / recommendation
- Further discussion
- Decision
- Mobilize team response if needed

Team Communication

Indeterminate (Cat II)/ Abnormal (Cat III) FHR Patterns

- Baseline rate, variability, presence or absence of accelerations and decelerations
- Clinical context of FHR pattern (oxytocin, misoprostol, tachysystole, bleeding, IV pain meds, hypotension, cord prolapse, second stage)
- FHR pattern evolution (how long has this been developing)
- Intrauterine resuscitation techniques / fetal response
- Urgency (now, as soon as you can; within 30 min)
- Standard FHR terminology

Intrauterine Resuscitation

Intrauterine Resuscitation

- Repositioning (side to side)
- IV fluid bolus of at least 500 mL lactated Ringer's solution
- Oxygen at 10 L/min via nonrebreather facemask (usually no more than 15-30 min per event)
- Discontinuation of oxytocin/removal of Cervidil
- Amnioinfusion (first stage)
- Modification of pushing efforts (second stage)
- Medications (SQ Terbutaline / IVP Ephedrine)

ACOG 2010

THE AMERICAN COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS
WOMEN'S HEALTH CARE PHYSICIANS

PRACTICE BULLETIN

CLINICAL MANAGEMENT GUIDELINES FOR OBSTETRICIAN–GYNECOLOGISTS

NUMBER 116, NOVEMBER 2010

Management of Intrapartum Fetal Heart Rate Tracings

Intrapartum electronic fetal monitoring (EFM) is used for most women who give birth in the United States. As such, clinicians are faced daily with the management of fetal heart rate (FHR) tracings. The purpose of this document is to provide obstetric care providers with a framework for evaluation and management of intrapartum EFM patterns based on the new three-tiered categorization.

Table 2. Various Intrauterine Resuscitative Measures for Category II or Category III Tracings or Both

Goal	Associated Fetal Heart Rate Abnormality*	Potential Intervention (s)†
Promote fetal oxygenation and improve uteroplacental blood flow	Recurrent late decelerations Prolonged decelerations or bradycardia Minimal or absent fetal heart rate variability	Initiate lateral positioning (either left or right) Administer maternal oxygen administration Administer intravenous fluid bolus Reduce uterine contraction frequency
Reduce uterine activity	Tachysystole with Category II or III tracing	Discontinue oxytocin or cervical ripening agents Administer tocolytic medication (eg, terbutaline)
Alleviate umbilical cord compression	Recurrent variable decelerations Prolonged decelerations or bradycardia	Initiate maternal repositioning Initiate amnioinfusion If prolapsed umbilical cord is noted, elevate the presenting fetal part while preparations are underway for operative delivery

When? Repositioning

FHR pattern suggests:
- **Decreased oxygenation**
- **Umbilical cord compression**

Maternal status suggests:
- **Hypotension**
- **Uterine activity is excessive**

When? IV Fluid Bolus

FHR pattern suggests:
- **Decreased oxygenation**

Maternal status suggests
- **Hypotension**
- **Dehydration**
- **Uterine activity is excessive**

When? Oxygen

Usual intrauterine resuscitation techniques haven't resolved indeterminate / abnormal FHR pattern:
- **Lateral positioning**
- **Discontinuation of oxytocin**
- **IV fluid bolus of at least 500 mL L/R**
- **Correction of maternal hypotension**
- **Amnioinfusion**
- **Modification of pushing efforts**

When? Oxygen

- **Minimal or absent variability**
- **Recurrent late decelerations**
- **Recurrent variable decelerations**
- **Prolonged decelerations**
- **Bradycardia**

- **If the fetus has moderate variability and/or accelerations, hypoxemia has been ruled out and O_2 is not indicated**

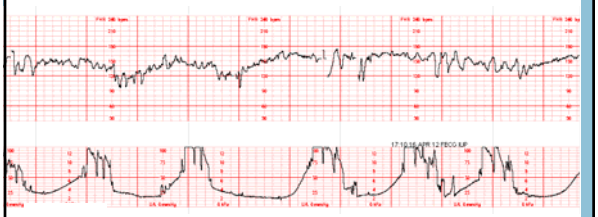
When? Amnioinfusion

- **Recurrent variable decelerations during first stage labor that have not resolved with position change**

- **Not for late decelerations**
- **Not for active pushing phase of labor**

Second Stage Labor

Active pushing is most physiologically stressful part of labor for the fetus

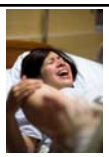


Second Stage Labor

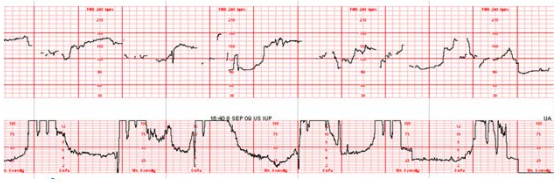
FHR indeterminate or abnormal

- **Push with every other contraction**
- **Maintain stable baseline rate**
- **Discontinue or decrease oxytocin based on FHR pattern**
  - **Recurrent late decelerations**
  - **Recurrent variable decelerations**
  - **Moderate vs minimal variability**
  - **Baseline rate elevated**

Second Stage Labor



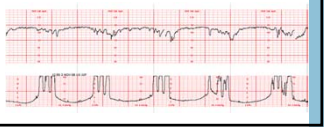
- **Avoid tachysystole**
- **Consider discontinuing pushing temporarily if FHR does not recover between pushes / contractions**



Physiologic Reserve

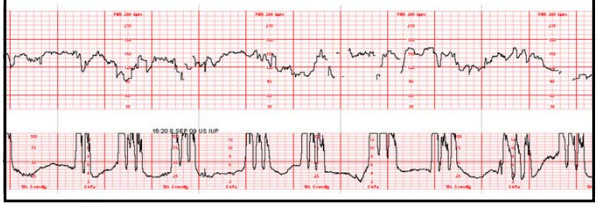
Fetus less likely to tolerate continued pushing with recurrent decelerations if

- **Minimal variability**
- **Rising FHR baseline into abnormal range**
- **First stage decelerations**
- **Infectious process**



During Second Stage Labor

Tachysystole + Recurrent Decelerations = Risk of Fetal Compromise



Promoting Fetal Wellbeing

- **Birth of the fetus, when possible, prior to the development of damaging degrees of hypoxia/ acidemia**

Summary

- Patience and support
- Labor within the context of normal limits
- Know the evidence / share with colleagues
- Careful assessment to promote maternal and fetal wellbeing
- Timely and accurate communication among members of the team