

FHR monitoring during the second stage: Common Practices & Pitfalls

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Disclosures

- No financial disclosures related to this talk

Overview

- Second stage outcomes
- What can FHR Monitoring impact?
- Common pitfalls
 - Ambiguous signal
 - Baby's almost out
- Practical approaches

Second Stage Outcomes

- Historically, longer second stage, worse neonatal outcomes
- Some data does not support these older findings

Second Stage Outcomes

Outcome	> 3 Hours of second-stage labor [†]	
	Odds ratio	95% CI
Endomyometritis [§]	1.03	0.67-1.61
Chorioamnionitis [§]	2.14	1.80-2.57
3/4-Degree lacerations ^{§¶}	1.16	0.97-1.39
Postpartum hemorrhage ^{§¶}	1.48	1.24-1.78
Cesarean delivery	5.84	4.63-7.37
Operative vaginal delivery	4.38	3.82-5.03
Meconium	1.15	0.98-1.31
5-min Apgar <7 [§]	0.73	0.48-1.11
Umbilical artery pH <7 [§]	1.21	0.45-3.29
Base excess <-12 [§]	0.61	0.32-1.16
Neonatal intensive care unit admittance [§]	1.07	0.72-1.58

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;191:93

Second Stage Outcomes

Outcome	> 4 Hours of second-stage labor [‡]	
	Odds ratio	95% CI
Endomyometritis [§]	0.79	0.49-1.26
Chorioamnionitis [§]	1.79	1.44-2.22
3/4-Degree lacerations ^{§¶}	1.33	1.07-1.67
Postpartum hemorrhage ^{§¶}	1.05	0.84-1.31
Cesarean delivery	5.65	4.46-7.16
Operative vaginal delivery	2.83	2.38-3.36
Meconium	1.11	0.93-1.33
5-min Apgar < 7 [§]	0.45	0.25-0.84
Umbilical artery pH < 7 [§]	1.52	0.53-4.43
Base excess < -12 [§]	0.52	0.21-1.27
Neonatal intensive care unit admittance [§]	0.59	0.35-1.03

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;191:93

What can FHR Monitoring Impact?

- Fetal Heart Rate Monitoring created to reduce CP
- Rates of CP unchanged over time
- However, rates of intrapartum stillbirth reduced
- So, perhaps:
 - Stillbirth -> CP
 - CP -> No morbidity
 - No net change in CP?

EFM: Cochrane Review

- 12 clinical trials (n=37,000), 2 of high quality
 - No “non monitoring” studies
 - Most very old
- cEFM compared to intermittent auscultation

	<u>number (trials)</u>	<u>RR</u>	<u>95%CI</u>
Perinatal death	33,513 (11 trials)	0.85	0.59-1.23
Neonatal seizures	32,386 (9 trials)	0.50	0.31-0.80
Cerebral palsy	13,252 (2 trials)	1.74	0.97-3.11
Cesarean delivery	18,761 (10 trials)	1.66	1.30-2.13
Operative VD	18,151 (9 trials)	1.16	1.01-1.32

What can FHR Monitoring Impact?

- Reduce intrapartum stillbirth, neonatal death, neonatal morbidity? CP?
- Increased operative delivery
 - Operative vaginal delivery
 - Cesarean delivery
- Alert clinician to impending problems
 - Tachysystole (and the old hyperstim)
 - Repetitive decelerations
 - Changes in baseline / variability

Goal

“Depending on severity and duration, metabolic acidosis can lead to tissue and organ damage, and ultimately death. The goal therefore is to intervene along this continuum at a point before any damage, but not so early that an unnecessary cesarean or operative delivery is performed.”

Garite. Intrauterine resuscitation during labor. Clinical Obstet Gynecol 2011.

The 2008 National Institute of Child Health and Human Development Workshop Report on Electronic Fetal Monitoring

Update on Definitions, Interpretation, and Research Guidelines

George A. Macones, MD, Gary D. V. Hankins, MD, Catherine Y. Spong, MD, John Hauth, MD, and Thomas Moore, MD

In April 2008, the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, the American College of Obstetricians

and Gynecologists, and the Society for Maternal-Fetal Medicine partnered to sponsor a 2-day workshop to revisit nomenclature, interpretation, and research recommendations for intrapartum electronic fetal heart rate monitoring. Participants included



Other Management Approaches

FHR	FHR Pattern*	Interventions & Actions
Category I Green	Mod variability (V), normal (nl) rate & absent decelerations (D)	CNM management; intermittent monitoring; notify MD of pattern evolution
Category IIa Blue	Mod V, nl rate, ED (early), mild VD (variable) & LD (late); tachy with no D; min V with no D	Conservative ameliorating techniques**; notify CNM; notify MD within 30 min; assess & plan
Category IIb Yellow	Mod V, mild & mod D; mild/mod brady; min V, tachy, ED or mild VD	Ameliorating techniques; notify CNM; notify MD for bedside eval, anesth, OR, NB resuscitator
Category IIc Orange	Mod V, severe VD, LD, PD or brady Min V, any decels; tachy with mild/mod D, or mild/mod brady	All above, plus move pt to OR if pattern persists
Category III Red	Min V, brady with decels, or any severe decels; absent V; sinusoidal	All above, plus immediate preparation for delivery, either operative vaginal or CS

Parer JT, 2007

Epidemiology of FHR Characteristics

TABLE 5

Association of NICHD categories and defined features 10 minutes before delivery

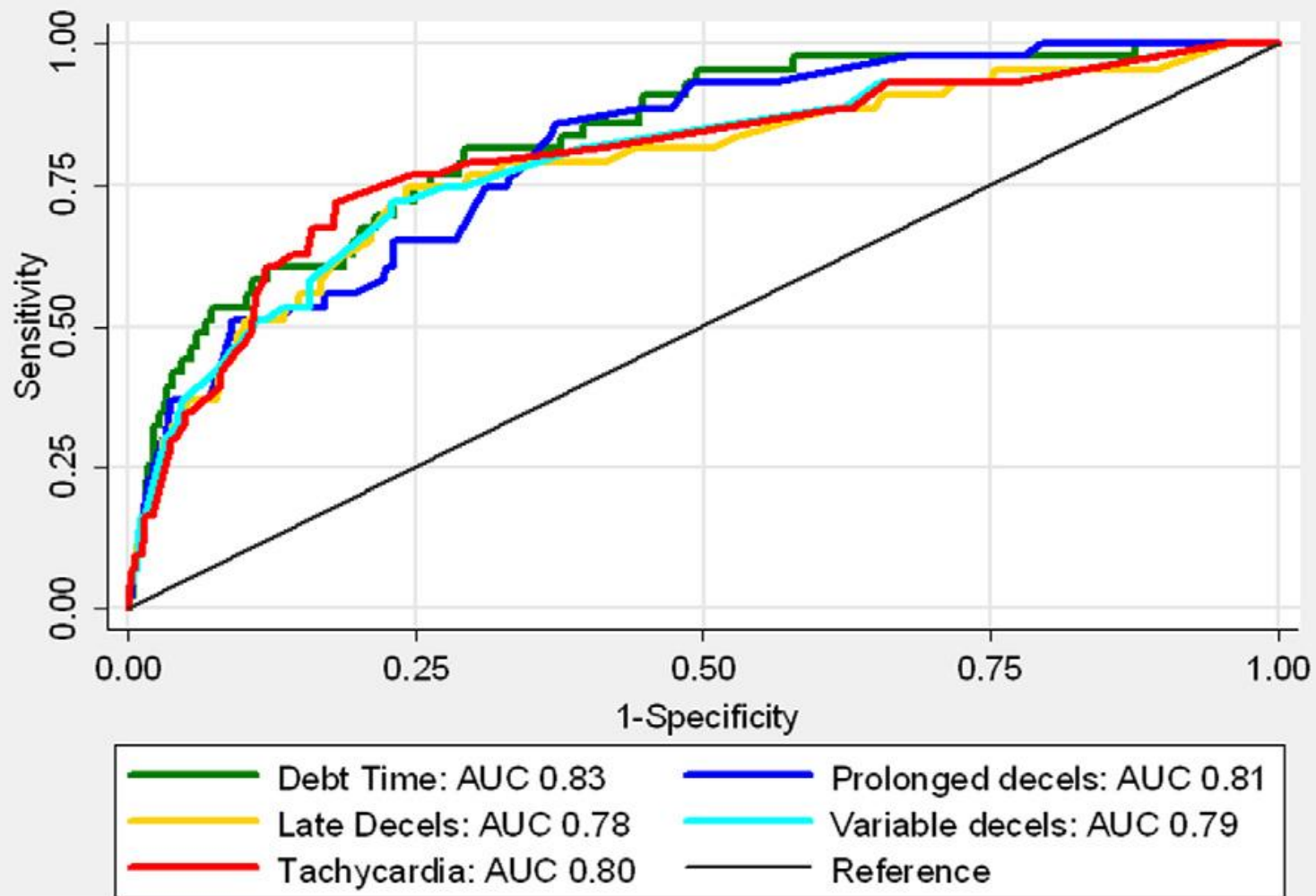
Variable	Acidemia (pH $\leq$ 7.10) (n = 57)	No acidemia (n = 5331)	Unadjusted relative risk (95% CI)
Category I	3.9%	5.4%	Referent
Category II	96.2%	94.3%	1.41 (0.35–5.78)
Category III	0.0%	0.4%	—
Moderate variability	71.1%	73.5%	Referent
Minimal variability	20.0%	22.9%	0.90 (0.43–1.89)
Marked variability	8.9%	3.4%	2.66 (0.95–7.44)
Absent variability	0.0%	0.3%	—
Repetitive late decelerations ^b	50.9%	22.7%	3.47 (2.07–5.81)
Repetitive prolonged decelerations ^b	50.9%	19.3%	4.24 (2.53–7.09)
Repetitive variable decelerations ^b	68.4%	46.4%	2.48 (1.42–4.32)
Baseline tachycardia	17.5%	6.6%	2.98 (1.52–5.85)
Baseline bradycardia	0.0%	1.1%	—

CI, confidence interval; NICHD, National Institute of Child Health and Human Development; OR, odds ratio.

^a Adjusted for nulliparity, fever, prolonged first stage, and obesity; ^b Repetitive: occurring with 50% or greater of contractions.

Cahill. *Electronic fetal monitoring to predict acidemia. Am J Obstet Gynecol* 2012.

Epidemiology of FHR Characteristics

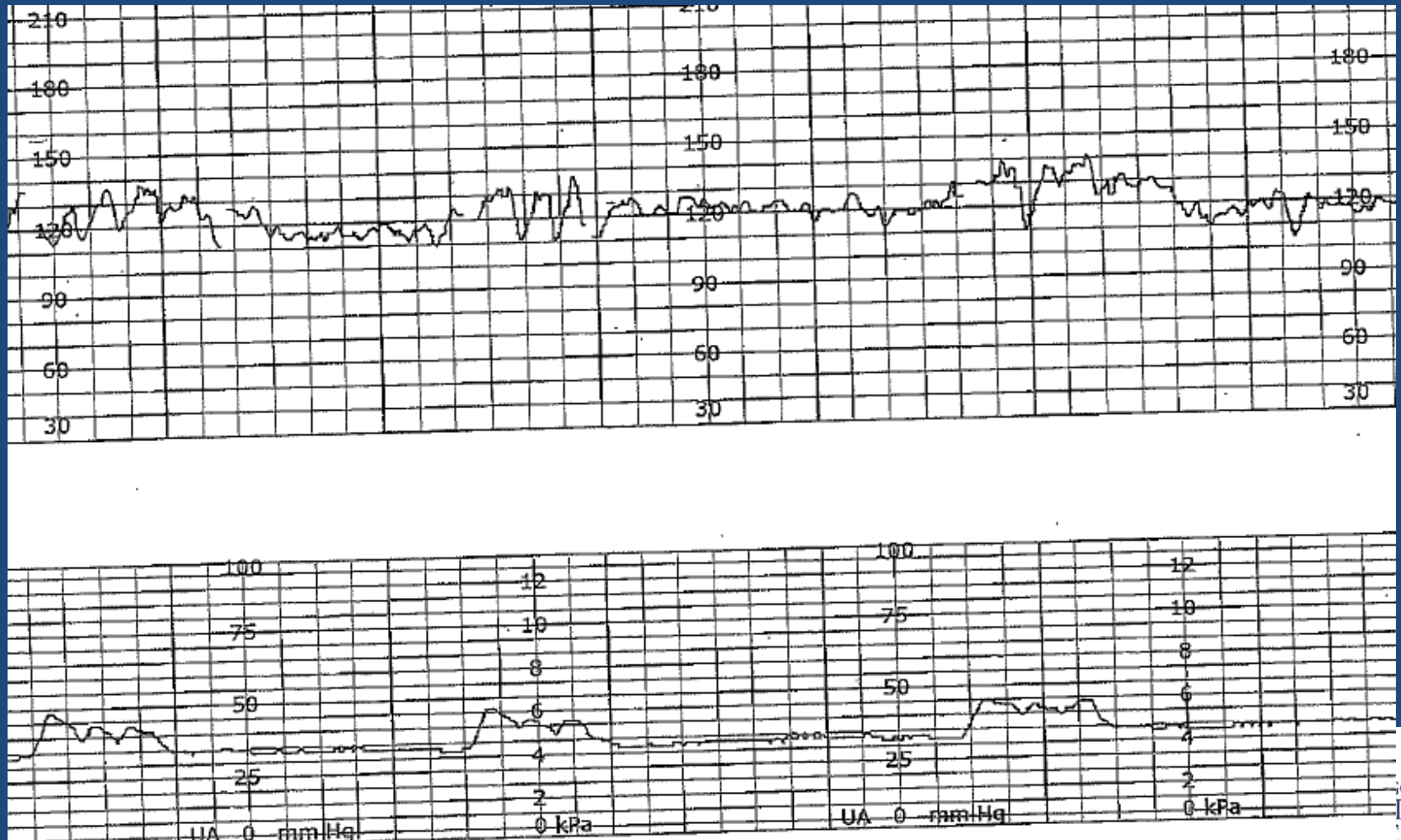


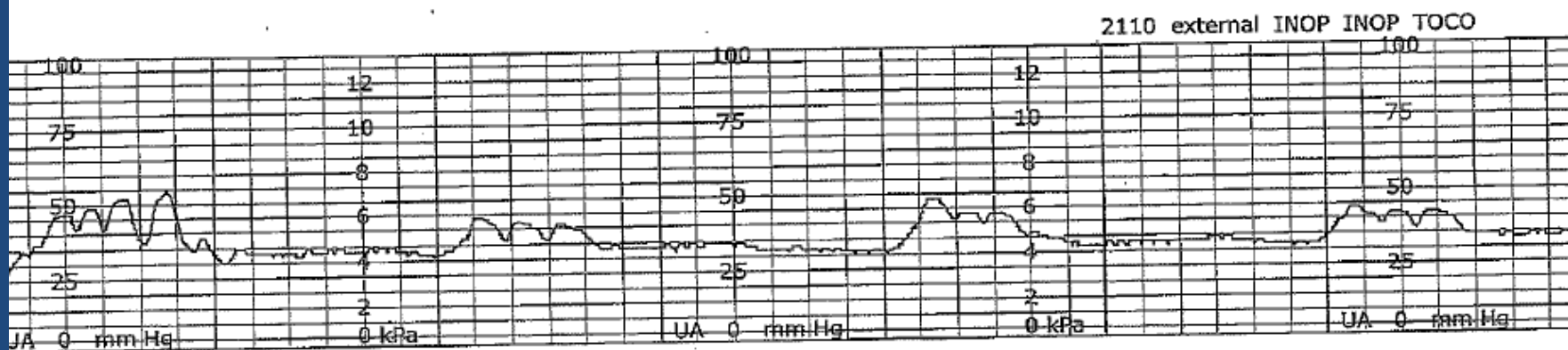
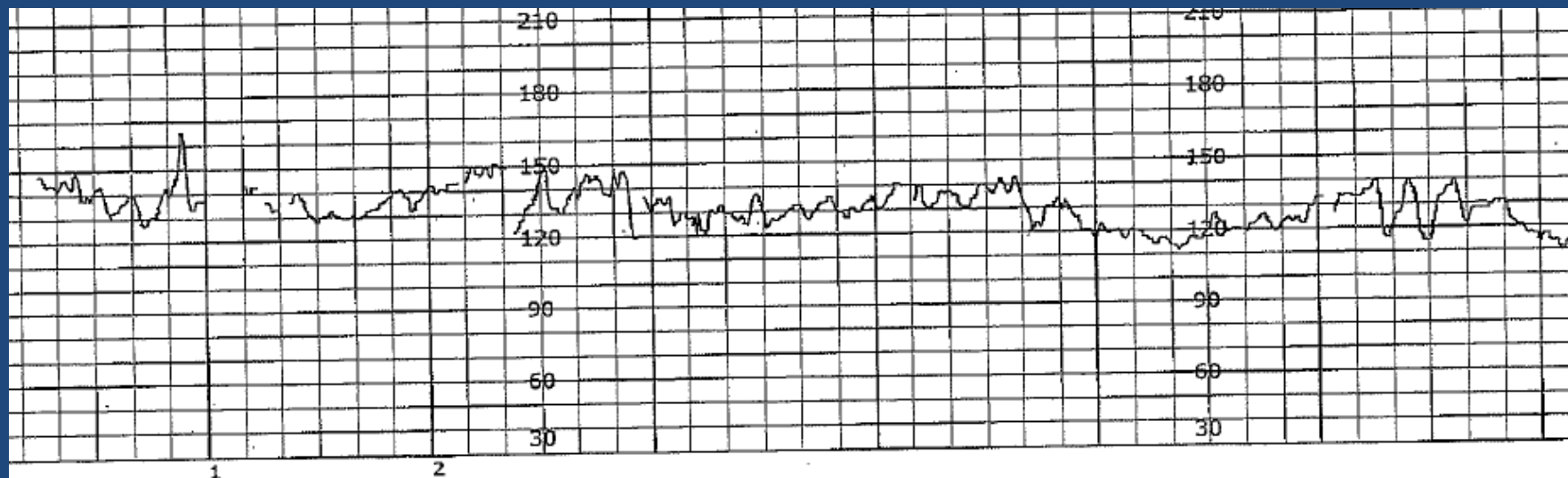
All models are adjusted for nulliparity, fever, prolonged first stage, and obesity

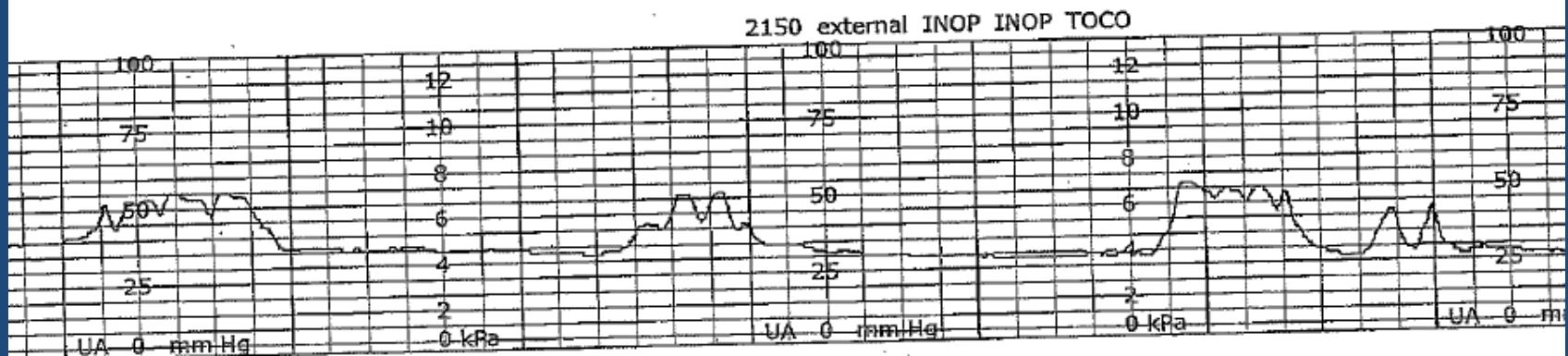
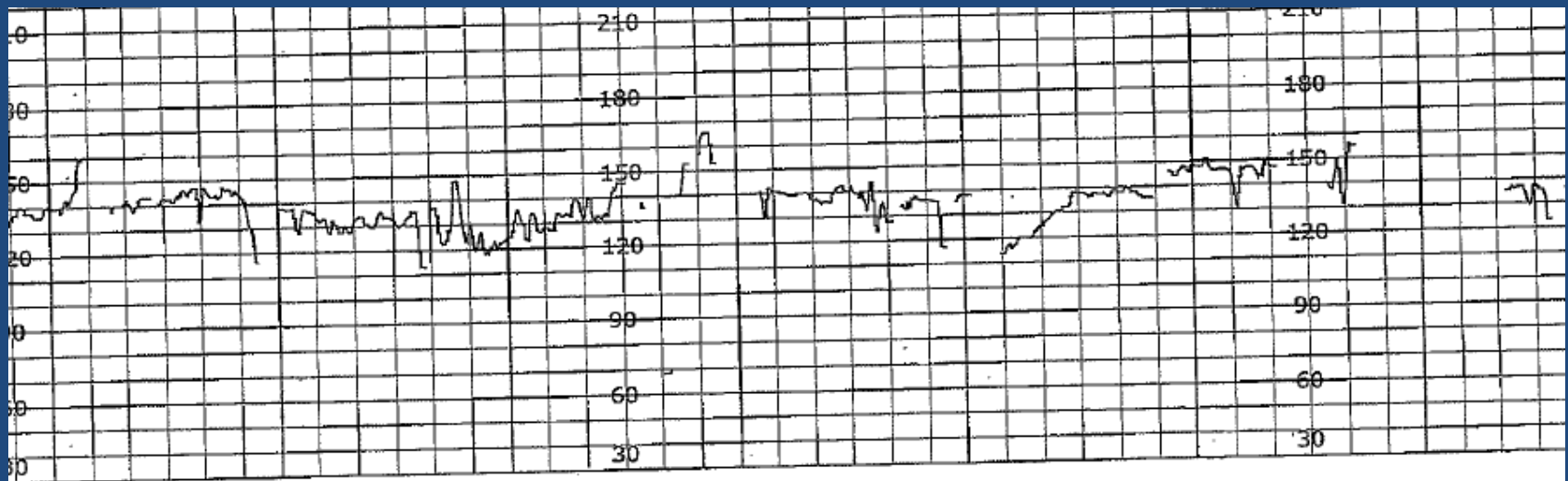
AUC, area under the curve; EFM, electronic fetal monitoring

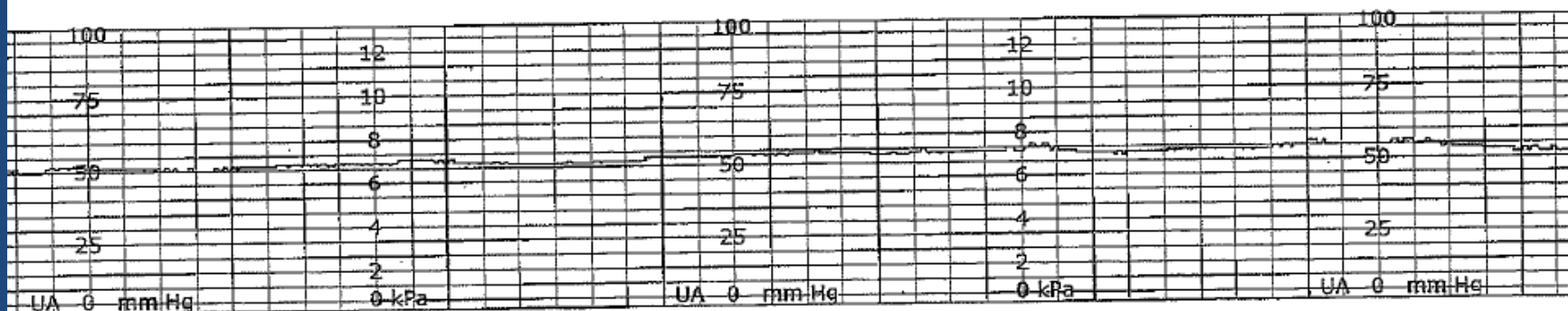
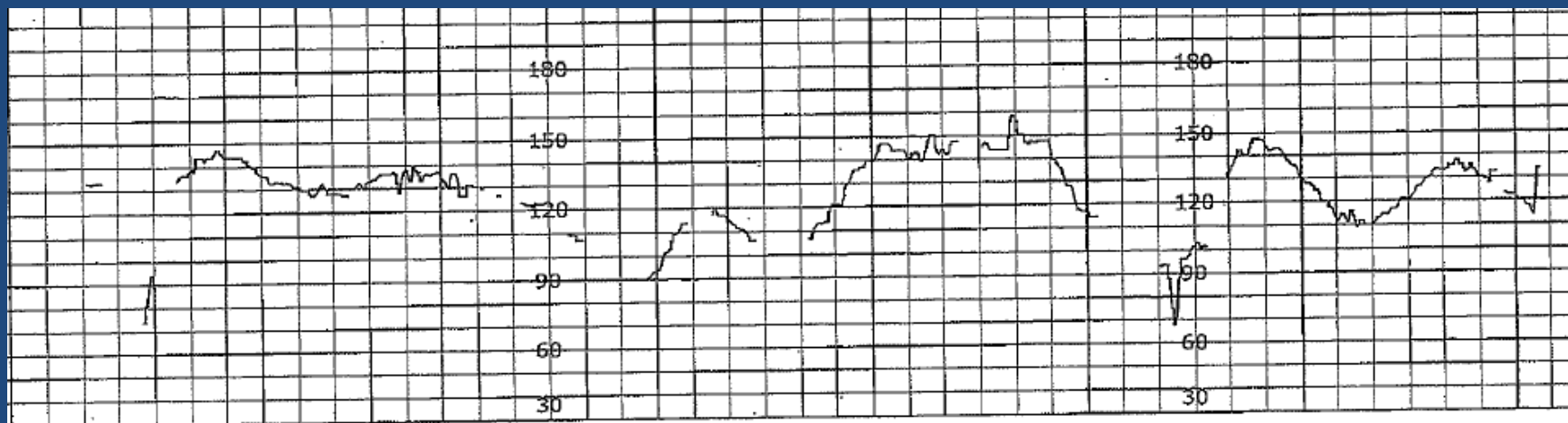
Cahill. Electronic fetal monitoring to predict acidemia. Am J Obstet Gynecol 2012

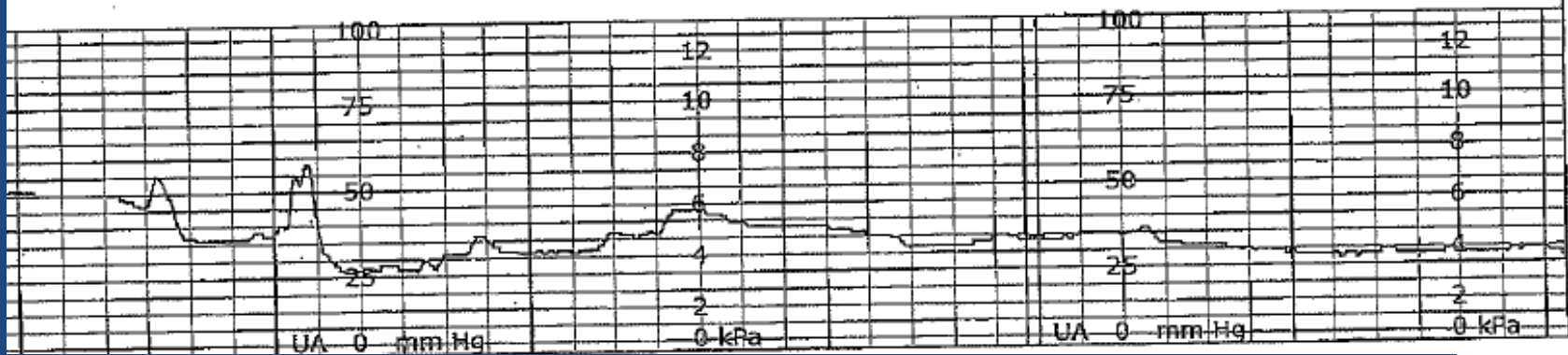
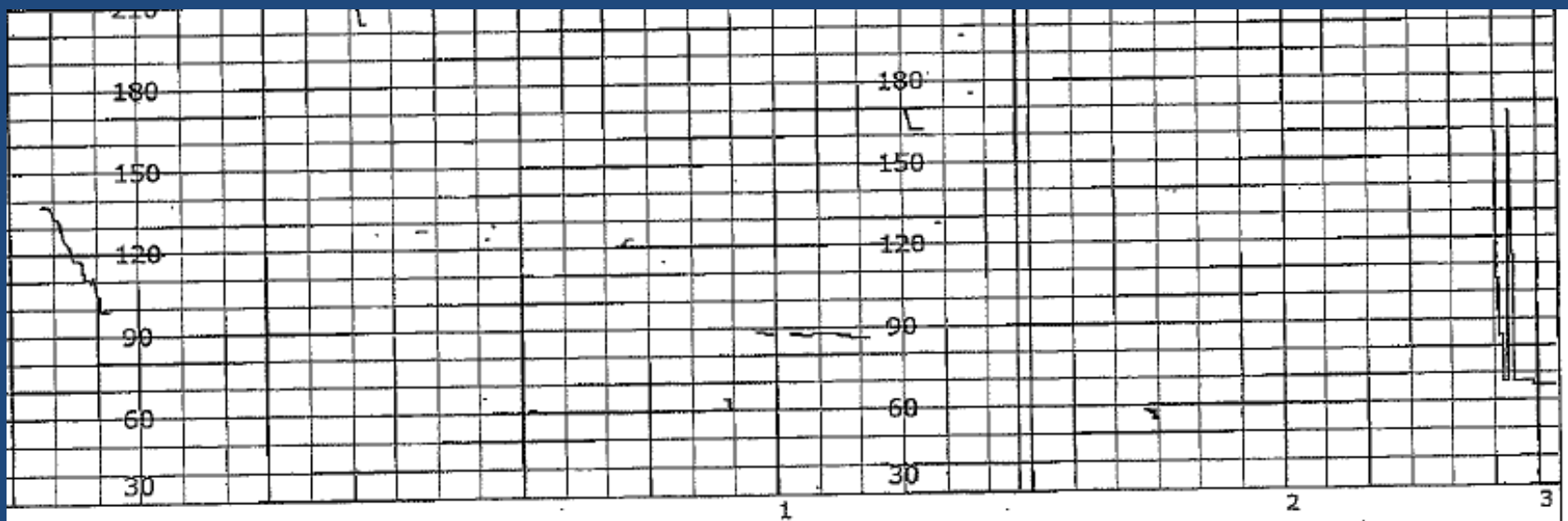
Case 1: 27 yo G1P0 at 39 6/7, starting the second stage

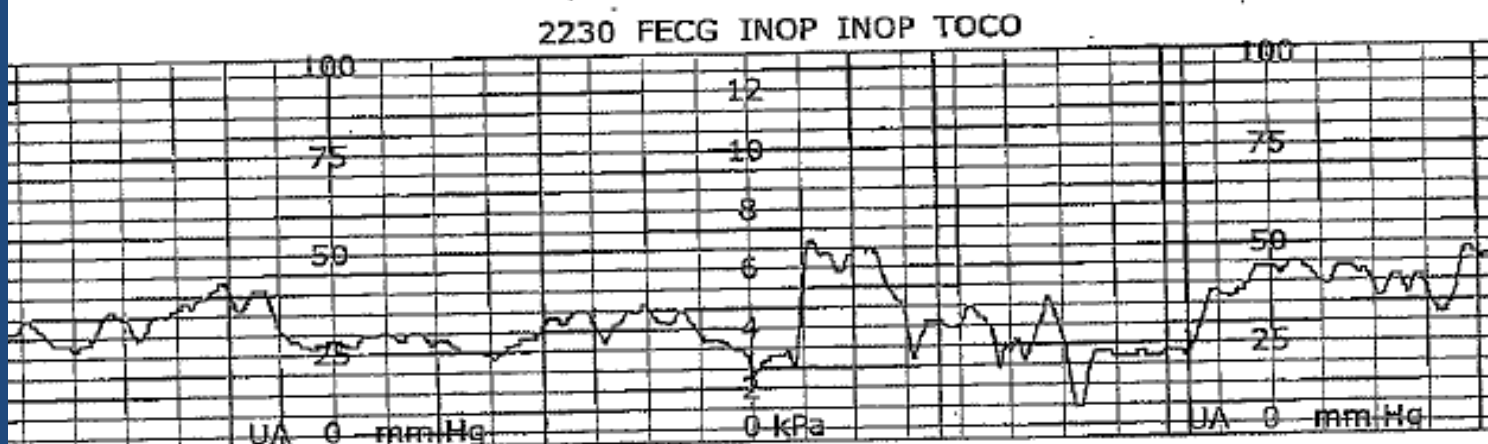
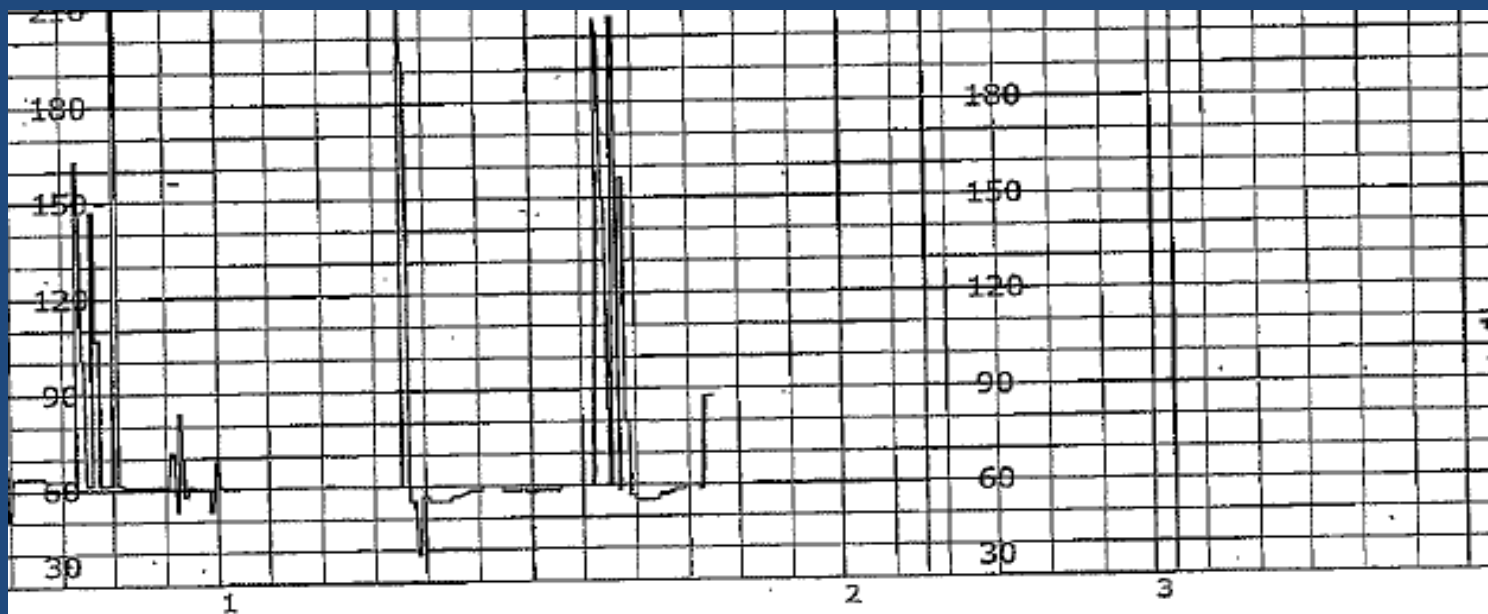












Outcome?

- Emergency Cesarean
- Apgars 0, 1, 2
- CBG: 6.78/-19 | 6.93/-14

FHR Signal Ambiguity

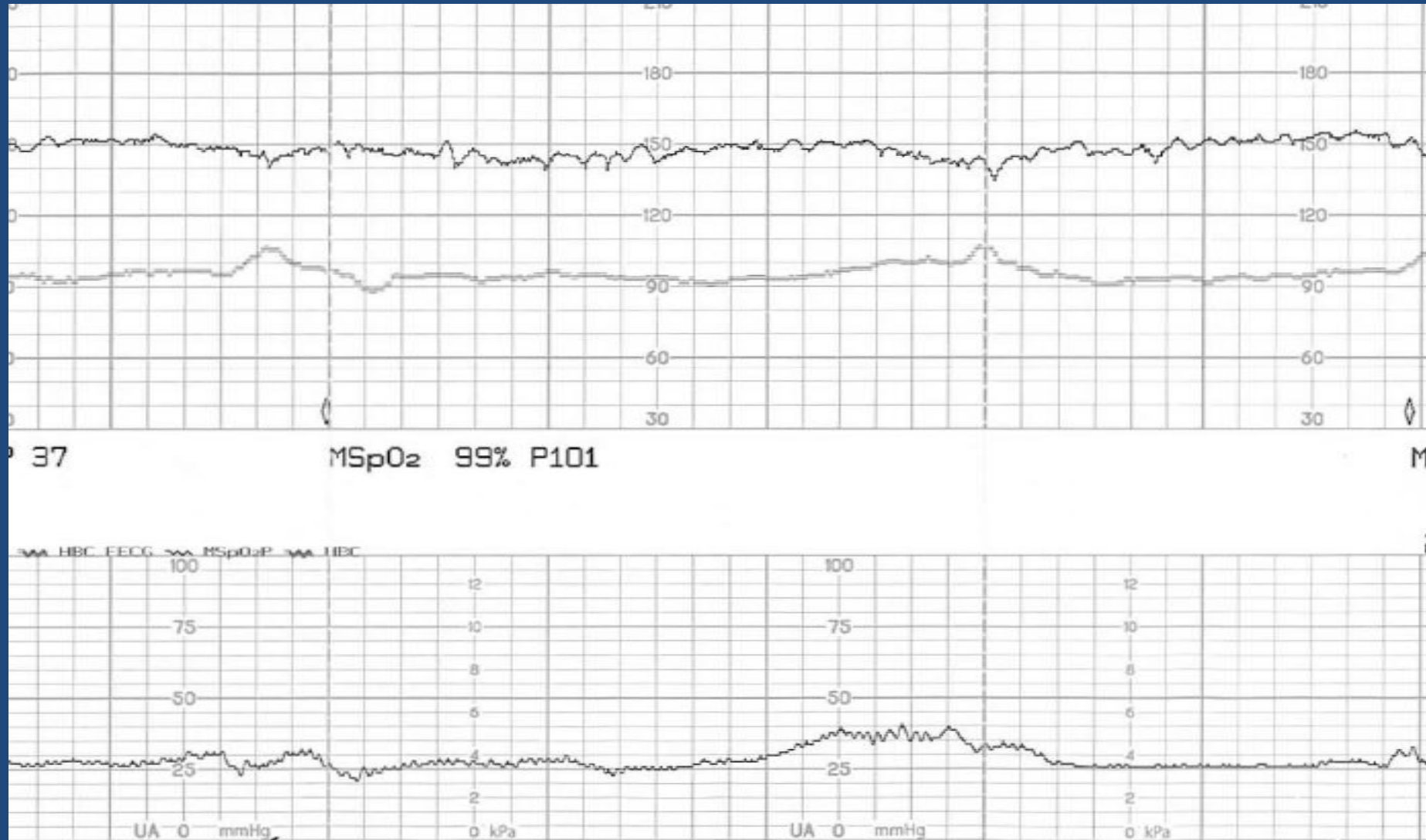
- Maternal Heart Rate confused with FHR
- Can lead to poor interpretation of fetal status
- Probably more common than thought
- Particularly more common in second stage

Ambiguous Signal

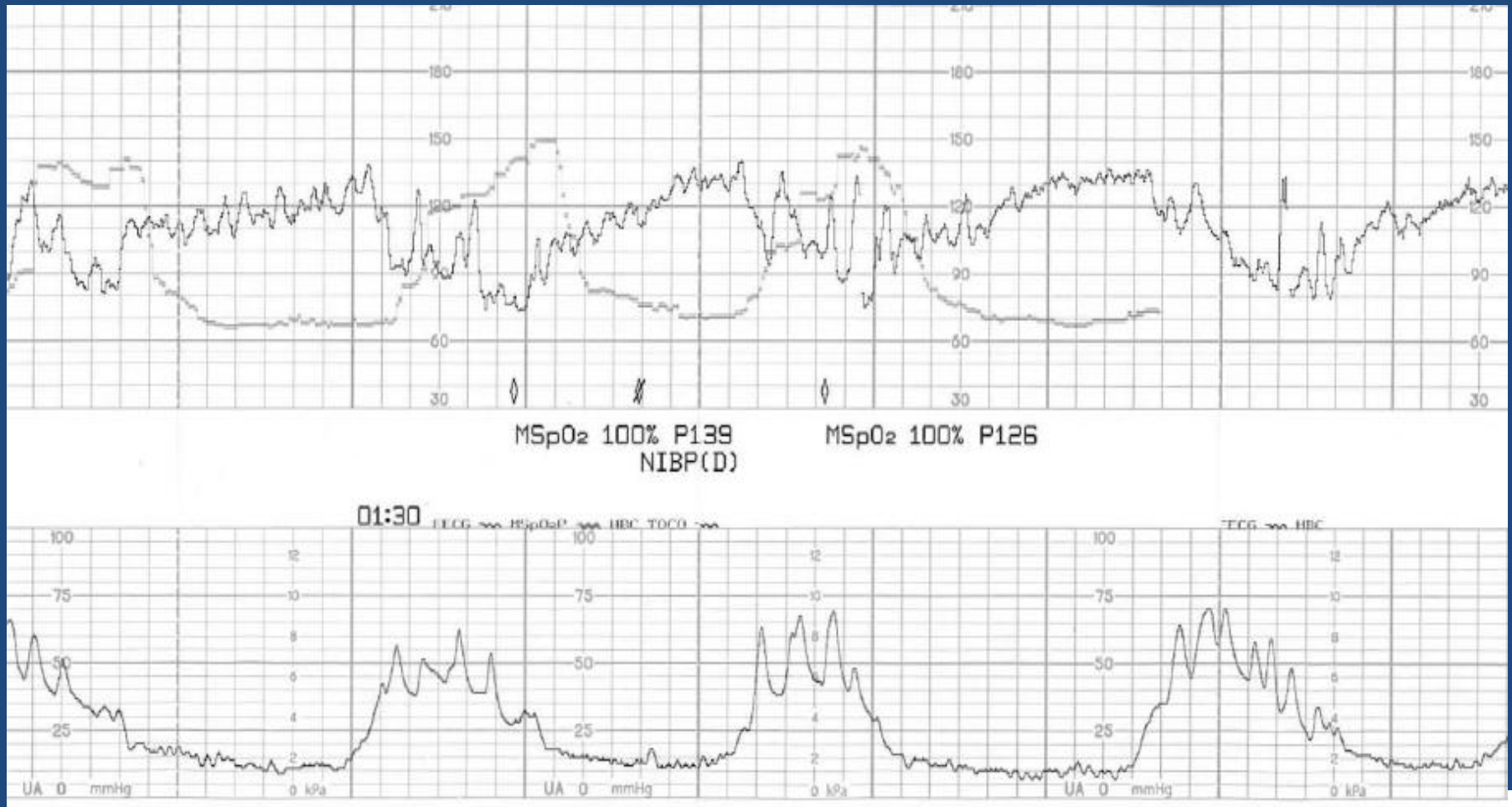
- While generally, $MHR < FHR$
- In second stage, MHR:
 - 27% > 100 BPM
 - 100% w accels during contractions
 - 20% > 140 BPM
 - MHR accels show greater amplitude than fetal accels

Ramadan M, et al. Neonatal Perinatal Med. 2019;12(4):405-410
Van Veen T, et al. Obstet Gynecol Scand. 2012 May;91(5):598-604

First Stage



Second Stage



Ambiguous Signal

- Cohort of 100 patients
- There were decelerations in 89% during second stage
- External FHR showed accels 28.1%
- FSE showed accels 10.9%
- Accels with uterine contractions
 - 11.7% with external FHR
 - 4.0% with FSE

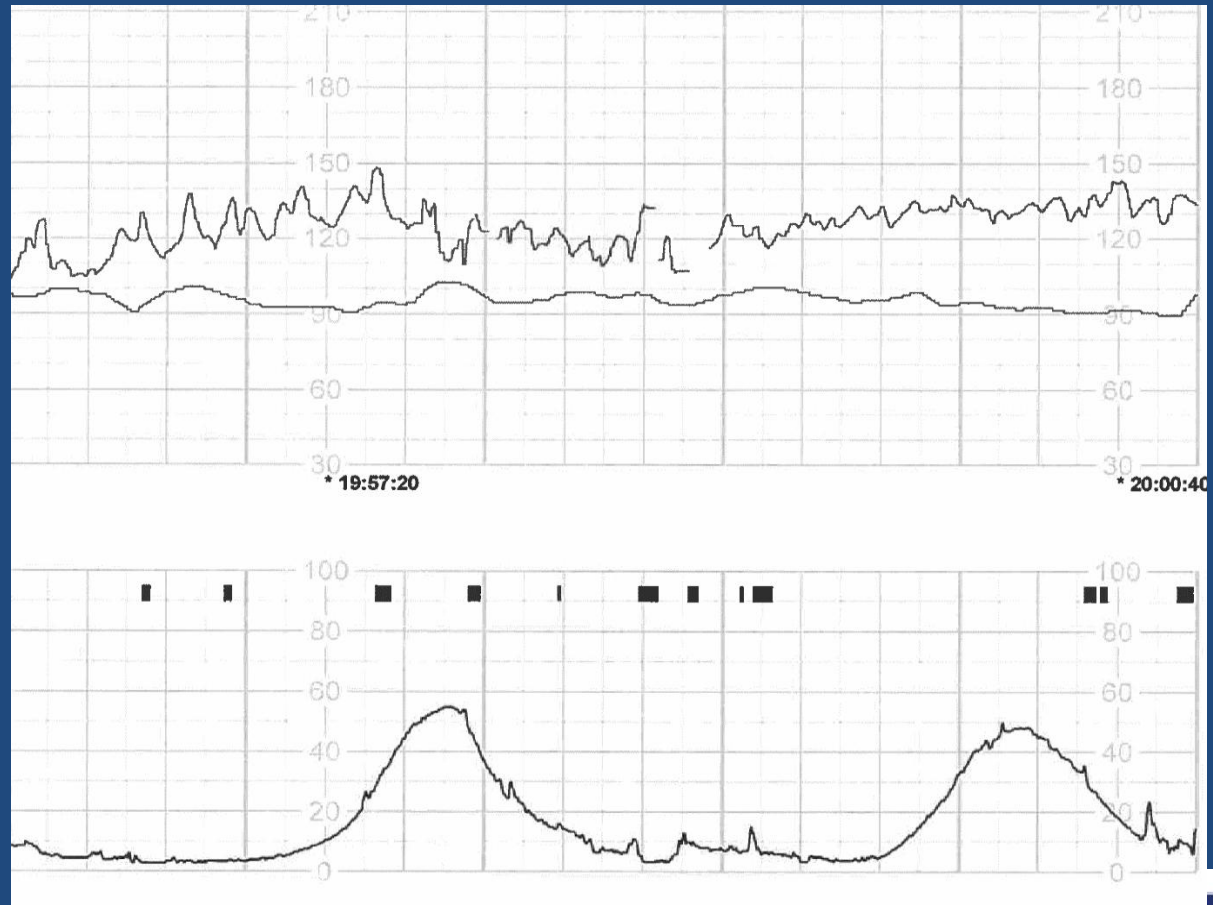
Nurani R, et al. Acta Obstet Gynecol Scand. 2012 Dec;91(12):1428-32.

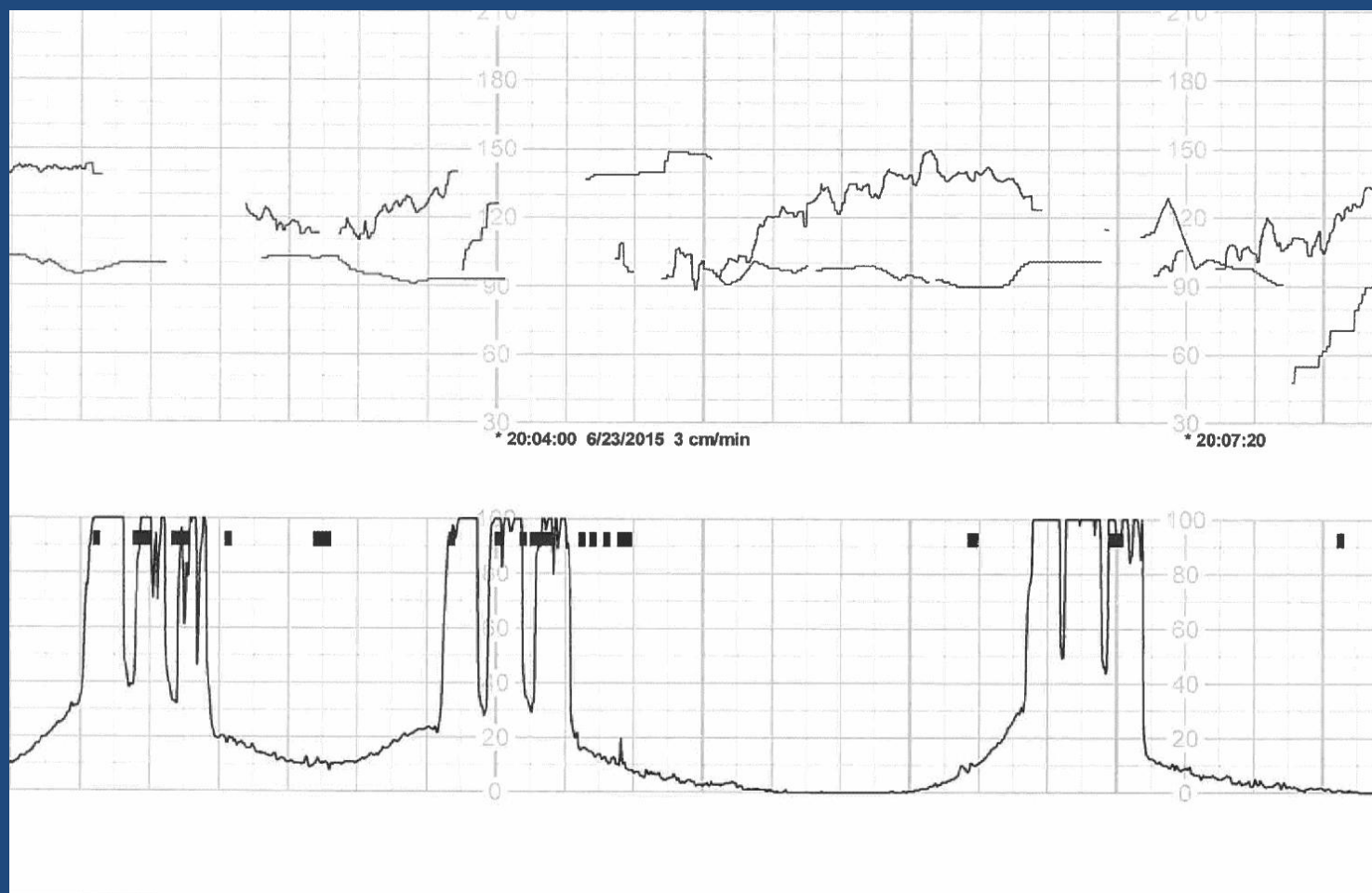
Common Pitfalls

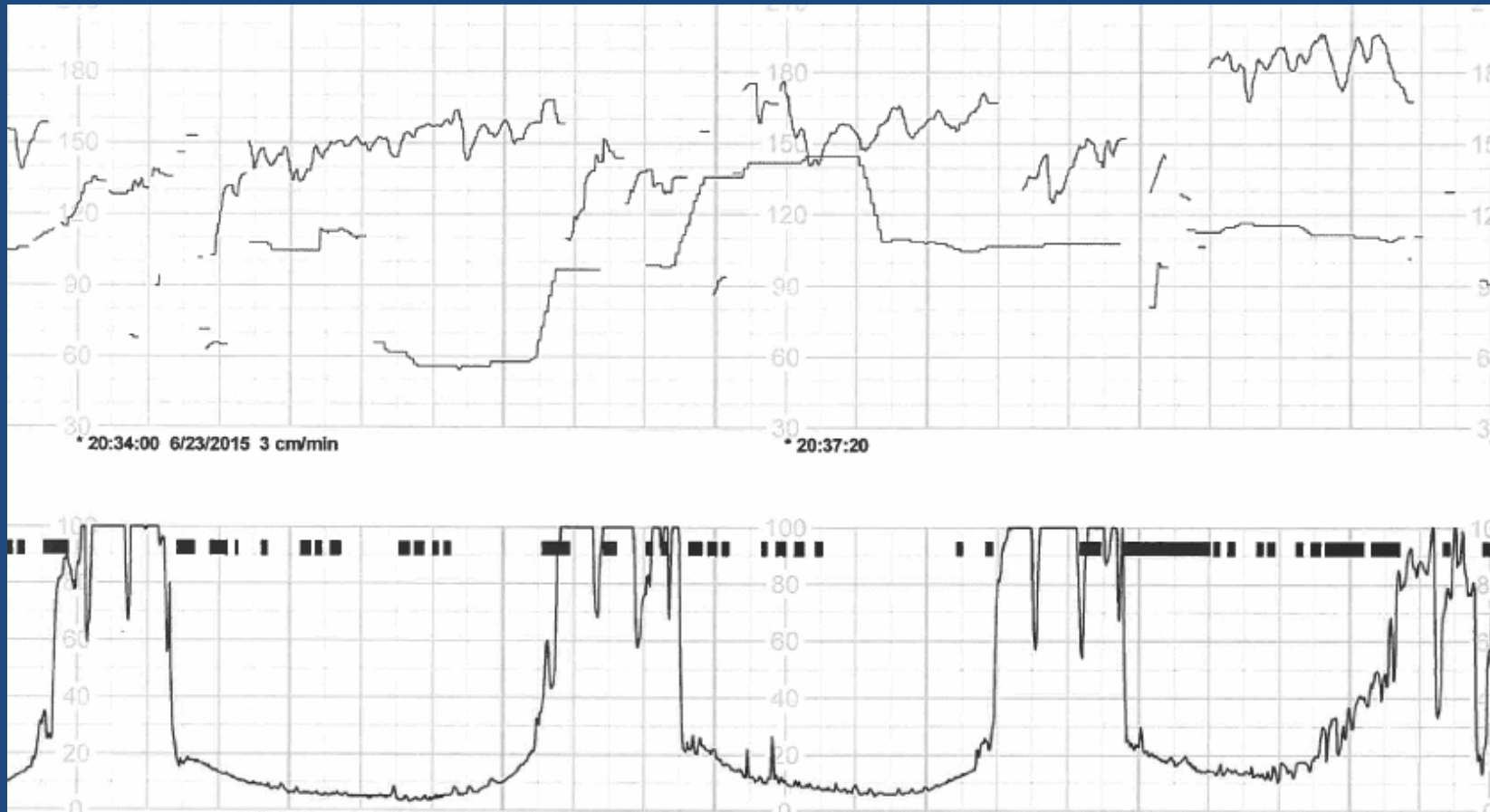
- Ambiguous signal
 - Mistaking FHR for MHR
 - Continuous or intermittent
- Baby's almost out
 - + 4-5 station
 - OA vs. OP
 - Nullip vs. multip
 - Regional analgesia vs. Nat Childbirth

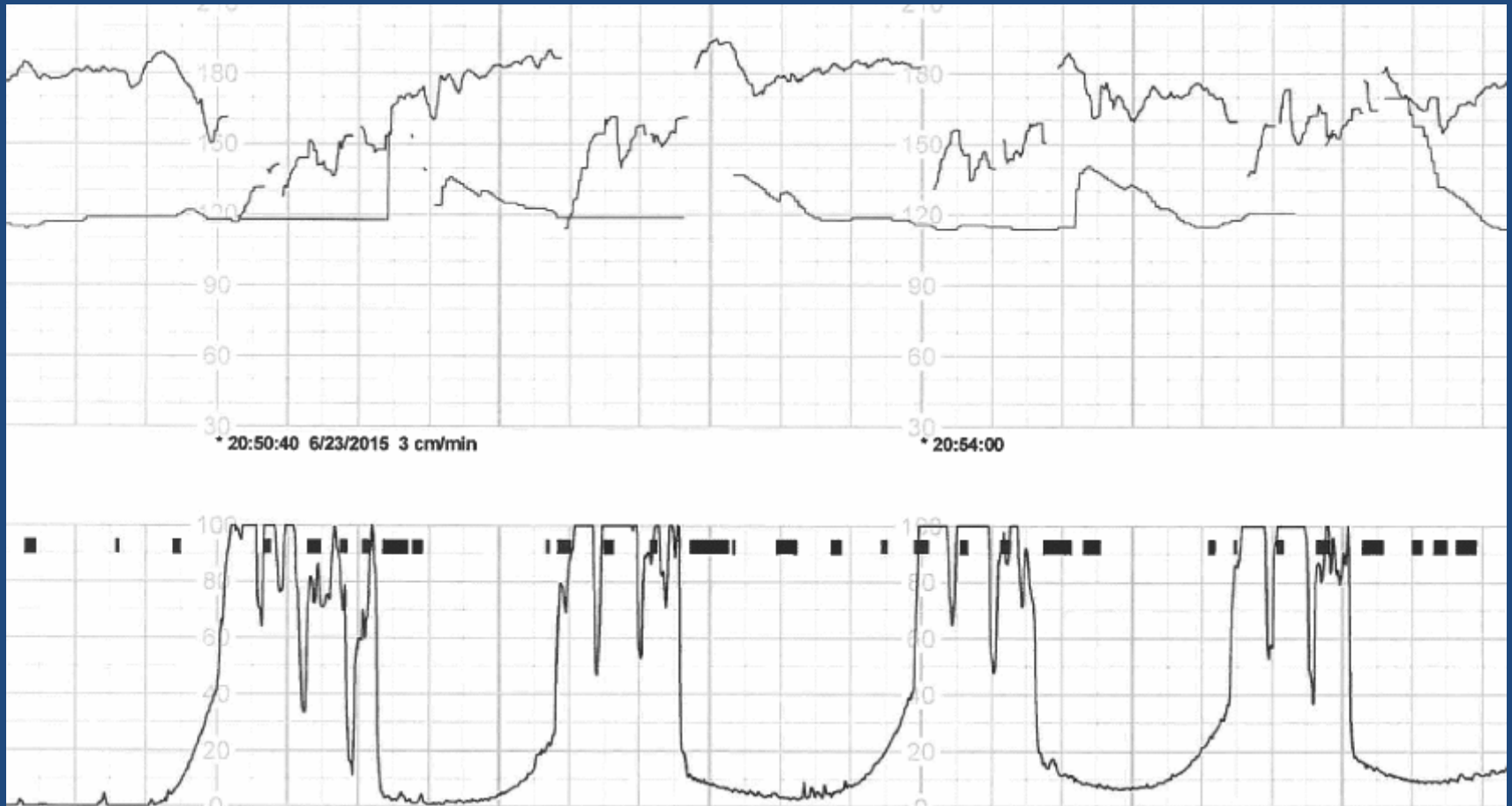
Case 2: 27 G2P0 at 40 4/7 – Just became completely dilated

- + 1 station
 - LOA to LOT
 - Nullip
 - Epidural







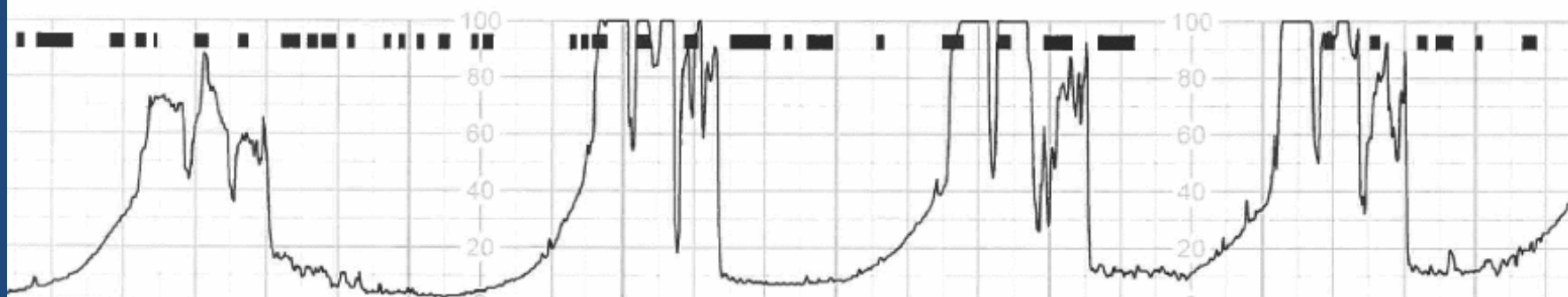
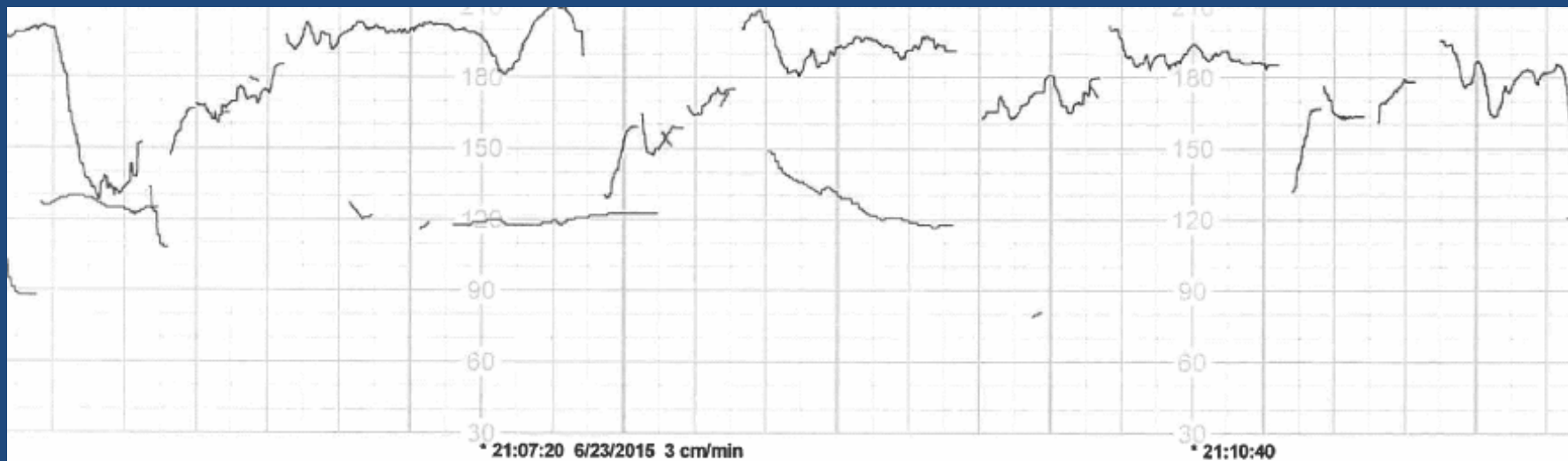


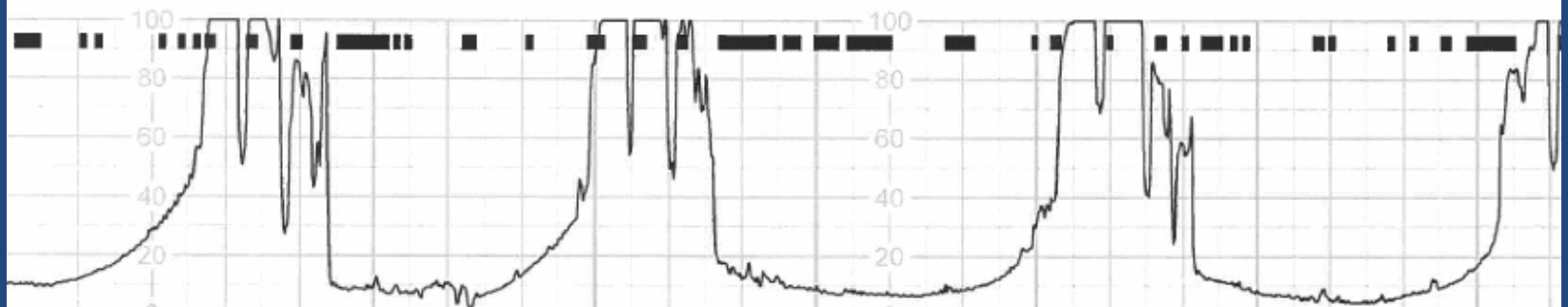
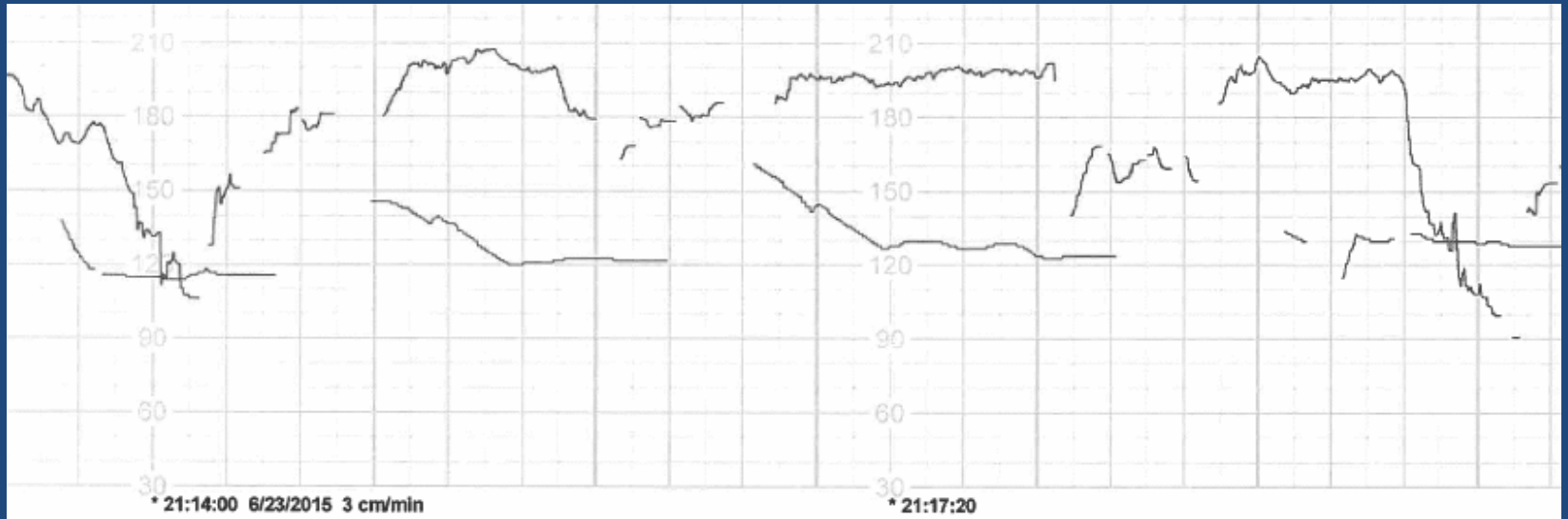
Management Approaches

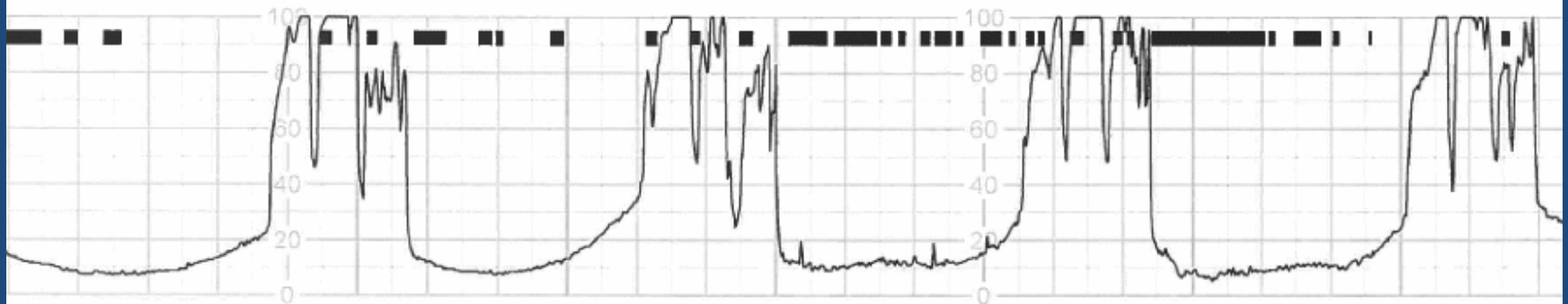
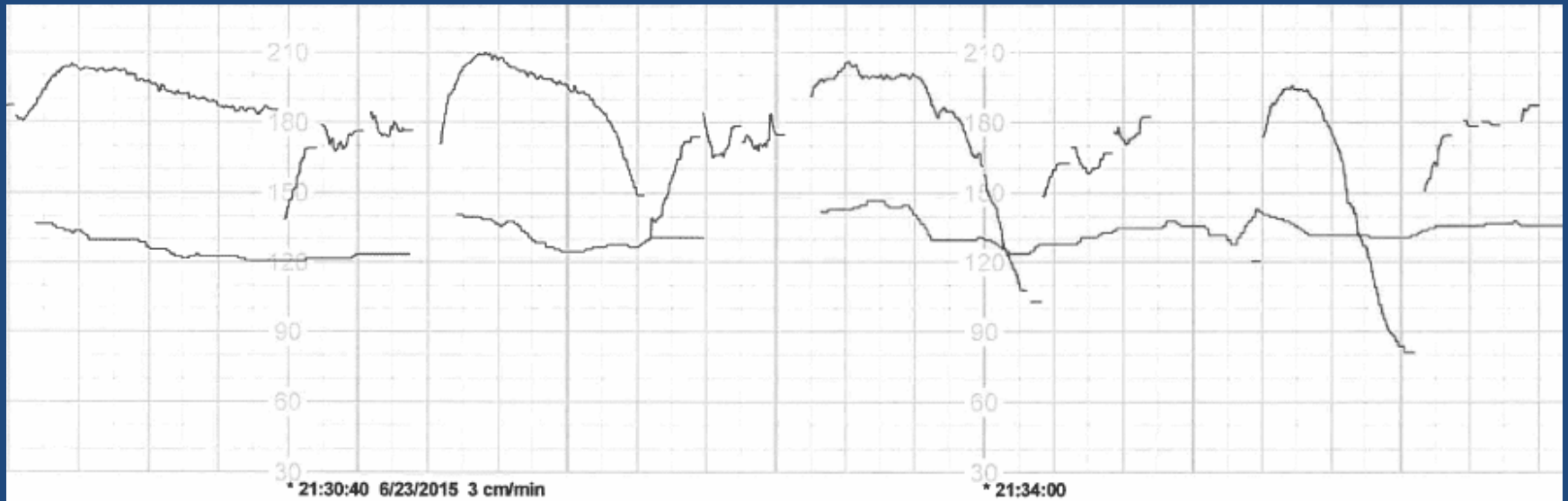
- Acute acidemia does not occur unless recurrent decelerations/bradycardia present
- Decelerations get deeper as acidemia develops
- Variability decreases as acidemia develops
- Baseline FHR may change (increases usually)
- Watching for components of pattern evolution is the clinical key
- Debt time(AUC) matters – can you reduce it?

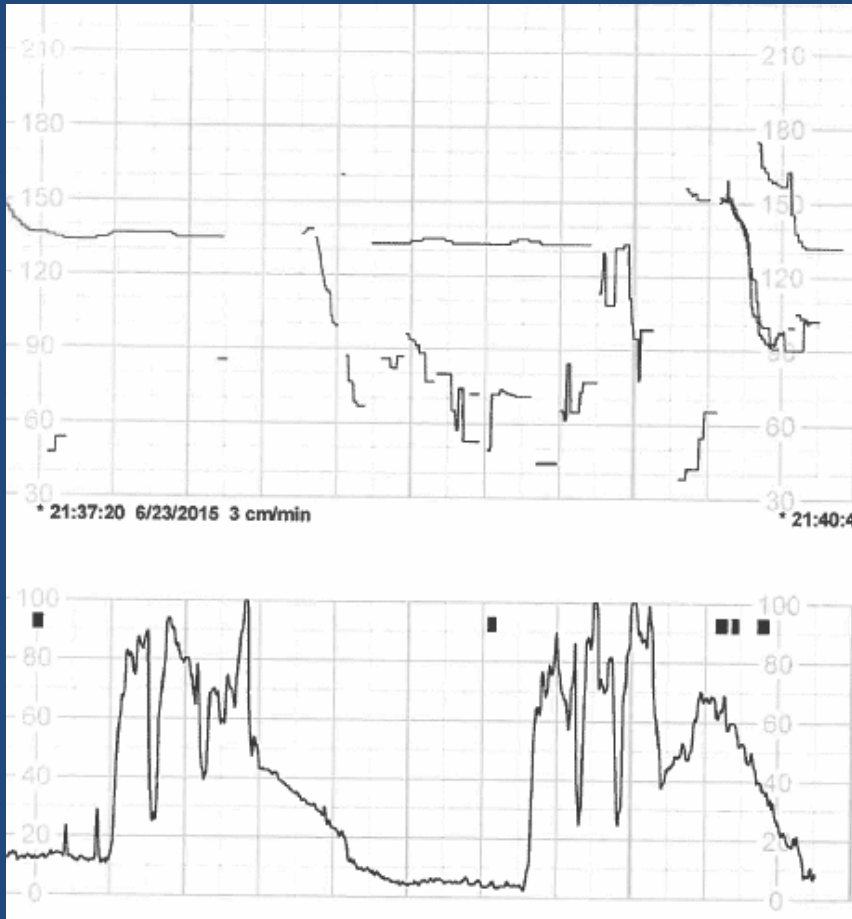
Management Approaches

- How do we reduce the Debt time (AUC)?
- Decrease frequency of ctxns
 - Decrease oxytocin
- Decrease frequency/depth of decels
 - Push every other
 - Amnioinfusion?
- Prolonged crowning
 - Modified Ritgen
 - Episiotomy
 - ? vacuum







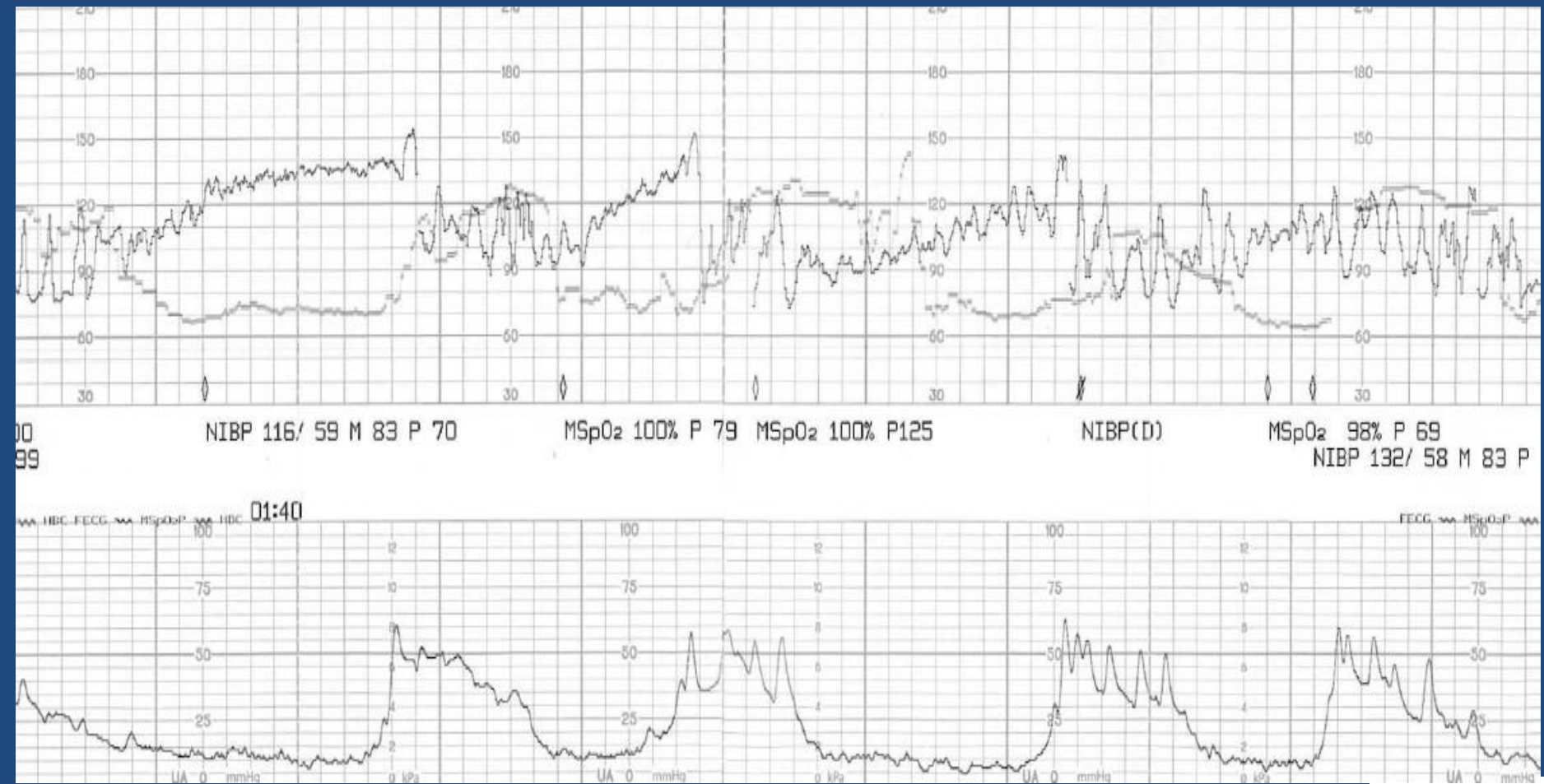


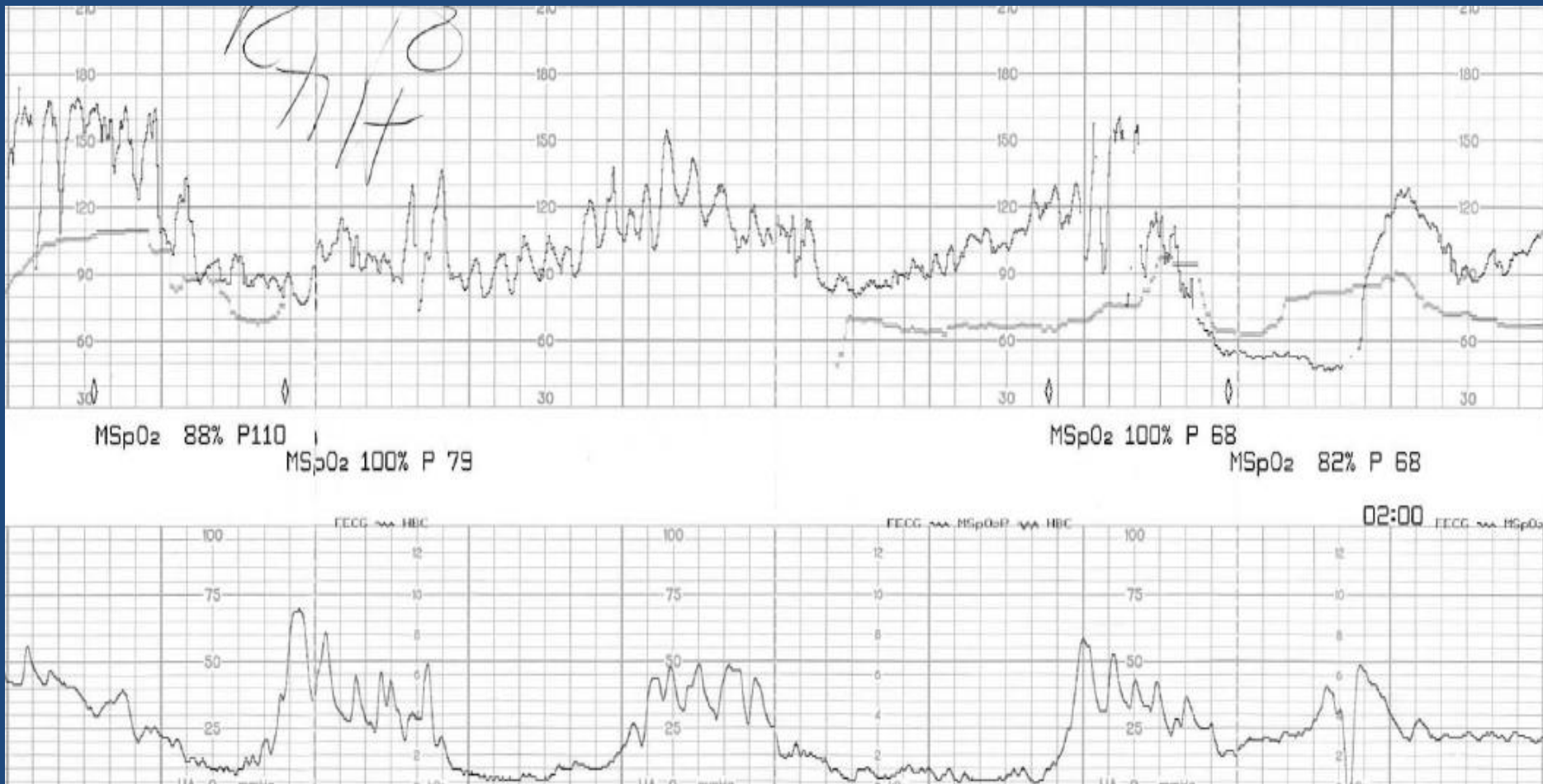
- Apgars 1, 2, 6
- uA - 6.95 / -13
- ABG at 20 min
– 7.08 / -22

Management Approaches

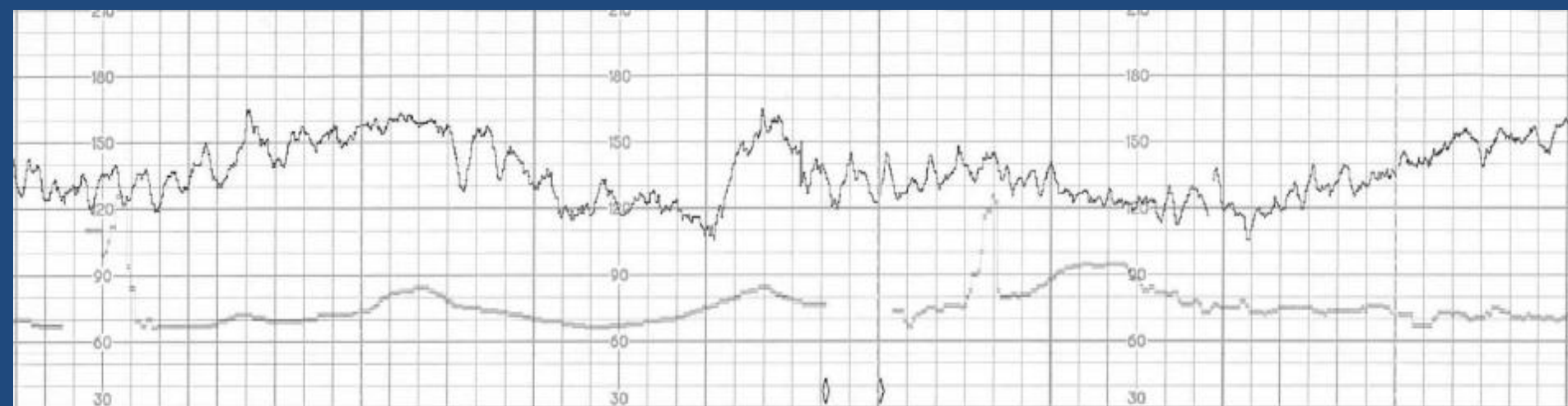
- How do we reduce the debt time (AUC)?
- Decrease frequency of ctxns
 - Decrease oxytocin
- Decrease frequency/depth of decels
 - Push every other
 - Amnioinfusion?
- Prolonged crowning
 - Modified Ritgen
 - Episiotomy
 - ? vacuum

Case 3: Deep recurrent decels



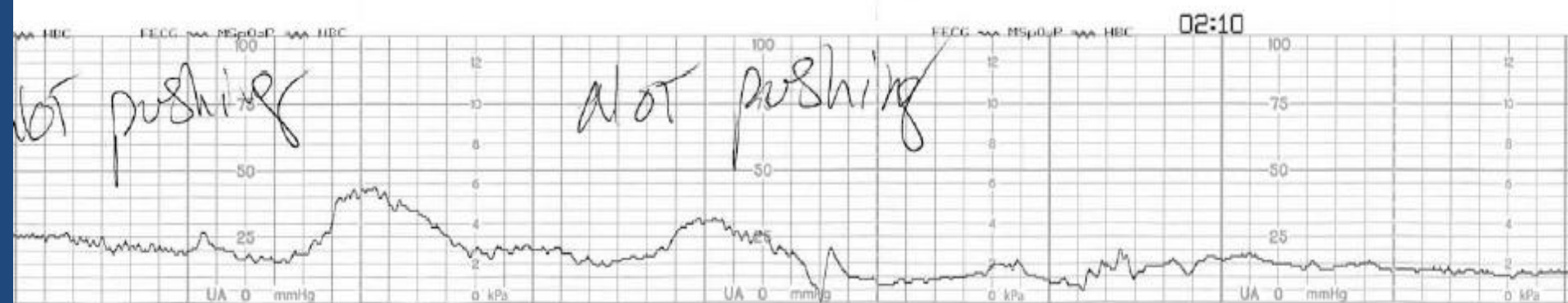


What next?



M 85 P 70
O₂ 100% P 82

MSpO₂ 92% P 80
MSpO₂ 51% P



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Management Approaches

- How do we reduce the debt time (AUC)?
- Decrease frequency of ctxns
 - Decrease oxytocin
- Decrease frequency/depth of decels
 - Push every other
 - Amnioinfusion?
- Prolonged crowning
 - Modified Ritgen
 - Episiotomy
 - ? vacuum

Almost Out

- Tachysystole w decels
 - stop or lower oxytocin
 - if no oxytocin, push every other / ? Terbutaline
 - Careful about prolonged crowning without fetal monitoring
- Assess status every 30 minutes – consider huddles
 - Variability?
 - Accelerations?
 - Change in baseline?
- Must continue to make progress
 - Station vs. increase in caput
 - Analgesia?
 - OP / OT / OA?

Common Pitfalls - Summary

- Ambiguous signal
 - Mistaking FHR for MHR
 - Low threshold FSE
- Baby's almost out
 - + 4-5 station / crowning
 - Consider push every other
 - Facilitate delivery

New ACOG FHR CPG



ACOG

The American College of
Obstetricians and Gynecologists

CLINICAL PRACTICE GUIDELINE

NUMBER 10

OCTOBER 2025

(REPLACES PRACTICE BULLETIN NUMBER 106, JULY 2009; PRACTICE BULLETIN NUMBER 116, NOVEMBER 2010; AND PRACTICE ADVISORY, OXYGEN SUPPLEMENTATION IN THE SETTING OF CATEGORY II OR III FETAL HEART TRACINGS, JANUARY 2022)

Intrapartum Fetal Heart Rate Monitoring: Interpretation and 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 Laura Mercer, MD, MBA, MPH, Aaron B. Caughey, MD, MPH, PhD, Nandini Raghuraman, MD, MSCI, and Stephanie Ros Saposnik, MD, MSCI.

New ACOG FHR CPG

Table 2. Potential Interventions Based on Clinical Findings

Finding	Potential Underlying Pathophysiology	Potential Intervention(s)
Fetal heart rate tracing changes associated with maternal hypotension (relative or absolute), commonly seen in the setting of regional anesthesia	Relative hypoperfusion of the placenta	• Maternal IV fluid bolus^{*,a} • Administration of IV vasopressor medication^a • Maternal position changes^{a,b,c} • Reduction of basal epidural analgesia infusion rate (if recurrent hypotension noted)^a
Intermittent or recurrent late decelerations without maternal hypotension	Uteroplacental insufficiency due either to impaired uterine perfusion or increased placental resistance	• Maternal IV fluid bolus^{*,d} • Maternal position changes^{b,c} • Reduction or cessation of induction or augmentation agents^e
Intermittent or recurrent variable decelerations	Umbilical cord compression	• Maternal position changes^{b,c} • Amnioinfusion^{*,f}
Fetal tachycardia	Maternal comorbidities such as infection (including intrapartum intraamniotic infection), hyperthyroidism, dehydration, diabetic ketoacidosis	• Evaluation for and treatment of underlying maternal comorbidity, as applicable[†]
Absent or persistent minimal variability without decelerations	Fetal sleep cycle Medication effect Maternal dehydration Maternal acidemia Fetal acidemia	• Attempt to elicit reassuring findings with vibroacoustic or scalp stimulation^{†,g,h,i,j} • Maternal IV fluid bolus^{*,†} • Evaluation for and treatment of underlying cause, as applicable[†]
Uterine tachysystole associated with fetal heart rate changes	Relative vasoconstriction of uterine spiral arteries	• Reduction or cessation of induction or augmentation agents^e • Maternal IV fluid bolus^{*,d} • Short acting uterine relaxation agent (eg, terbutaline)^k

New ACOG FHR CPG

Table 2. Potential Interventions Based on Clinical Findings (*continued*)

Finding	Potential Underlying Pathophysiology	Potential Intervention(s)
Recurrent decelerations associated with maternal expulsive efforts in the second stage of labor	Relative temporal hypoperfusion of uterine spiral arteries; Cord or head compression	• Modification of cadence of maternal expulsive efforts (eg, pushing every other contraction)[†] • Modification of maternal position[†] • Evaluation for operative vaginal delivery[†]

New ACOG FHR CPG

Box 3. Predictive Category II Fetal Heart Rate Tracing Characteristics

Higher-risk features of a category II FHR tracing include one or more of the following:

- Absent variability
- Prolonged, otherwise unexplained, minimal variability*
- Unexplained change in baseline from normal to tachycardia
- Recurrent late, recurrent variable, or more than one prolonged deceleration

Protective features include one or both of the following:

- Moderate variability
- Accelerations

New ACOG FHR CPG

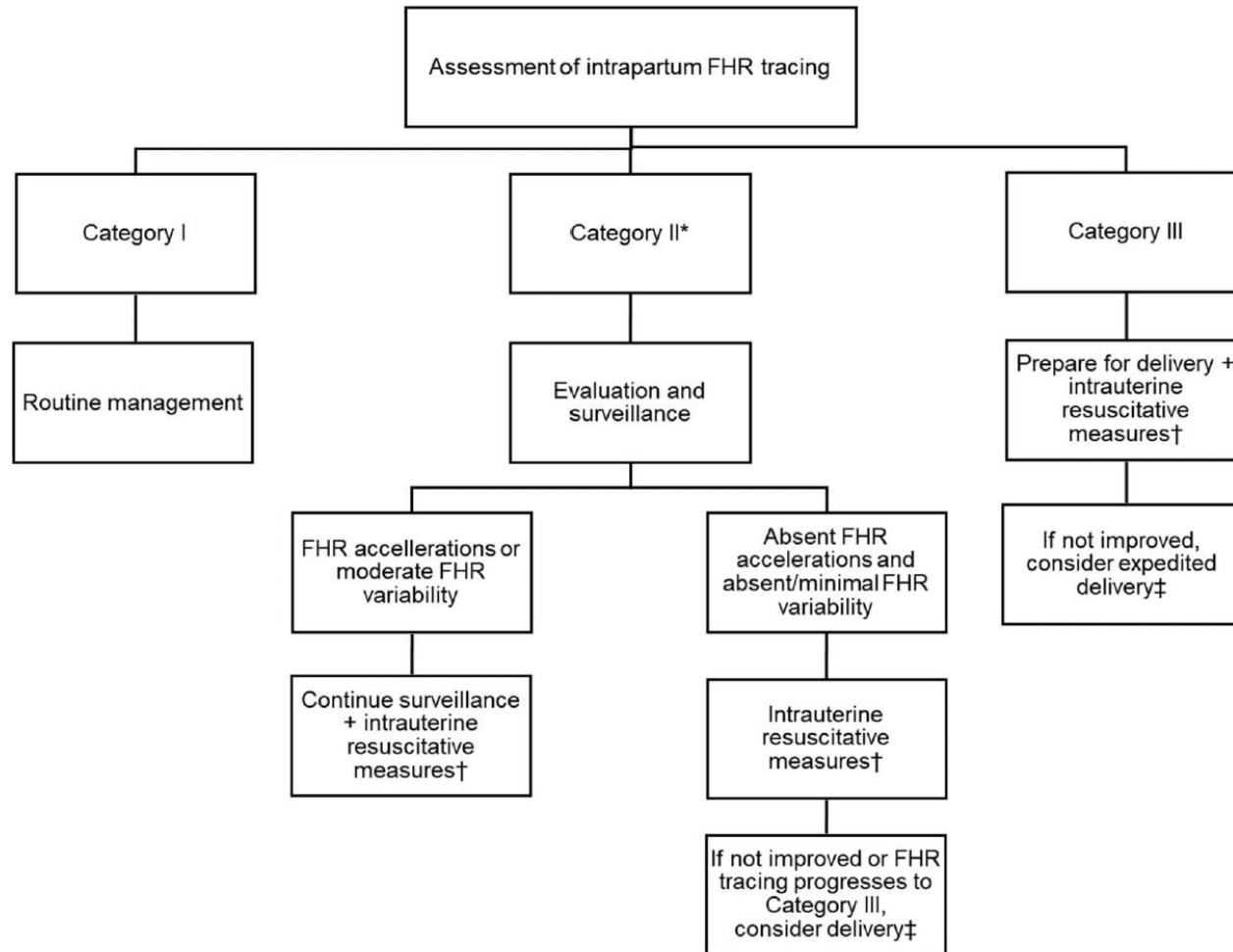


Fig. 1. Management algorithm of intrapartum fetal heart rate (FHR) tracings based on the three-tiered category system. *Given the wide variation of FHR tracings in category II, this algorithm is not meant to represent assessment and management of all potential FHR tracings but to provide an action template for common clinical situations. †See Table 2 for a list of various intrauterine resuscitative measures. ‡Timing and mode of delivery based on feasibility and maternal-fetal status.

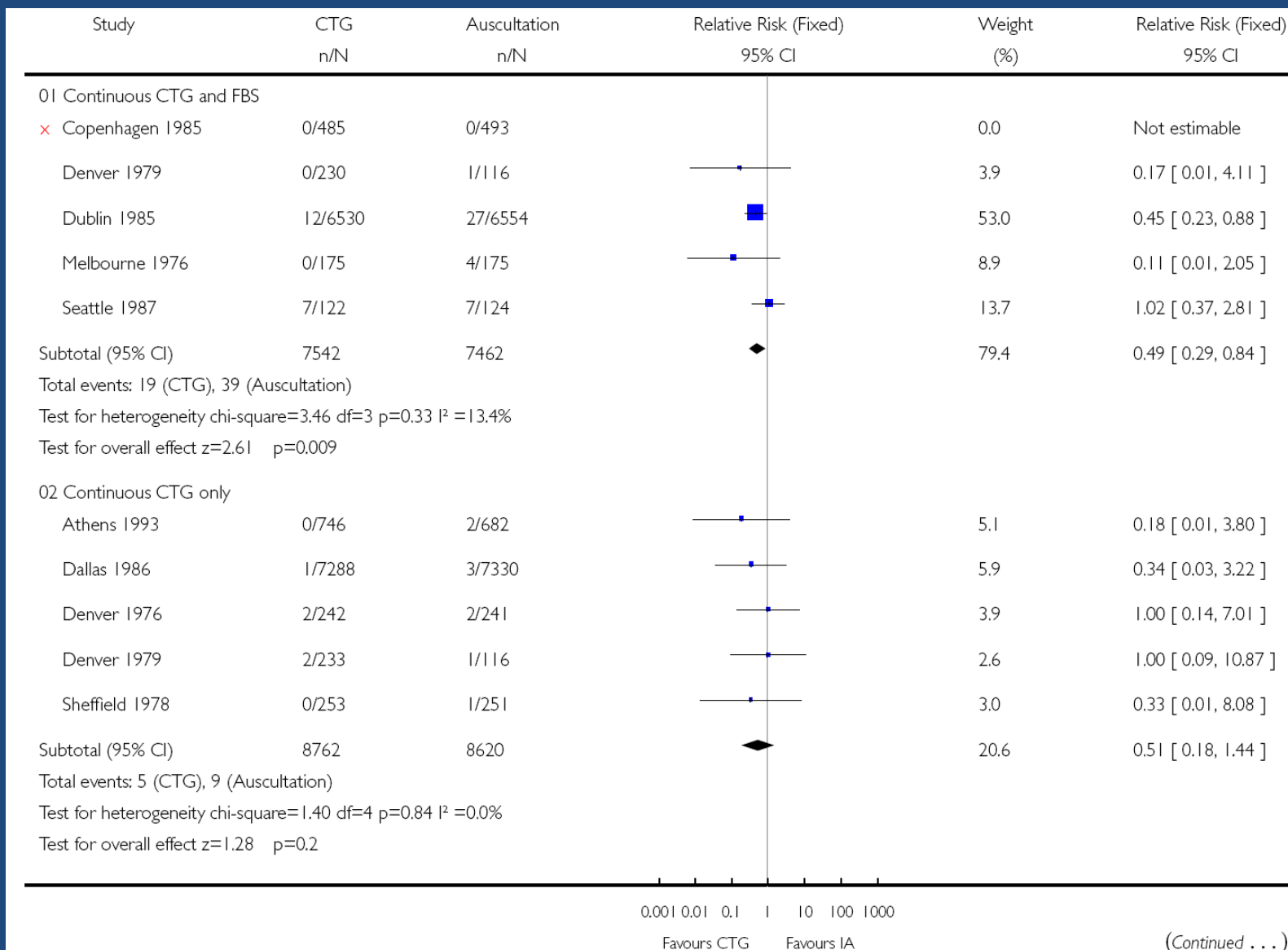
Thank you

Other Management Opportunities

- Scalp pH (FBS)
- Use of scalp stim before CS

EFM with or w/o FBS

Neonatal Seizure



Other Management Opportunities

- Use of scalp stim before CS
- Meta-analysis, 8 small studies, 2002
- Reported as + and – LR
- Digital - +LR 15.7 (3.2-76.2) / - LR 0.06 (0.01-0.31)
- Vibroacoustic stim: +LR 5.1 (CI 2.7-9.5) / -LR 0.2 (CI 0.1-0.4)
- Fetal scalp pH should be determined whenever possible after a positive stimulation test (lack of acceleration).

Skupski et al. Obstet Gynecol. 2002 Jan;99(1):129-34. Intrapartum fetal stimulation tests: a meta-analysis.