



Inpatient and Intrapartum Fetal Heart Rate Monitoring

FITZMAURICE 4.5.15

Learning Objectives

- ▶ Describe approaches to assessing fetal well being
- ▶ Describe methods of monitoring the fetus
- ▶ Describe the techniques of fetal monitoring
- ▶ Describe intrapartum fetal surveillance procedures, including indications and possible complications.
- ▶ Interpret electronic fetal monitoring
- ▶ Prerequisites
 - ▶ Overview of Interpreting Fetal Heart Rate Tracing
- ▶ See also, for closely related topics:
 - ▶ Outpatient antenatal testing
 - ▶ The Nonstress Test (NST) and Contraction Stress Test (CST)
 - ▶ Intermittent fetal monitoring in labor

Goals of Inpatient Fetal Monitoring

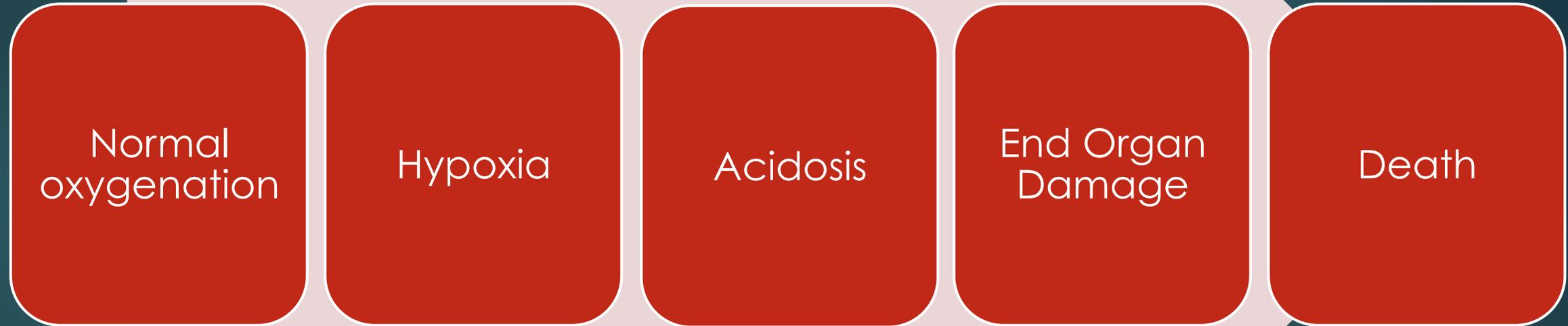
- ▶ Reassure ourselves regarding fetal status in order to prevent unnecessary interventions
- ▶ Detect fetal acidosis in order to allow:
 - ▶ Treatment of underlying cause, OR
 - ▶ Prompt delivery
- ▶ Prevent fetal injury or death due to asphyxia
 - ▶ Approximately 60% of term pregnancies with fetal asphyxia had no known risk factors
 - ▶ Detection of fetal acidosis should allow for intervention prior to “fetal distress cascade” reaching the irreversible end points of end organ damage (particularly neurologic injury) and death

Outpatient vs. Antepartum vs. Intrapartum Monitoring

Clinical Context	Clinical Question(s)	Treatment Options
Outpatient (antenatal testing)	-- Is there an increased risk of fetal death due to uteroplacental insufficiency within the next week?	-- continue outpatient testing (q3-4 days) -- Move to inpatient testing
Antepartum (inpatient)	-- Is the fetus becoming hypoxic? -- Is the clinical situation (e.g. uterine activity) changing? -- How will I detect a cord accident?	-- Increase frequency of monitoring or begin continuous fetal monitoring -- Move to delivery
Intrapartum	Same as antepartum, PLUS: -- Is the fetus acidemic RIGHT NOW? -- Can I safely allow labor to continue? For how long?	-- Expectant management -- Start/stop augmentation of labor -- Intrauterine resuscitation -- Assisted vaginal versus cesarean delivery

Fetal Distress Cascade:

Fetal heart rate changes appear early



Fetal heart rate monitoring:

Physiologic Rationale

- ▶ The fetal brain is incredibly sensitive to changes in blood oxygenation and pH
 - ▶ Interplay of sympathetic and parasympathetic stimulation/tone
 - ▶ Level of fetal activity



Changes in fetal heart rate pattern over time

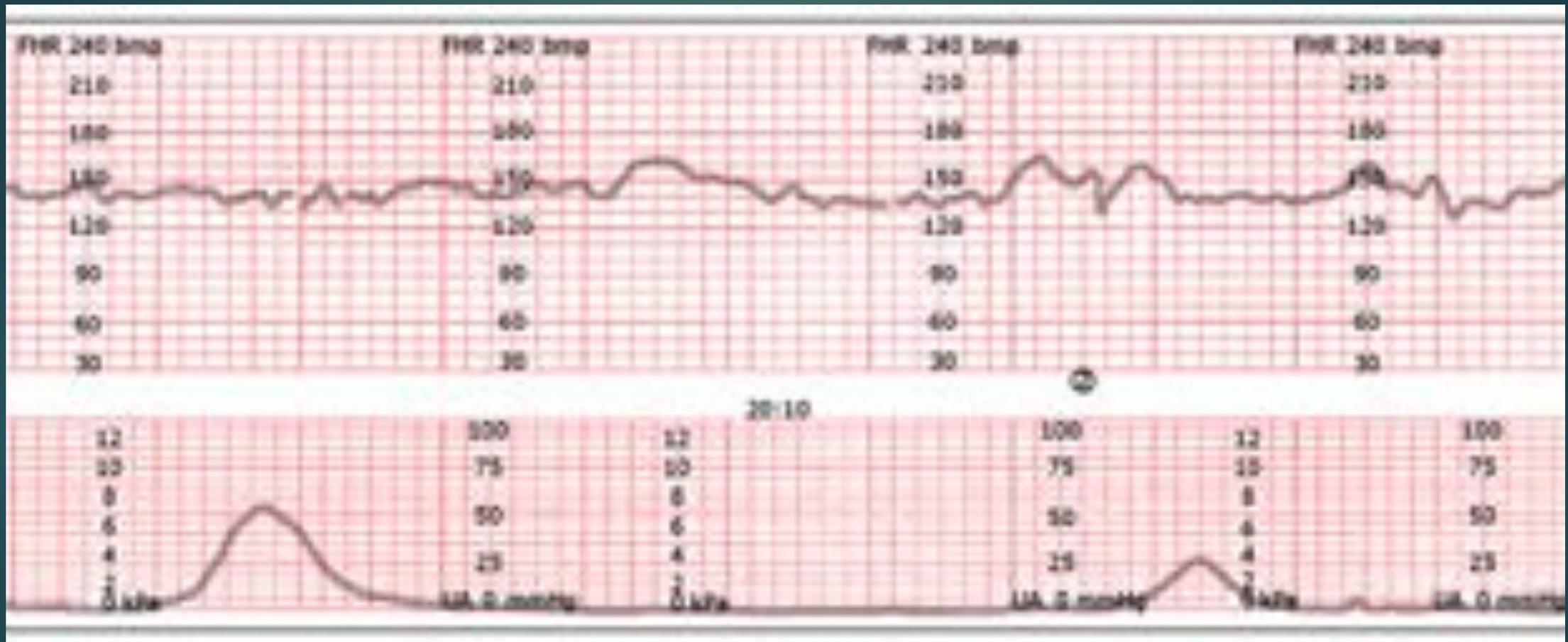
Limitations of Fetal Monitoring

- ▶ Despite strong biologic plausibility and extensive review/research, there is no high quality evidence that fetal monitoring achieves its goals
- ▶ Increases cesarean delivery and operative vaginal delivery rates
- ▶ Interpretation of fetal heart rate tracings is plagued by subjectivity and wide inter-observer variability

NICHD 2008 Three-Tiered Fetal Heart Rate Interpretation System

Category	Definition	Significance
Category I	<p>ALL of the following:</p> <ul style="list-style-type: none"> -- baseline 110-160 bpm -- moderate variability -- NO late or variable decelerations present <p>Accelerations and/or early decelerations may be present OR absent</p>	<p>Strongly predictive of NORMAL fetal acid-base status</p> <p>Routine care</p>
Category II	Any tracing not meeting criteria for categories I or III	<p>Indeterminate</p> <p>Take into account context Re-evaluate frequently/ increased surveillance Possible intervention</p>
Category III	<p>EITHER:</p> <ul style="list-style-type: none"> -- Absent variability plus ANY of the following: <ul style="list-style-type: none"> -- recurrent late decelerations -- recurrent variable decelerations -- bradycardia <p>OR</p> <ul style="list-style-type: none"> -- Sinusoidal pattern 	<p>Associated with fetal acidemia at the time of observation</p> <p>Expeditious resolution of underlying cause OR delivery</p>

Category I



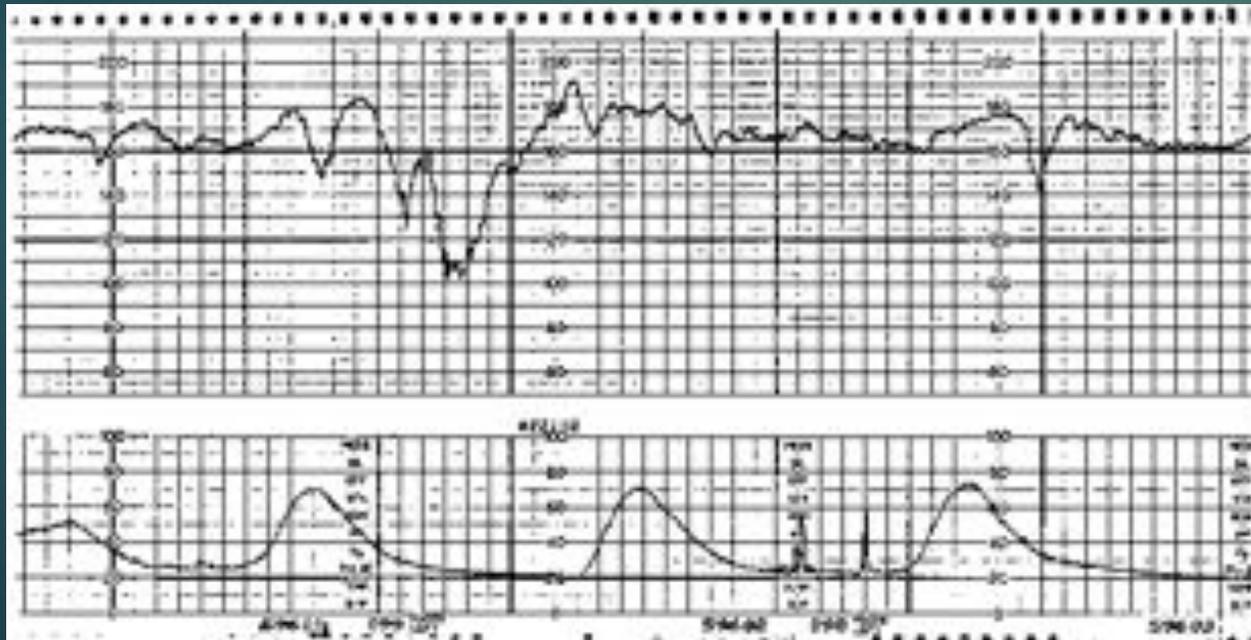
Category II

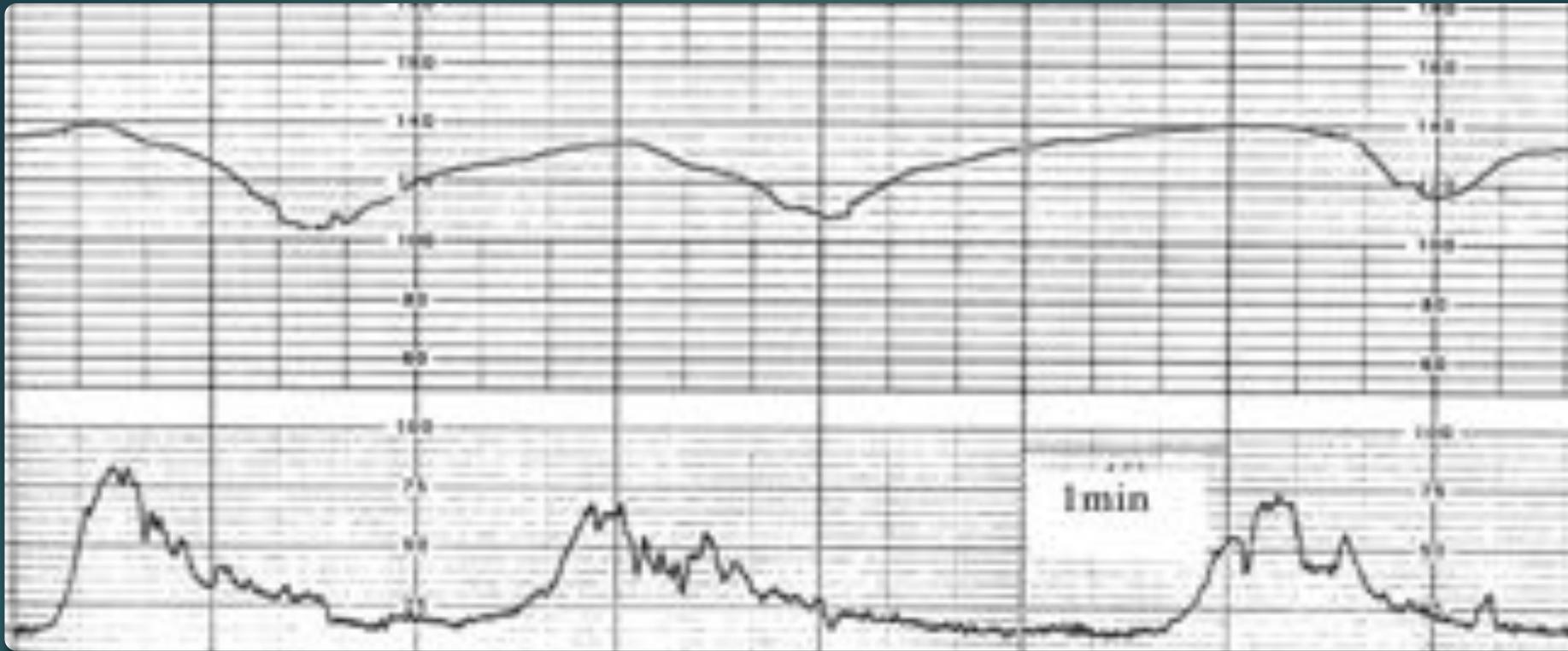
- minimal variability
- recurrent variables
- no accelerations

VS.

- moderate variability
- intermittent variables
- accelerations present

- Accelerations are associated with NORMAL fetal acid-base status
 - Includes those elicited by scalp-stim
- Moderate variability strongly associated with pH > 7.15 in some but not all studies





Category III tracing

- variability absent
- recurrent late decelerations

Category II or III tracing: Now what?

- ▶ Evaluate clinical context
 - ▶ What is the underlying cause?
 - ▶ Recent epidural? → hypotension?
 - ▶ Recent amniotomy? → cord prolapse?
 - ▶ Vaginal bleeding? → Abruptio?
 - ▶ Uterine tachysystole? → Inadequate myometrial relaxation?
 - ▶ How soon can a vaginal delivery be reasonably anticipated?
 - ▶ Ex. Is the patient a G5P4 at 10 cm or a G1P0 at 2 cm?
- ▶ Intervene, in series or combination, based on suspected underlying cause
 - ▶ Observation
 - ▶ Intrauterine resuscitation
 - ▶ Treatment directed at underlying cause (e.g. ephedrine for hypotension)
 - ▶ Operative delivery (Assisted vaginal or Cesarean)

Intrauterine Resuscitative Measures

Goal	Associated FHR abnormality	Potential interventions
Promote fetal oxygenation and improve uteroplacental blood flow	<ul style="list-style-type: none">-- Recurrent late decelerations-- Prolonged decelerations or bradycardia-- Minimal or absent FHR variability	<ul style="list-style-type: none">-- Place mother in lateral position (either left or right)-- Administer oxygen-- Give IV fluid bolus-- Reduce contraction frequency
Reduce uterine activity	<ul style="list-style-type: none">-- Tachysystole with Category II or III tracing	<ul style="list-style-type: none">-- Discontinue oxytocin or cervical ripening agents-- Administer tocolytic medication (e.g. terbutaline)
Alleviate umbilical cord compression	<ul style="list-style-type: none">-- Recurrent variable decelerations-- Prolonged decelerations or bradycardia	<ul style="list-style-type: none">-- Reposition mother (left or right lateral, hands and knees)-- Perform amnioinfusion-- cord prolapse → elevate presenting part and move to OR

Internal vs. External Monitoring

- ▶ Fetal heart rate
 - ▶ External monitor: Doppler ultrasound
 - ▶ Internal monitor: fetal scalp electrode
 - ▶ PROS: Avoids loss of signal, risks of misinterpreting signal (e.g. maternal, doubling) → indicated for poor quality tracing, frequent loss of signal. Lower threshold in high-risk patients (e.g. TOLAC)
 - ▶ CONS: Requires amniotomy, small risk of scalp bleeding, hematoma, infection
- ▶ Uterine activity
 - ▶ External monitor: mechanical pressure transducer
 - ▶ Internal monitor: intrauterine pressure catheter
 - ▶ PROS: allows measurement of strength and precise measurement of duration of contractions, as well as baseline uterine tone → indicated for protracted labor curve, poor quality monitoring, amnioinfusion
 - ▶ CONS: requires amniotomy, small risk of placental abruption or cord prolapse with insertion

IMPORTANT LINKS/REFERENCES

- ▶ [ACOG PRACTICE BULLETIN 106 – Intrapartum Fetal Heart Rate Monitoring: Nomenclature, Interpretation, and General Management Principles](#)
- ▶ [UpToDate.com, Young BK “Intrapartum Fetal Heart Rate Evaluation”](#)