INPATIENT AND INTRAPARTUM FHR MONITORING

FITZMAURICE/STELLER 12.31.23

LEARNING OBJECTIVES

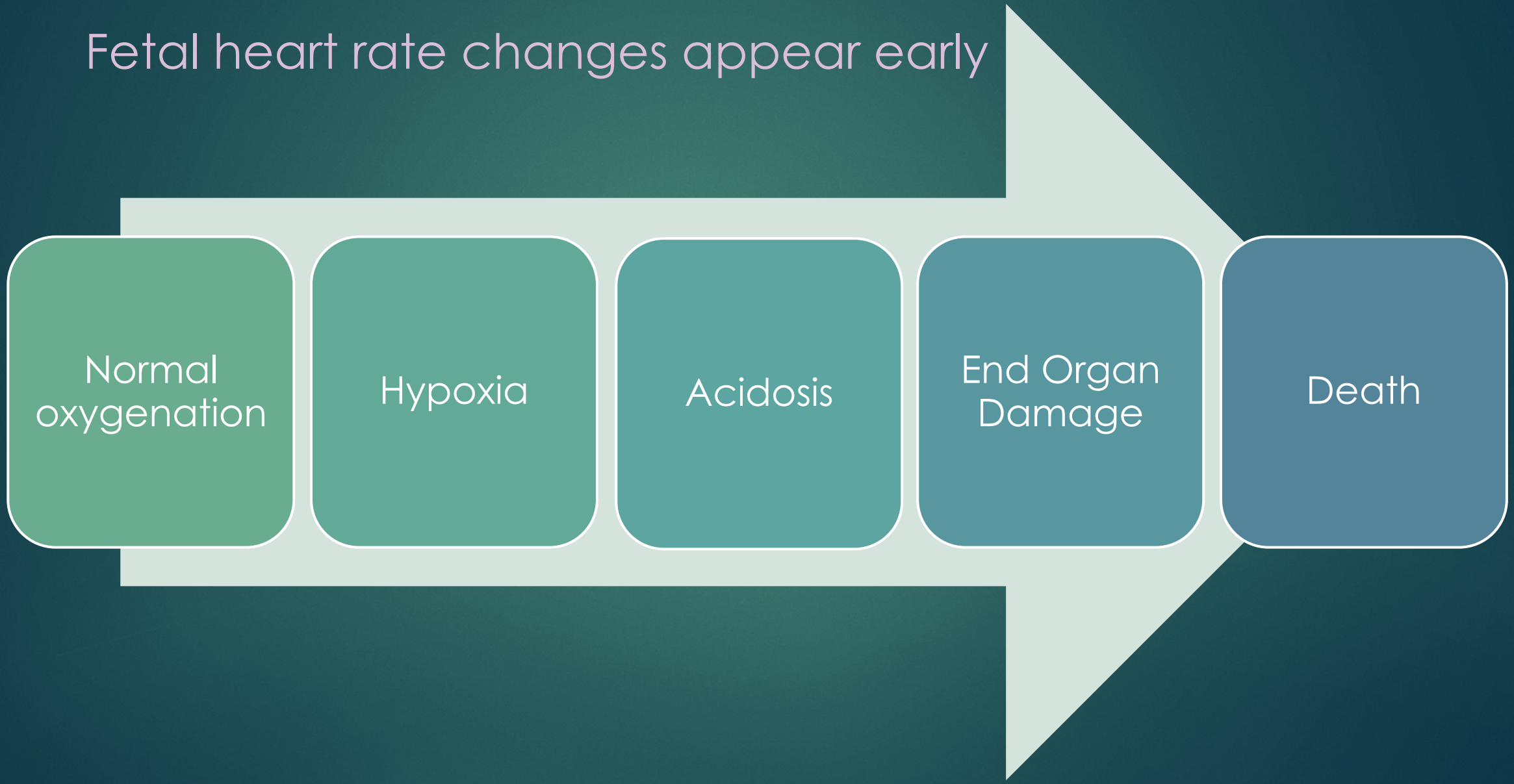
- Describe approaches to assessing fetal well being
- Describe methods of monitoring the fetus
- Describe the techniques of fetal monitoring
- Describe intrapartum fetal surveillance procedures, including indications and possible complications.
- Interpret electronic fetal monitoring
- Prerequisites
  - 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

- Gain reassurance 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 by recognizing the fetal distress cascade (next slide)
  - Approximately 60% of term pregnancies with fetal asphyxia had no known risk factors
  - Detection of fetal acidosis should allow for intervention prior to reaching the irreversible end points of end organ damage (particularly neurologic injury) and stillbirth

FETAL DISTRESS CASCADE

Fetal heart rate changes appear early



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 (i.e., 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 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

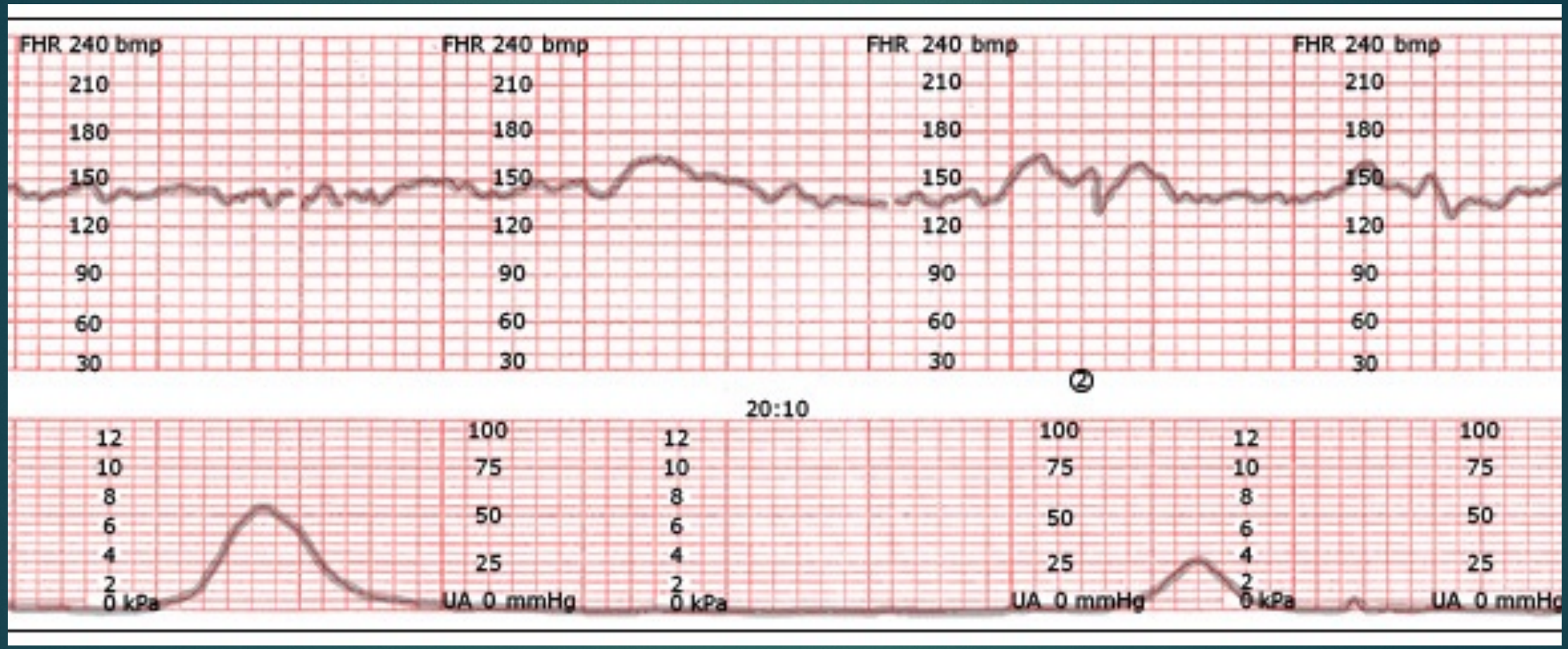
LIMITATIONS OF FETAL MONITORING

- 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 LABOR FETAL HEART RATE INTERPRETATION SYSTEM

Category	Definition	Significance
Category I	ALL of the following: -- Baseline 110-160 bpm -- Moderate variability -- NO late or variable decelerations present ** Accelerations and/or early decelerations may be present OR absent	Strongly predictive of NORMAL fetal acid-base status Plan: Routine care
Category II	Any tracing not meeting criteria for categories I or III	Indeterminate Plan: Take into account context, re-evaluate frequently, Consider intervention (i.e., amnioinfusion)
Category III	1. Absent variability plus ANY of the following: -- Recurrent late decelerations -- Recurrent variable decelerations -- Terminal fetal bradycardia 2. Sinusoidal pattern	Associated with fetal acidemia at the time of observation Plan: Expeditious resolution of underlying cause OR emergent delivery

CATEGORY I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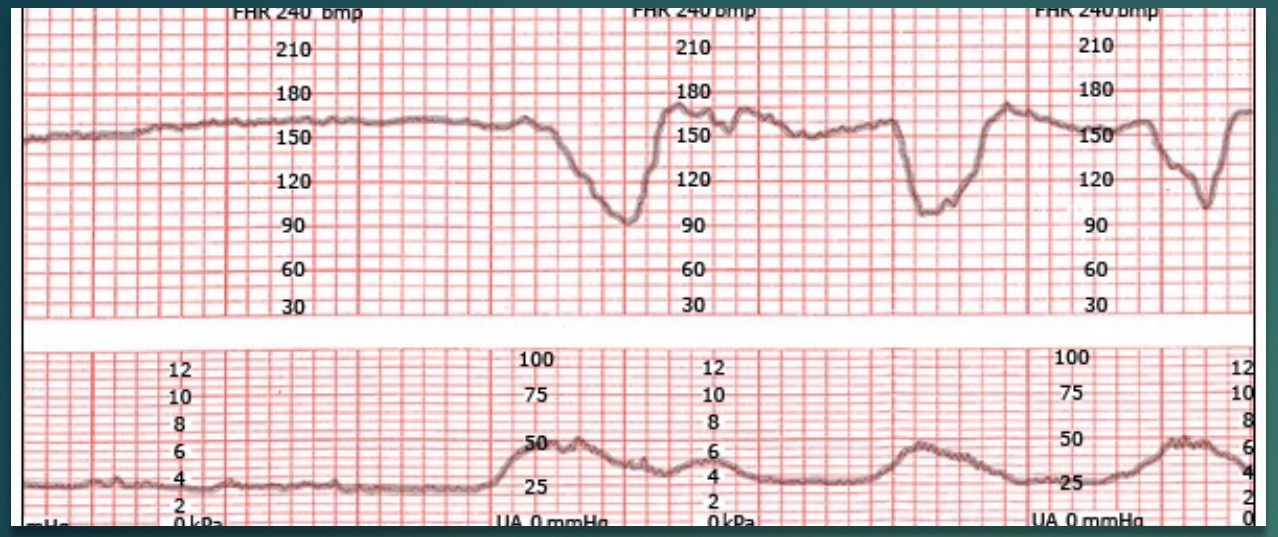
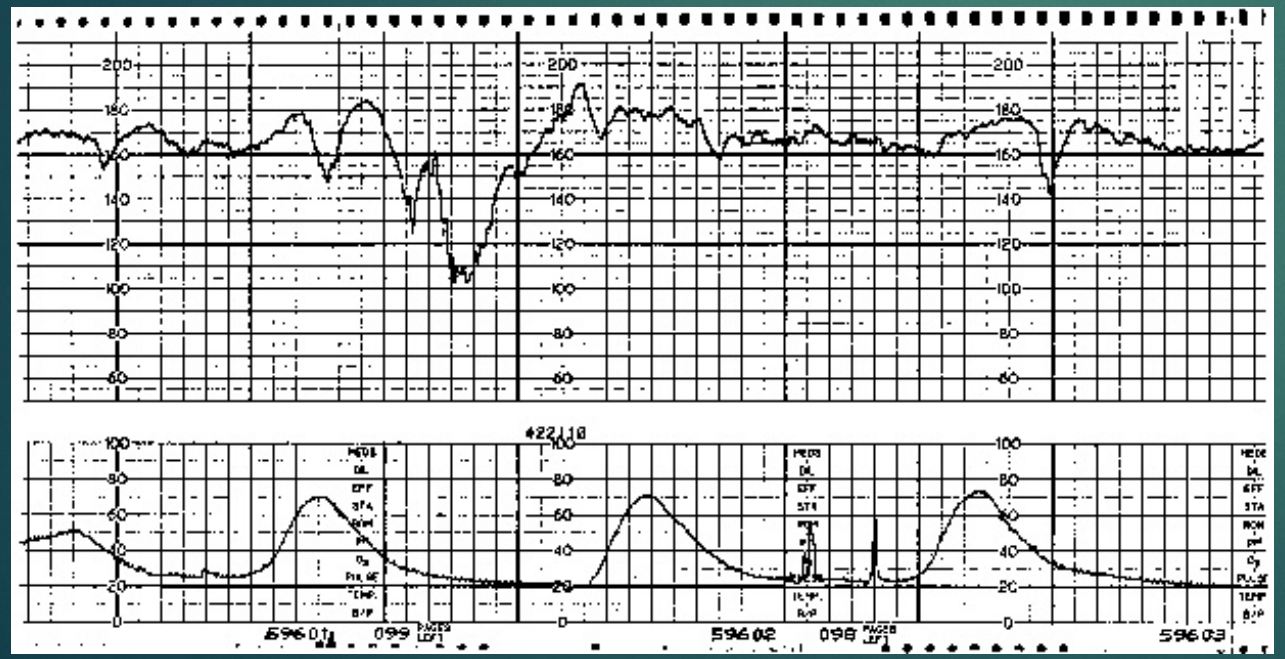
CATEGORY II



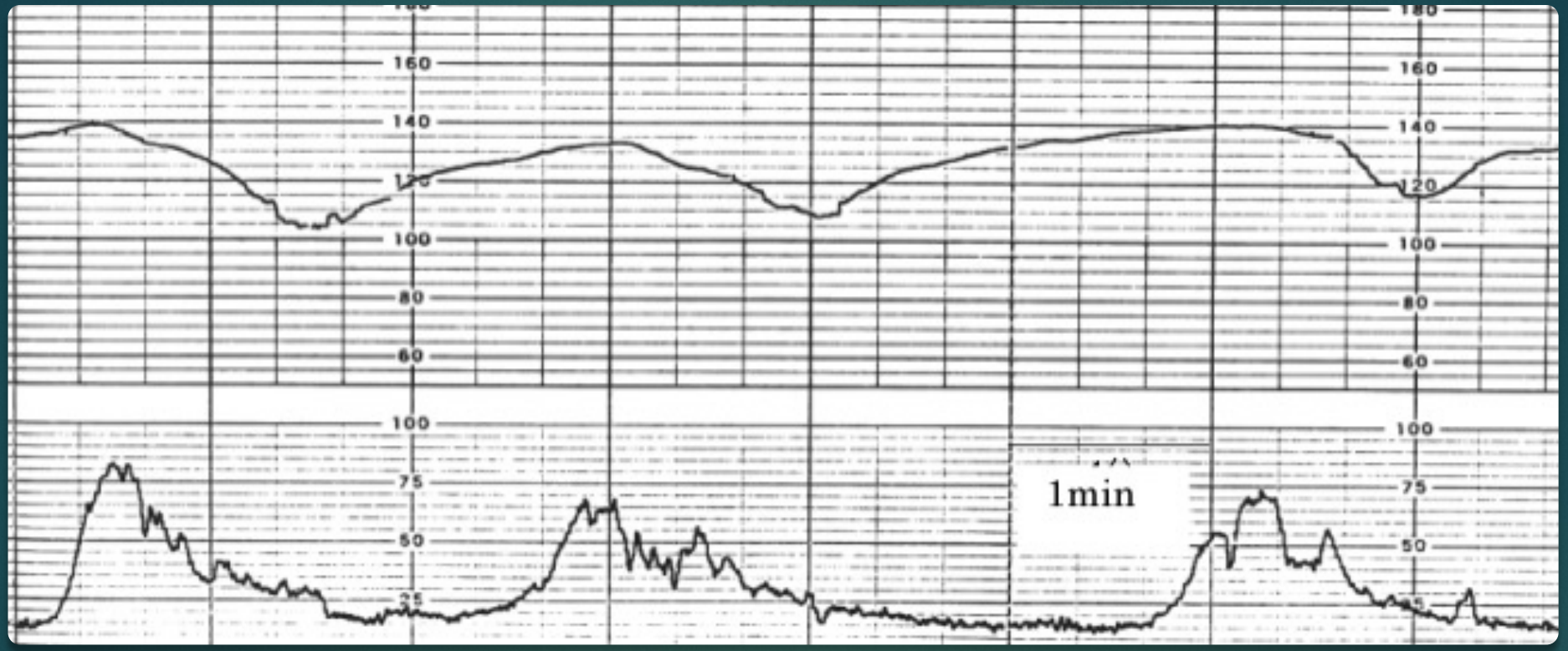
-- minimal variability
-- recurrent variables
-- no accelerations

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? → Abruption?
    - 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
  - Continued close observation
  - Intrauterine resuscitation
  - Treatment directed at underlying cause (ex. 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	-- Recurrent late decelerations -- Prolonged decelerations or bradycardia -- Minimal or absent FHR variability	-- Place mother in lateral position (either left or right) -- Administer oxygen -- Give IV fluid bolus -- Reduce contraction frequency
Reduce uterine activity	-- Tachysystole with Category II or III tracing	-- Discontinue oxytocin or cervical ripening agents -- Administer tocolytic medication (e.g. terbutaline)
Alleviate umbilical cord compression	-- Recurrent variable decelerations -- Prolonged decelerations or bradycardia	-- Reposition mother (left or right lateral, hands and knees) -- Perform amnioinfusion -- cord prolapse → elevate presenting part and move to OR

Source: UptoDate.com

INTERNAL VS. EXTERNAL MONITORING

- Fetal heart rate
  - External monitor: uses Doppler ultrasound
  - Internal monitor: fetal scalp electrode (FSE)
    - FSE avoids loss of signal or risks of misinterpreting signal (i.e., maternal HR)
    - However, placement requires amniotomy to place and carries small risk of scalp bleeding, hematoma, and infection
- Uterine activity
  - External monitor: mechanical pressure transducer
  - Internal monitor: intrauterine pressure catheter (IUPC)
    - IUPC allows for measurement of strength and precise measurement of duration of contractions, as well as baseline uterine tone
    - However, placement also requires amniotomy, and small risk of placental abruption

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"