

# FETAL MONITORING

## INTRODUCTION TO FETAL HEART MONITORING

### BASELINE PATTERNS

#### RATE

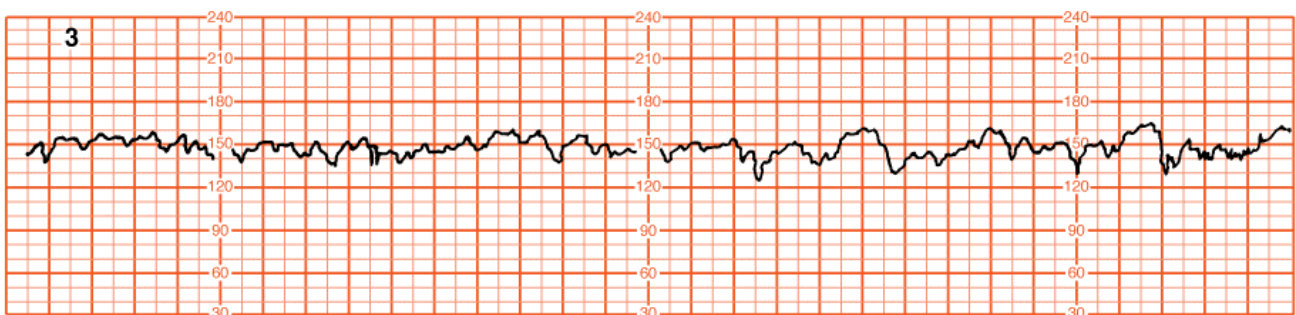
- It is the **mean FHR during a 10-minute segment**

Periodic changes and periods of marked FHR variability are excluded when calculating the mean FHR

- Normal baseline FHR** is 110-160 beats/min.
- Tachycardia**
  - If the baseline FHR is >160 beats/min.
    - Mild: >160 beats/min.
    - Marked: >180 beats/min
  - It is due to
    - fetal: hypoxia
    - maternal: fever, thyrotoxicosis, sympathomimetics
- Bradycardia**
  - If the baseline FHR is <110 beats/min.
    - Mild: <110 beats/min.
    - Marked: < 100 beats/min.
  - It is due to Fetal hypoxia, fetal congenital heart block, and Maternal SLE

#### VARIABILITY

- Short term** (beat-to-beat): 5-10 beats/min
  - Absent variability due to fetal hypoxia, tachycardia, prematurity.
  - minimal variability:  $\leq 5$  beats/min
  - moderate variability: 6 to 25 beats/min
  - marked variability: >25 beats/min, due to mild fetal hypoxia
- Long term** (fluctuations in the baseline FHR  $\geq 2$  cycles/min).



Normal FH pattern (normal rate and normal variability)

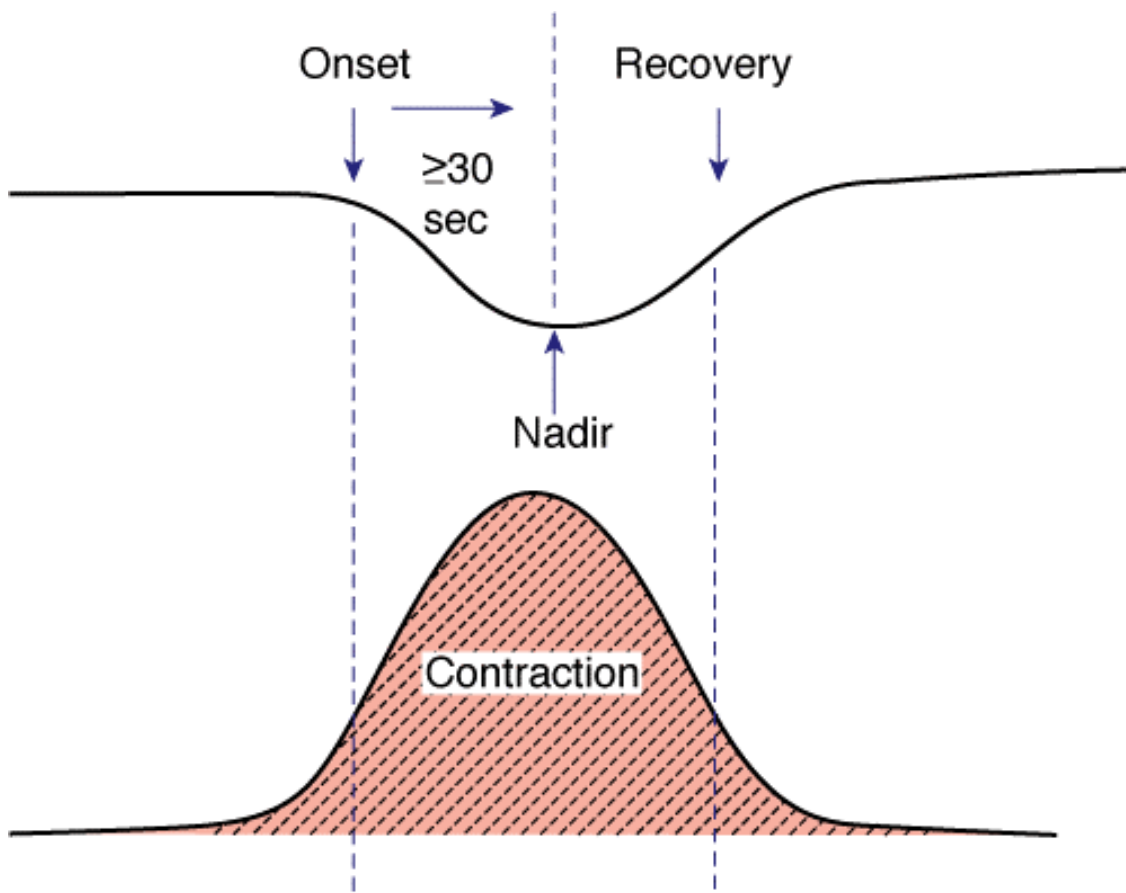
PERIODIC PATTERNS

ACCELERATION

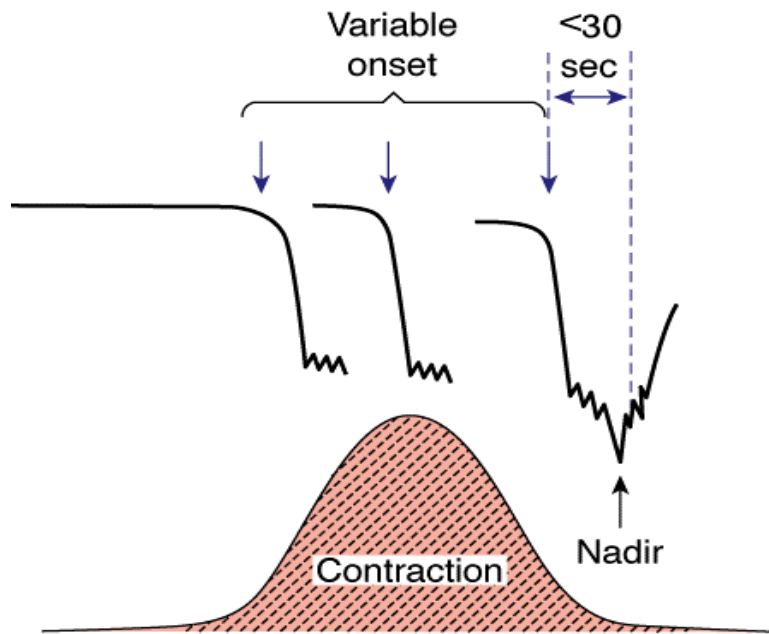
- Definition: increase in FHR  $\geq 15$  beats/min above the baseline, and lasts  $\geq 15$  seconds and  $< 2$  minutes.
- Acceleration occurs with
  1. fetal movements (This is the basis for the [Non Stress test](#))
  2. Uterine contractions.
- **Prolonged acceleration** is  $\geq 2$  minutes and  $< 10$  minutes.

DECELERATION

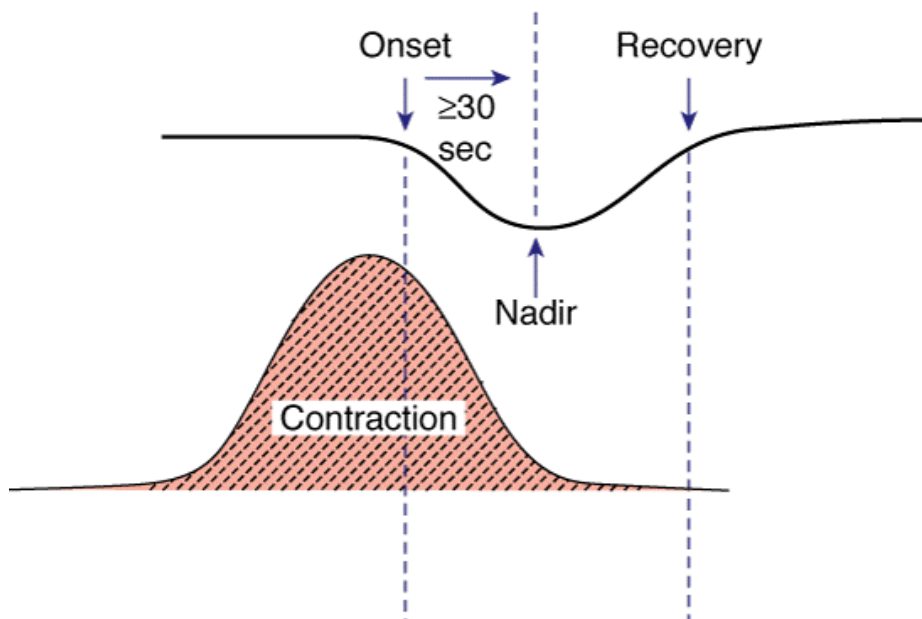
- **Early deceleration** (type I dips) of the FHR
  1. Decrease and return to baseline FHR associated with a uterine contraction.
  2. The onset, nadir, and recovery of the deceleration are coincident with the beginning, peak, and ending of the contraction, respectively.
  3. It is due to fetal head compression with vagal stimulation



- **Variable deceleration** (type II a dips) of the FHR
  - Abrupt decrease in FHR below the baseline.
  - When variable decelerations are associated with uterine contractions, their onset, depth, and duration vary with successive uterine contractions.
  - It is due to umbilical cord compression.



- **Late deceleration** (type II b dips) of the FHR
  - Gradual decrease and return to baseline FHR associated with a uterine contraction.
  - The onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, respectively.
  - It is due to placental insufficiency causing fetal hypoxia.



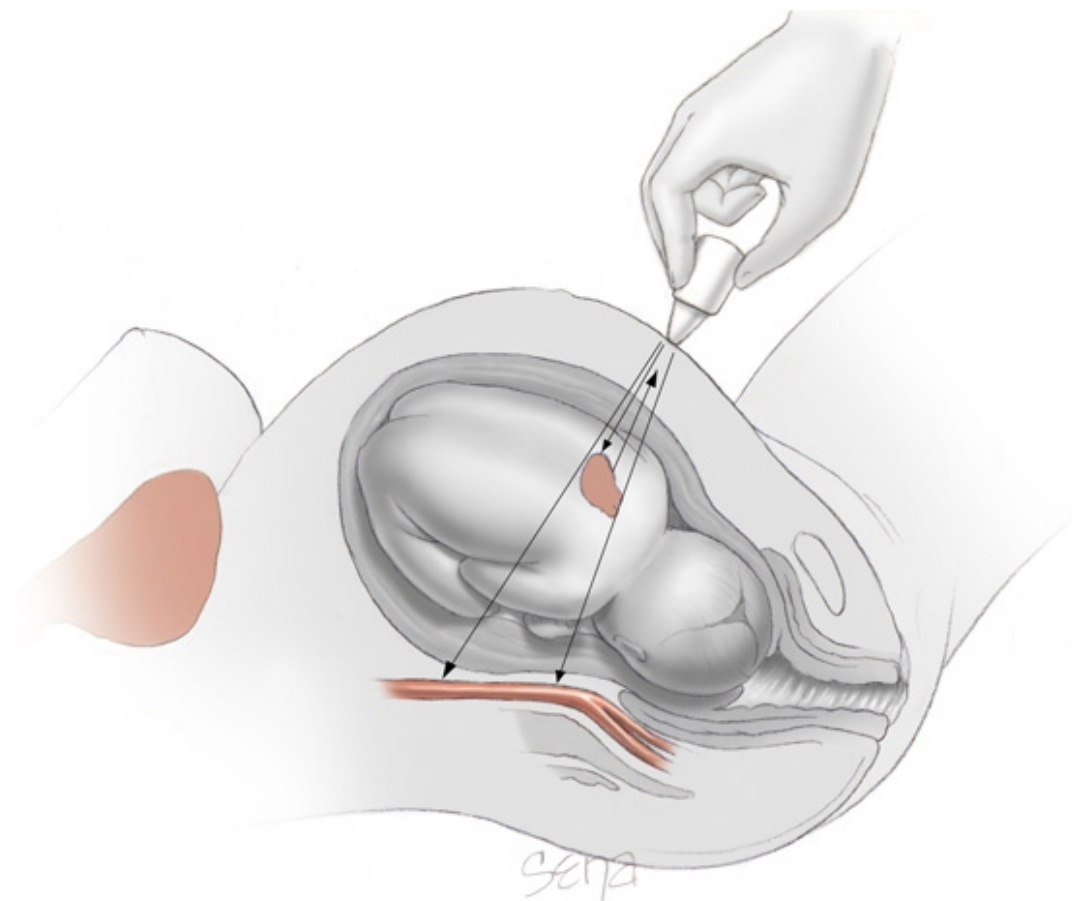
- **Prolonged deceleration:** is  $\geq 2$  minutes, but  $< 10$  minutes.

## ANTEPARTUM FETAL MONITORING

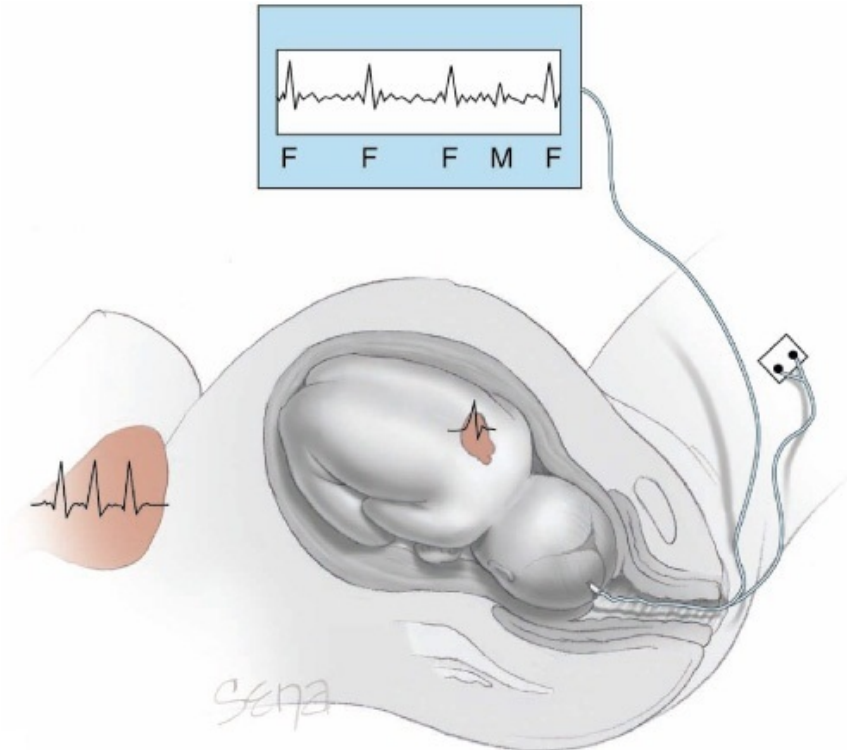
- **Indications:** conditions associated with increased risk of chronic fetal hypoxia
- **Methods:**
  1. **Fetal kick count:** the time required for 10 movements to occur is noted daily. It is considered abnormal if 10 movements are not counted within 12 hours or if it takes the patient twice as long to count to 10 as it did the week before. *It has NO value in reducing PNM.*
  2. **Non Stress Test (NST):** During awake & REM-sleep periods, fetal moves.
    - a. reactive: at least 2 accelerations each 15 beats above baseline rate & lasts 15 seconds during 20 minutes period
    - b. non-reactive
      - (1) causes
        - (a) fetal hypoxia-acidosis
        - (b) other causes: non-REM sleep, maternal sedation, fetal CNS anomalies
    - c. If the NST is reactive the test is extended 45 minutes or the fetus is awakened by artificial larynx or manually.
  3. **VAST:** (FAST: Fetal Acoustic Stimulation Test)
    - a. The fetus is awakened by vibroacoustic stimulation (The test uses stimulation with an artificial larynx over the fetal head for 1 to 3 seconds). A healthy fetus will respond with sudden movement (**STARTLE RESPONSE**) followed by acceleration of the fetal heart rate.
    - b. If the test is still non-reactive, BPP is done
  4. **Bio Physical Profile (BPP): it is composed of 5 steps. The normal observation scores 2/2** (total 10/10). If the BPP is normal repeat after 1 week except in diabetic & post term pregnancy repeat twice weekly.
    - a. Non stress test: reactive.
    - b. Fetal breath movement:  $\geq 1$  in 30 min.
    - c. Fetal movement:  $\geq 3$  in 30 min.
    - d. Fetal tone:  $\geq 1$  limb extension with return to flexion in 30 min.
    - e. Amniotic fluid volume:  $\geq 1$  pocket measures  $\geq 1$  cm in 2 perpendicular diameters.
  5. **Modified Bio Physical Profile (MBPP):** Is considered normal if the NST is reactive and the amniotic fluid index is normal
  6. **Contraction Stress Test (CST).**
    - a. uterine contractions compress spiral arterioles causing reduction in placental blood flow
    - b. abnormal: [late deceleration](#) with each contraction induced by oxytocin (**oxytocin challenge test**) or nipple stimulation (**nipple stimulation test**)
    - c. contraindications: previous classic USCS, PROM, threatened PTL, Placenta previa
  7. **Doppler:** ultrasound waveform analysis of the fetal & uterine vessels
    - (1) fetal middle cerebral artery, Ductus venosus, umbilical vessels
    - (2) uterine arteries
    - b. Methods of waveform analysis
      - (1) systolic/diastolic ratio (S/D ratio)
      - (2) **Resistance index:** systole/ (systole + diastole).
    - c. Clinical application:
      - (1) **IUGR (Review the findings in IUGR).**
      - (2) post term pregnancy
      - (3) Preeclampsia

## INTRAPARTUM FETAL MONITORING

- Indications:
  1. Conditions associated with increased risk of chronic fetal hypoxia
  2. Conditions associated with increased risk of acute fetal hypoxia
  3. meconium stained liquor
- Methods:
  1. FHR monitor
    - a. Intermittent Auscultation:
      - (1) using the Sonic-Aid
      - (2) FHR **MUST** be routinely recorded for 30 seconds after uterine contraction every 30 min (1<sup>st</sup> stage) & every 15 min (2<sup>nd</sup> stage) in low risk cases.
    - b. **Continuous Electronic Fetal Heart Monitor (EFM)**: proper evaluation of FHR patterns requires simultaneous recording of FHR & uterine contractions
      - (1) **External: Cardio Toco Graphy (CTG)**. It is easy, non-invasive, no risk of intra-amniotic infection

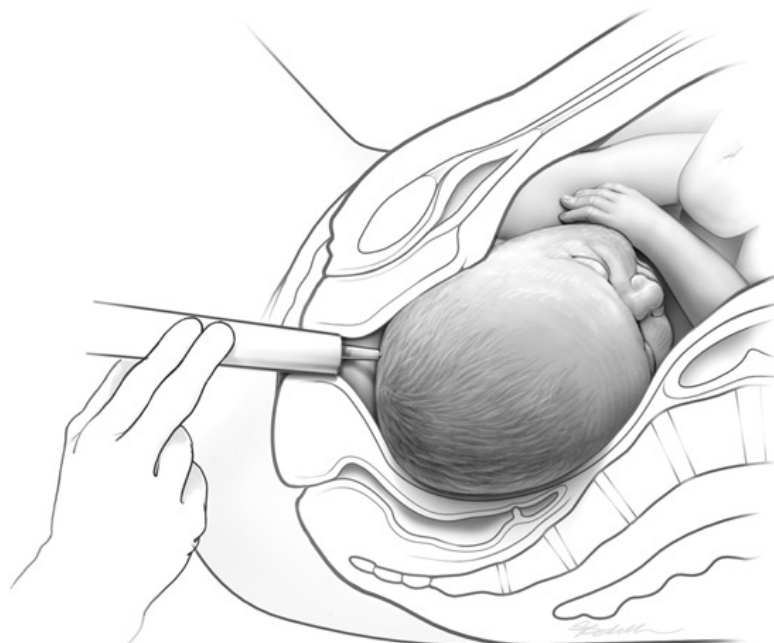


- (2) **Internal:** a transcervical bipolar electrode is attached to fetal scalp or buttocks after ROM with internal monitor of uterine contractions. It's invasive but it reveals beat to beat (short term) variability

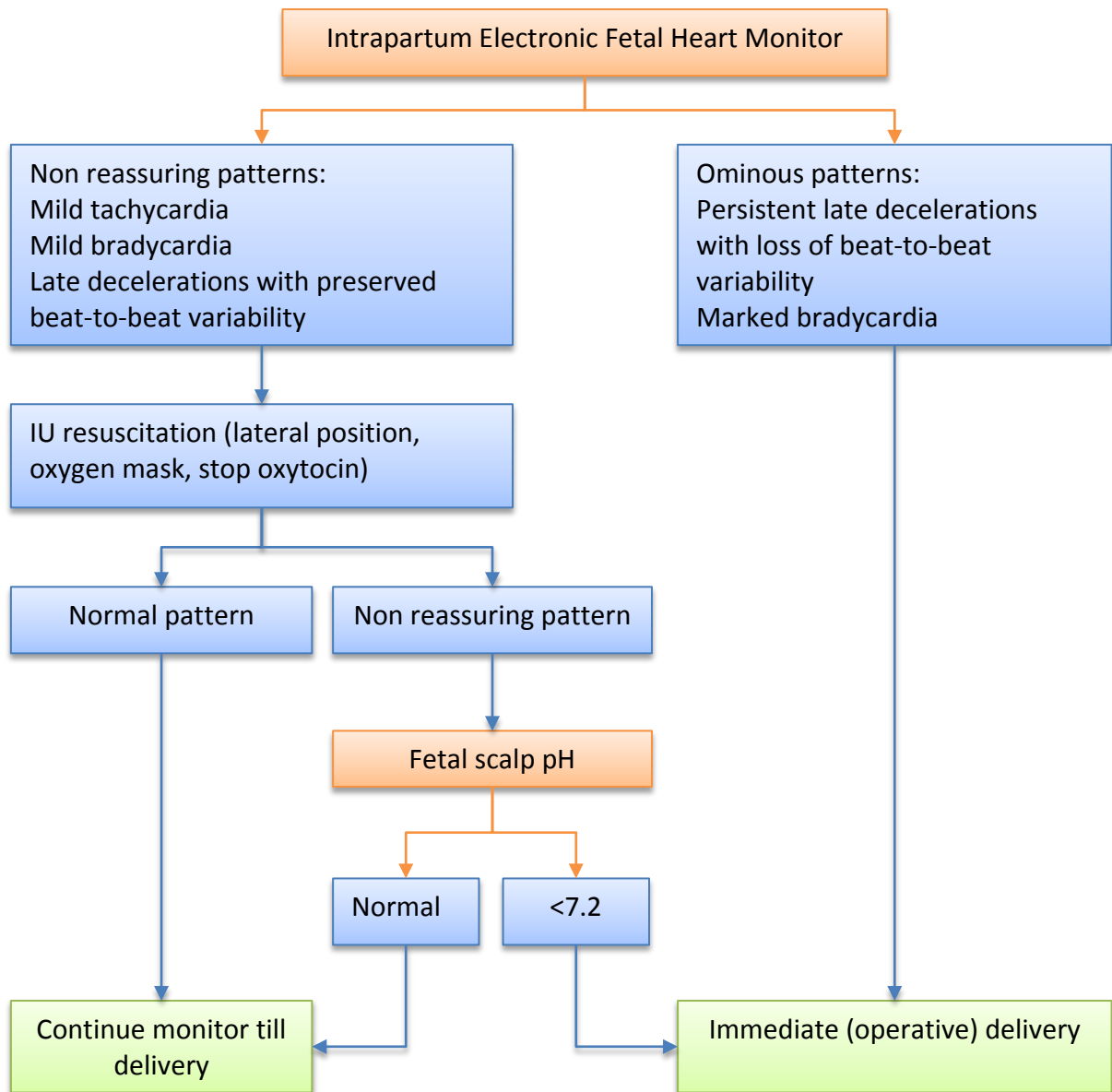


**2. Fetal Acid Base Balance:**

- a. method: fetal scalp blood sample
- b. normal: pH: 7.25-7.35
- c. indications: see flow-chart
- d. contraindications
  - (1) Fetal clotting defects.
  - (2) Maternal herpes virus infection.



**3. Continuous fetal pulse oximetry:** safe, reliable, noninvasive.



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