

- Intrapartum Fetal Surveillance
- 4235
- 9-08
- Learning Objectives
- Identify the purpose of fetal surveillance during labor
- Explain the normal and pathologic influence on the fetal heart rate
- Identify the advantages and limitation of auscultation and electronic surveillance
- Describe the interpretation of the data
- Explain the equipment used for electronic fetal monitoring
- Describe appropriate responses to non-reassuring fetal heart rate patterns.

- Concepts
- Oxygenation/Perfusion
- Safety
- Health Maintenance/Promotion

- Introduction
- Fetal surveillance uses several methods to identify signs of well being or compromise of the fetus
 - Two approaches – each with advantages and limitations
 - High tech
 - Low tech

— Purpose

- Evaluate how fetus tolerates stress of labor
- Identify hypoxic insult to fetus during labor

■ Fetal Oxygenation

- Oxygen and nutrient rich blood enter intervillous spaces via maternal spiral arteries
- Fetal blood circulates in capillaries in intervillous spaces, exchange of O₂ and nutrients for fetal waste takes place here.
- During labor, spiral arteries are compressed by uterine contractions, stopping maternal blood flow into intervillous spaces
- Fetus depends on oxygen supply already present
 - Enough to last about 1-2 minutes

■ 5 Fetal Factors That Regulate Heart Rate

■ 1) Autonomic Nervous System

— Sympathetic and parasympathetic branches of ANS

- Sympathetic increases heart rate, cardiac output by release of epinephrine and norepinephrine
- Parasympathetic slows heart rate and maintains short term variability by way of vagus nerve stimulation

■ 2) Baroreceptors

- Cells in carotid respond when fetal BP increases, stimulates vagus nerve to slow heart rate, BP falls as cardiac outputs decreases

- 3) Chemoreceptors
 - Cells in brain and aortic respond to changes in O₂, CO₂ and pH
 - Decrease in O₂ or pH or increase in CO₂ cause increase in heart rate
 - Prolonged hypoxia or acidosis depresses fetal heart rate
- 4) Adrenal glands
 - Secretes epinephrine and norepinephrine in response to stress, causes sympathetic nervous system to increase heart rate
- 5) Cerebral cortex
 - Causes heart rate to increase with fetal movement, decrease with fetal sleep
 - Hypothalamus coordinates the two branches of ANS
- Influences That Compromise Fetal Oxygenation
- Maternal cardiopulmonary alterations
 - Anything that causes reduction in circulating blood volume reduces circulation to fetus
 - Maternal hypertension d/t vasospasm and narrowing of spiral arteries
 - Decreased O₂ level in blood from respiratory problems such as smoking or asthma or from DKA
- Uterine activity
 - Hypertonic uterine activity decreases time available for exchange
- Placental disruptions
 - Abruptio and infarcts reduce amount of placental surface able to exchange

- Interruptions in umbilical flow
 - Compression by fetal body, nuchal cord, knot
 - Oligohydramnious
- Fetal Alterations
 - Low fetal blood volume, hypotension, anemia, cardiac or CNS anomalies
- Low Tech Surveillance
- Intermittent auscultation of FHR
 - Use of Doppler or fetoscope
 - Determine fetal back, listen over it
- Palpation of uterine contractions
 - Palpate fundus of contraction
 - Subjectively describes intensity as
 - as mild, moderate or strong based on ability to indent uterine muscle
 - Time duration and frequency manually
- Low Tech Surveillance
- Advantages
 - Mobility
- Limitations
 - Intermittent nature, usually done between contrx
 - No continuous printout to identify patterns or trends
 - Is staff intensive

- High Tech Surveillance
- Electronic Fetal Monitoring or EFM
 - May be intermittent or continuous
 - Advantages
 - Supplies more data about FHR, prints permanent record
 - Can determine subtle trends, show response before, during and after contractions when done continuously
 - Limitations
 - Reduced mobility
 - Constant adjustment of equipment with movement
 - May be uncomfortable to mom
- Consists of bedside monitor and sensors
 - Provides visual output on screen or graph paper
 - Can monitor internally or externally
- Computer interface allows documentation
- Telemetry enables wireless transmission of signal to base allowing ambulation while monitoring
- Remote surveillance at central location if nurse not at bedside
- Paper strip
 - Two horizontal grids
 - Lower grid for contractions as mm of Hg
 - Upper one for FHR as beats per min

- Also vertical grid

- Measures time by dividing into 60 second and 10 second intervals



External monitoring

- Can do both FHR and contractions externally

- Toco for contractions placed over uterine fundus

- Transducer for FHR placed over fetal back

- Devices are secured on mother's abd with elastic straps or a stockinette tube

- Less accurate than internal, but non-invasive

- Can get interference from mother's heart, hiccups, deep respirations, vomiting, movement, abd fat, poor placement of transducers

- External monitor measures frequency and duration of contractions but not intensity



Internal monitoring

- FHR using scalp electrode

- Membranes must be ruptured and cervix open 2 cm

- Electrode penetrates fetal scalp about 1 mm

- Avoid placing on fetal face, fontanelles and genitals

- Wire protrudes from vagina, fastened to leg plate

- Contractions using Intrauterine pressure catheter (IUPC)

- Membranes must be ruptured and cervix open 2 cm

- Can detect frequency, duration and intensity

- Can also be used for amnioinfusion



- Evaluating Monitor Strips
- Must evaluate both contractions and FHR together
 - Interpretation is often subjective
- FHR
 - Evaluate baseline rate, variability and patterns of change from baseline
- Contractions
 - Evaluate duration, frequency, intensity and resting tone
- Other relevant data
 - Mother's VS, position, meds, anesthetic, oxygen
- Baseline FHR
 - Describe by rate and variability rounded to nearest 5 bpm
 - Baseline assesses average rate for 2 minutes within 10 minute window with uterus at rest
 - Excludes any temporary increases or decreases
 - Normal = 110-160 bpm
 - Bradycardia = < 110 bpm lasting at least 10 min
 - Tachycardia = > 160 bpm lasting at least 10 min
- Baseline variability
 - Describes fluctuations that give tracing irregular appearance instead of smooth, flat line
 - May be decreased by:
 - Fetal sleep up to 2 hours
 - Sedatives, narcotics

- Alcohol, illicit drugs
- Immature fetus (< 28 weeks)
- Fetal anomalies affecting CNS regulation of FHR
- Severe hypoxia
- Cardiac anomalies
- Maternal hypoxemia

— Occur because of multiple factors that constantly speed and slow FHR

— Important indicator of fetal well being for 2 reasons

- Adequate oxygenation promotes normal function of ANS, helps fetus adapt to stress of labor
- Evaluates function of ANS, especially parasympathetic branch

— Described as

- Moderate 6-25 bpm – considered reassuring
- Absent if not detectable at all
- Minimal if 5 or less bpm
- Marked if over 25 bpm

■ Periodic patterns

— Temporary, recurrent changes in baseline associated with contractions

— Include accelerations and decelerations in FHR

— Are described in addition to the baseline rate and variability

■ Accelerations

- FHR that peaks 15 beats above baseline and lasts 15 seconds
- Usually occur with fetal movement
- Can occur with or without contractions
- Is reassuring sign
- Preterm fetus (< 32 weeks) may have

■ Decelerations

- Classified into 3 different types based on shape and relationship to contraction
 - Early
 - Late
 - Variable

■ Early decels

- Fetal head compression increases intracranial pressure, causes vagus nerve to slow heart rate
- Not associated with fetal compromise
- Requires no interventions
- Uniform in appearance, mirrors contraction
- Gradually falls from baseline, but returns by end of contraction
 - Falls rarely > 30-40 bpm
- Nadir is at peak of contraction
- Not related to maternal position

■ Late decels

- Reflects impaired placental exchange (uteroplacental insufficiency)
- Look similar to early decels, but gradual drop happens later in contraction and recovery to baseline occurs after contraction over
 - Drop rarely > 30-40 bpm
- Nadir after contraction peak
- Uniform appearance
- May remain within normal rate
- Occasional lates with mod variability and accels not ominous
- Repetitive lates with no accels and minimal or absent variability requires interventions to improve blood flow and increase oxygen supply

■ Variable decels

- Caused by reduced blood flow thru cord
- Shape, duration and degree of fall varies
- Onset and return to baseline abrupt < 30 seconds usually
- May occur with or without contractions

■ Significance of FHR Patterns

■ Patterns on monitor classified as:

- Reassuring
 - Accels, mod variability, baseline stable 110-160
 - Contractions

- No oftener than q 2 minutes
- No longer than 90-120 seconds
- At least 30 seconds between contractions
- Uterus relaxed between contractions

— Nonreassuring

- Tachycardia
- Bradycardia
- Decreased or absent variability
- Late decelerations
- Variable decelerations (falling to less than 70 beats per minute for longer than 60 seconds)
- Prolonged decelerations
- Hypertonic uterine activity

— See table on page 404 for possible causes of above

■ Other Methods of Fetal Surveillance

■ Fetal scalp stimulation

— Evaluates fetal response to tactile stimulation during labor, usual response is accel

■ Vibroacoustic stimulation (VAS)

— Evaluates response of fetus to sound and vibration applied to maternal abdomen, FHT should accel

■ Fetal O2 saturation monitor or fetal pulse ox

— Sensor placed along fetal cheek or temple

- Helps to make better decisions about whether fetus really in trouble, critical value is 30%

- Fetal scalp blood sampling

- Directly measures recent fetal acid base status by taking blood sample, acidosis present if $\text{pH} < 7.20$

- Cord blood gases and pH

- Umbilical cord blood used to assess infant status immediately after birth for oxygenation and acid base balance
- Help identify if acidosis present and if was short or long term