MATERNAL911

Fetal Well Being

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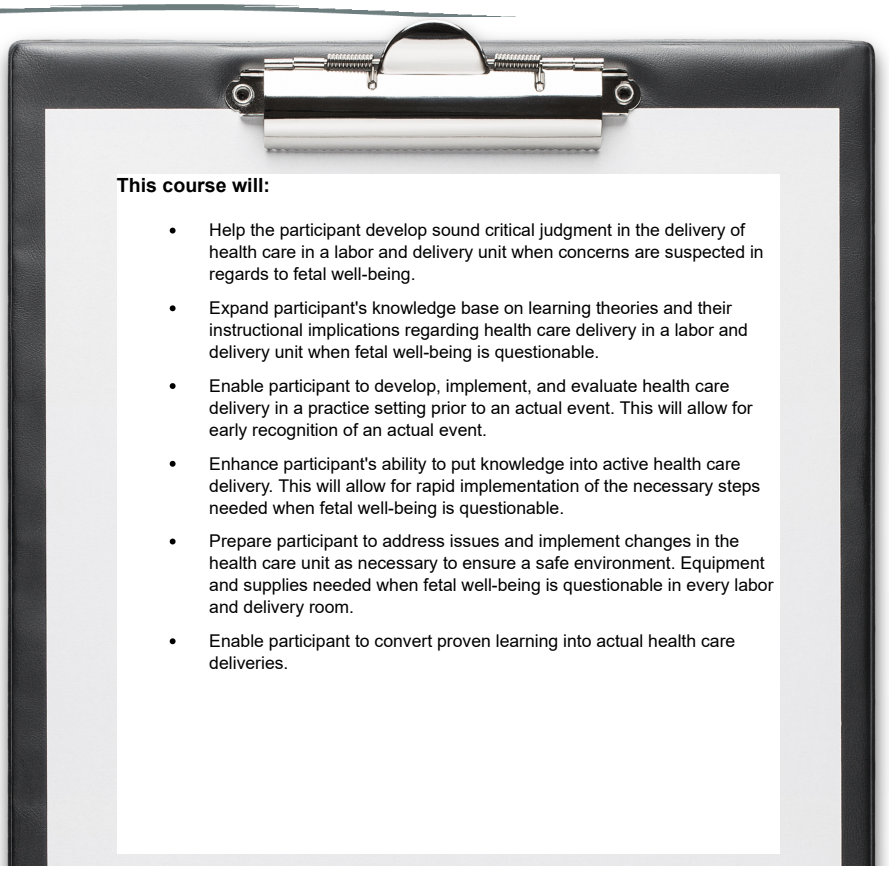
Course Description:

This course will help the participants identify hypoxemia and acidosis in an unborn fetus based upon fetal heart rate (FHR) monitoring to avoid fetal neurologic injury. The participant will be aware of measures needed to ensure a safe outcome so measures can be rapidly implemented.

Approximate Time to Complete: 60 minutes

Click here to download a print version of this course.



This course will:

- Help the participant develop sound critical judgment in the delivery of health care in a labor and delivery unit when concerns are suspected in regards to fetal well-being.
- Expand participant's knowledge base on learning theories and their instructional implications regarding health care delivery in a labor and delivery unit when fetal well-being is questionable.
- Enable participant to develop, implement, and evaluate health care delivery in a practice setting prior to an actual event. This will allow for early recognition of an actual event.
- Enhance participant's ability to put knowledge into active health care delivery. This will allow for rapid implementation of the necessary steps needed when fetal well-being is questionable.
- Prepare participant to address issues and implement changes in the health care unit as necessary to ensure a safe environment. Equipment and supplies needed when fetal well-being is questionable in every labor and delivery room.
- Enable participant to convert proven learning into actual health care deliveries.

- Definition
- Goal
- Modalities
- Candidates for Monitoring
- Definitions of FHR Characteristics
- Interpretation
- Evaluation of Category I and II Tracings
- Instrumentation
- Instrumentation: Non-invasive Fetal Monitoring
- Instrumentation: Invasive Fetal Monitoring
- Recommendations from National Organizations
- Summary

The rationale for monitoring the fetal heart rate (FHR) during labor is that FHR patterns are indirect markers of the fetal cardiac and central nervous system (CNS) response to blood volume changes, acidemia, and hypoxemia, since the brain modulates heart rate.

Nearly all obstetric societies advise monitoring the FHR during labor.

This position is chiefly based upon medical and legal opinion with neither continuous electronic fetal monitoring (EFM) or intermittent auscultation proven beneficial in low risk pregnancies.

The primary goal of intrapartum FHR monitoring is to identify hypoxemic and acidotic fetuses in whom timely intervention will prevent death.
The American College of Obstetricians and Gynecologists (ACOG) recommends antepartum fetal surveillance for pregnancies when risk fetal demise is increased [1].

These pregnancies include but are not limited to:

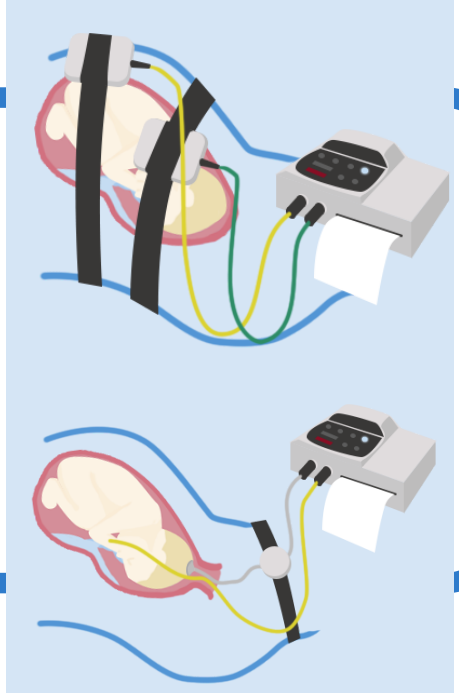
- Diabetes
- Hypertensive disorders
- Fetal growth restriction
- Multiple gestation
- Post-term pregnancy
- Decreased fetal movement
- Systemic lupus erythematosus
- Antiphospholipid syndrome
- Sickle cell disease
- Alloimmunization
- Oligohydramnios
- Polyhydramnios
- Prior fetal demise
- Nonimmune hydrops
- Maternal heart disease
- Poorly controlled maternal hyperthyroidism
- Maternal vascular diseases
- Preterm premature rupture of membranes (PPROM)

Mouse over the colored blocks to see more information.

Intrapartum FHR evaluation is achieved through continuous electronic FHR monitoring and intermittent auscultation.

In initial FHR monitoring studies, comparison between intermittent auscultation with no monitoring, intermittent auscultation did not demonstrate a decrease in perinatal mortality or neurologic disabilities [6-8].

No trials have compared continuous electronic fetal monitoring with no monitoring.



For both low and high risk pregnancies, there is no convincing evidence that continuous electronic FHR monitoring performs better than intermittent auscultation and consistent evidence that electronic fetal monitoring has a high false positive rate for predicting adverse outcomes [6-8].

A systematic review completed in 2017, included 13 randomized trials and > 37,000 low and high risk pregnancies, compared continuous electronic FHR monitoring with intermittent auscultation and found no compelling differences between techniques in the following events [8]:

- Perinatal mortality
- Cerebral palsy
- Acidosis (measured in cord blood)
- Hypoxic ischemic encephalopathy
- Neurodevelopmental impairment at ≥12 months of age
- Apgar score <4 at five minutes
- Neonatal intensive care unit admission

Fewer neonatal seizures were noted with continuous electronic FHR monitoring, but the seizures prevented by this monitoring were not associated with long-term sequela [8,9].

Use of continuous electronic FHR monitoring also resulted in more cesarean and operative vaginal deliveries for abnormal FHR patterns (RR 2.38 [95% CI 1.89-3.01] and RR 2.54 [95% CI 1.95-3.31], respectively), and, in turn, fewer spontaneous vaginal births (RR 0.91, 95% CI 0.86-0.96) [8-9].

Data for low risk and high risk subgroups, preterm pregnancies, and high-quality trials were consistent with these overall results [8].

Click here to see the more information.

There are many reasons why it is difficult to identify a reduction in cerebral palsy:

- Intrapartum interventions are not likely to change the course of cerebral palsy because most cases are due to an antepartum event [6].
- In a study, cerebral palsy was not associated with an abnormal FHR in 99.8 percent of tracing [6].
- Furthermore, a fetal neurologic disorder may be the cause, rather than the result, of FHR abnormalities [10].
- Rather than survive with disabilities, most severely depressed term fetuses survive intact or die [11].

Some maternal and fetal conditions have an increased risk of adverse fetal/neonatal outcome; however, there is no convincing evidence that continuous FHR monitoring reduces this risk.

Nevertheless, some type of FHR monitoring during labor has become routine for all women in the United States and will probably not be abandoned because most patients and clinicians are reassured by normal results and believe there is some value in detecting abnormal patterns.

Most are willing to accept an increase in cesarean and operative vaginal births associated with continuous electronic fetal monitoring, which is estimated to be an extra 12 cesareans and 25 operative deliveries per 1000 births [5].

In addition, economic issues preclude hospitals' ability to provide 1:1 nurse:patient staffing, which is needed for monitoring by intermittent auscultation.

National Institute of Child Health and Human Development (NICHD)
Definitions of FHR Characteristics

- Variability
- 10 Minute Window
- Baseline Rate
- Acceleration
- Late Deceleration
- Early Deceleration
- Variable Deceleration
- Prolonged Deceleration

Click each characteristic to see the definitions.

Absent/minimal variability with recurrent decelerations

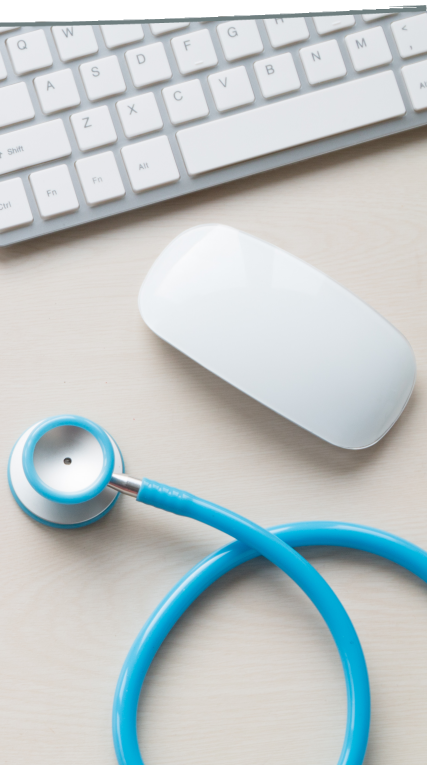
- Absent/minimal variability is thought to result from cerebral hypoxemia and acidosis, and signifies failure of fetal compensatory mechanisms to maintain adequate oxygenation of the brain [12].

- It may be accompanied by recurrent or prolonged decelerations [12].
- The likelihood of fetal acidemia increases in tandem with increases in the frequency, depth, and duration of the decelerations [13].

- If variable decelerations occur with at least 50 percent of uterine contractions in a 20-minute window they are considered recurrent [12,15]

Recurrent late decelerations

- Late decelerations are caused by the reflex CNS response to transient hypoxia and acidemia caused by uterine contractions, as well as direct myocardial depression and humoral factors [14].
- If late decelerations occur with at least 50 percent of uterine contractions in a 20-minute window they are considered recurrent [12,15].



Click each link to see the waveforms.

Waveform 1

Waveform 2

Waveform 3

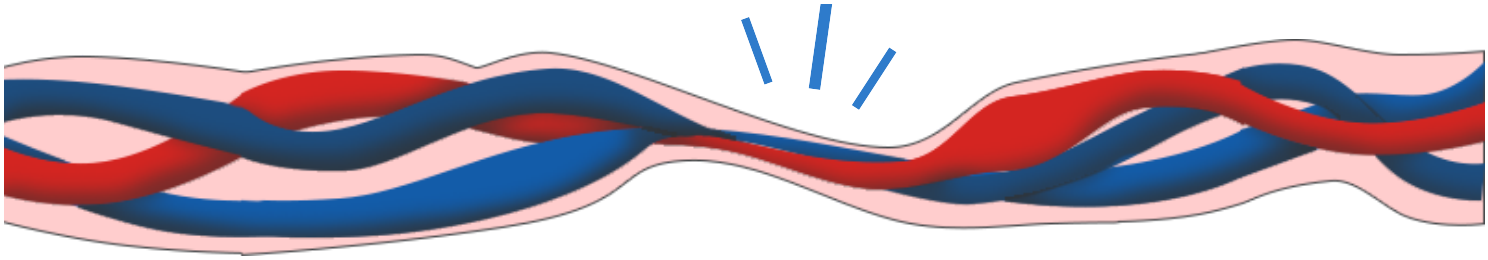
Waveform 4

Recurrent variable decelerations

- Variable decelerations occur when the umbilical cord is compressed, which may happen during a contraction in the setting of oligohydramnios or a nuchal cord.

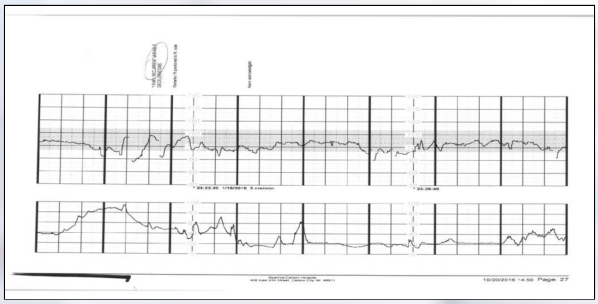
- The thin walled umbilical vein is more sensitive to compression than the umbilical arteries.
- This results in variable effects on fetal preload and afterload, which lead to changes in FHR mediated by baroreceptors, and by chemoreceptors when there is sufficient hypoxemia.

- Intermittent variable decelerations are frequently observed in labor tracings and are not usually associated with adverse consequences, presumably because transient cord compression is well tolerated by the fetus.



Recurrent variable decelerations continued

- In sleep studies, fetal metabolic acidosis or mixed metabolic and respiratory acidosis developed with increasing duration, depth, and frequency of variable decelerations [16-17].
- In a human study, pH fell when the decelerations had delayed recovery and when they were deeper than 60 bpm, but only 18 percent of newborns with these findings had a low Apgar score at one minute and none had a low score at five minutes [18].



Mouse over Waveform 5 to enlarge the image.

Variable Decelerations

- There are many atypical variations, particularly with this type of deceleration, which is inherently variable (**waveform 6** and **waveform 7**) [17].

- The body of evidence does not support attaching clinical significance to atypical features:
- Variable decelerations with lambda or W pattern (biphasic deceleration),
- Loss of primary or secondary acceleration (shoulders),
- Persistent secondary acceleration (overshoot), or
- Reduction in post-deceleration baseline [12]

- The NICHD classification does not include atypical variable decelerations as a category of FHR pattern [12].
- However, it does consider variable decelerations with absent baseline variability as predictive of acidosis.

the waveforms.