Of all the areas in medicine a nurse can focus on as a career, obstetrics has perhaps the greatest need for caring, flexible professionals who keep up with the latest in nursing research and technologies. This includes the latest fetal monitoring techniques and equipment. A generation ago, the only monitoring systems available to most women in labor were the nurse's eyes, ears, and hands.

As time passed, advances in external fetal monitoring devices developed, such as the fetoscope, or bone conduction device, and the Doppler. Advanced internal monitoring devices were also developed for high-risk pregnancies. The current monitoring technology used every day in this country by labor and delivery nurses is Electronic Fetal Monitoring, or EFM.

Nurses who use electronic fetal monitoring need to understand and recognize fetal heart rate patterns, beat-to-beat variability, and uterine activity, and should use accepted terms to describe these patterns. It is especially important to document reassuring and non-reassuring changes in heart rate patterns, as well as the fetal response to actions taken to treat the non-reassuring changes. And it is important that the nurse documents uterine activity.

The monitor tracing, or its electronic counterpart, is a legal part of the patient's medical record. As such, it should include identifying information and times and events related to the patient's care. The nurse identifies non-reassuring tracings and is responsible for initiating appropriate nursing actions and for notifying a physician. Once the nurse notifies the physician, a timely response should be expected.

The two modes of electronic fetal monitoring include the external mode, which uses transducers placed on the maternal abdomen to assess uterine activity and the fetal heart rate, and the internal mode, which uses internal devices to accomplish this. Once the patient arrives in the labor and delivery department and has changed into a patient gown, external
fetal monitoring transducers are placed on her abdomen.

When placing the fetal monitor, the nurse first locates the fetal back by palpating the mother's abdomen. The fetal back is a smooth, continuous surface usually to one side of the abdomen. The nurse places a small amount of ultrasound gel on the ultrasonic transducer and positions it over the fetal back. This is where the fetal heart rate will be heard most clearly.

The transducer is held firmly in place by a soft belt around the abdomen. With current technology, the recording from a well-placed ultrasonic transducer is very accurate. It picks up the movement of the valves in the baby's heart, which is transformed by the monitor into an audible output and a visual tracing. Next, the nurse places the toco transducer, or toco, over the fundus of the patient's uterus. It is also held in place by a belt.

The toco has a pressure-sensitive surface on the side next to the abdomen, which picks up the pattern of the patient's contractions and records them on the monitor strip. The toco can measure and record the frequency and duration of contractions, but not their intensity. The monitor tracing is divided into upper and lower parts. The upper part shows the fetal heart rate, while the lower part shows uterine activity.

The portions are divided into grids. Each horizontal line on the heart rate grid indicates an increase of 10 beats per minute in the fetal heart rate as you move up the grid. The vertical line indicates intervals of time. As you move across the tracing, the light lines indicate the intervals of 10 seconds and the darker lines intervals of 60 seconds when the paper speed is 3 centimeters per minute.

A typical contraction appears as a waveform. The amplitude of the contraction depends on the tightness of the belt, the amount of adipose tissue and amniotic fluid between the uterine wall and the toco, the fetal position, the maternal position, and the strength of the contraction.

Sometimes, internal fetal monitoring may be indicated when maternal or fetal factors make
obtaining consistent readable tracing difficult. Signal disruptions can occur due to maternal obesity, fetal malpresentation, or fetal activity. For this type of monitoring, the membranes must be ruptured and the cervix sufficiently dilated to allow attachment of a small electrode to the fetal presenting part, usually the head.

To implement internal monitoring of uterine activity, a solid or fluid-filled Intrauterine Pressure Catheter, or IUPC, is introduced into the uterine cavity. It is placed between the fetus and the wall of the uterus and accurately measures frequency, duration, and intensity of uterine contractions. It also more accurately determines uterine resting tone, that is, how relaxed the uterus is between contractions. Normal resting tone is between 10 to 15 millimeters of mercury.

Once the fetal monitor is placed, the nurse reviews the patient's prenatal record to determine the presence of risk factors that may impact the patient's labor and make an assessment to determine the presence of current risk factors. Nursing assessment includes determining gravida, or number of pregnancies, and para, or number of births; the gestational age of the fetus and the mother's delivery history; and the presence of pregnancy-related problems, such as diabetes, hypertension, anemia, and Rh-sensitization.

Other factors that are explored during assessment include the adequacy of prenatal care, fetal movement, the presence of bleeding, whether membranes are intact or ruptured, the contraction patterns, fetal heart rate, and maternal vital signs. The normal fetal heart rate ranges from 110 to 160 beats per minute. This is called the baseline. If using a Doppler, it is important to listen through a contraction and for one minute following the contraction.

During the active phase of labor, contractions are assessed for frequency, duration, and intensity. Contractions will be between three and five minutes apart. Frequency is measured from the beginning of one contraction to the beginning of the next. The duration or length of the contraction is measured as the uterus begins to tighten. On the monitor tracing, the wave line begins to rise. When the contraction ends, the wave line descends back to the level of the resting tone.
In active labor, a contraction usually last 60 to 90 seconds. The nurse may assess the intensity or strength of a contraction by placing the pads of the fingers on the fundus of the uterus and palpating gently through the contraction. Learning to differentiate between mild, moderate, and strong contractions requires time and repeated assessments under the guidance of an experienced labor nurse.

Resting tone refers to the degree of relaxation of the uterine wall between contractions. It is normally less than 20 millimeters of mercury. The resting phase is the number of seconds from the end of one contraction to the beginning of the next. This phase should last at least 60 seconds. This is when the fetus gets re-oxygenated.

Multiple factors influence the fetus's response to its environment. The nurse's ability to understand these factors and adjust for them is vital to the assessment of fetal status and the ability to intervene appropriately for non-reassuring changes.

Maternal arterial oxygen tension provides oxygen to the fetus. Anything that interferes with this, such as maternal hemorrhage, will impact the amount of oxygen available to the fetus. Maternal oxygen-carrying capacity also depends on adequate maternal hemoglobin, making the fetus of a woman with chronic anemia at risk for decreased reserve.

Adequate uterine blood flow also determines the availability of oxygen for placental perfusion. Because of this, maternal position, hypotension, medications or anesthesia, or other factors that reduce uterine blood flow may also compromise fetal well being. Vasoconstricting agents, such as tobacco and cocaine, decrease uterine blood flow and may compromise the fetus. Uterine contractions also decrease uterine blood flow.

Another factor that affects the flow of blood to and from the fetus is cord compression. Normally a thick layer of Warton's jelly protects the cord vessels, and the cord floats freely in the amniotic fluid. When the umbilical cord is thin or there is insufficient amniotic fluid, fetal movements may cause the umbilical cord to become pinched, which may compromise the
blood flow. Usually the blood flow reestablishes as soon as the fetus moves off the cord.

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Systemic fetal assessment includes observation and recording of uterine activity, including frequency, duration, intensity of uterine contractions; uterine resting tone and resting phase; fetal heart rate baseline, including rate and variability; periodic changes to fetal heart rate baseline that are occurring in relation to contractions; and episodic changes to fetal heart rate baseline that aren't occurring in relation to contractions.

When determining a baseline, look at the average fetal heart rate over a 10-minute period of time, excluding periodic or episodic changes, periods of marked variability, and segments of the baseline that differ by more than 25 beats per minute. Fetal tachycardia is described as a baseline greater than 160 beats per minute for a duration of 10 minutes or longer.

Tachycardia can be considered an early sign of fetal hypoxemia, especially when associated with late decelerations and minimal or absent variability. Fetal tachycardia can result from maternal or fetal infection, such as prolonged rupture of membranes with amnionitis, fetal anemia, or in response to medication, such as atropine and terbutaline, or illicit drugs, such as cocaine or amphetamines.

Fetal bradychardia is a baseline fetal heart rate less than 110 beats per minute for a duration of 10 minutes or longer. Fetal bradychardia can be caused by placental transfer of maternal medications, such as anesthetics, prolonged compression of the umbilical cord, and maternal hypotension.

Maternal supine hypertension syndrome, caused by the weight and pressure of the gravid uterus on the vena cava, decreases the return of blood flow to the maternal heart, which then reduces maternal cardiac output and blood pressure. These responses in the mother subsequently result in a decrease in the fetal heart rate and fetal bradychardia.

Variability can be described as irregular fluctuations in the baseline of the fetal heart rate.
Fetal heart rate variability is the primary indicator of adequate fetal oxygenation and holds key information for evaluating other components of the tracing. Four terms are used to describe baseline variability. These are based on visualization of the amplitude of the fetal heart rate in the peak-to-trough segments in beats per minute.

Absent describes patterns where there is no detectable fluctuation in the baseline. Minimal variability describes a range of one to five beats per minute in the baseline. Moderate describes a range from six to 25 beats per minute in the baseline. Marked variability refers to anything over 25 beats per minute in the baseline. Absent or undetected variability is considered non-reassuring.

Diminished variability can result from fetal hypoxemia and acidosis, as well as from drugs that depress the central nervous system, including analgesics and narcotics. In addition, a temporary decrease in variability can occur when the fetus is in a sleep state, which does not usually last longer than 30 minutes.

Changes in the fetal heart rate from baseline are categorized as periodic or episodic. Periodic changes are those that occur with uterine contractions, and episodic changes are those that are not associated with contractions. These patterns include accelerations and decelerations. Accelerations, or increases in the fetal heart rate, occur most often in the presence of fetal movement. An acceleration is defined as a visually-apparent abrupt increase in the fetal heart rate, above the baseline rate of at least 15 beats per minute that last at least 15 seconds.

Episodic accelerations of the fetal heart rate occur during fetal movement and are indications of fetal well being. Periodic accelerations are caused by dominance of the sympathetic nervous response and may be encountered with breech presentations associated with pressure of the contraction applied to the fetal buttocks or during the second stage of labor in cephalic presentations.

Periodic deceleration, caused by dominance of the parasympathetic response, may be
benign or non-reassuring. Four types of decelerations are encountered during labor—early, late, variable, and prolonged. Early deceleration of the fetal heart rate is a visually-apparent gradual decrease and return to baseline in response to fetal head compression. It is a normal and benign finding. These decelerations are mild and have a uniform shape that roughly mirrors the contraction.

The deceleration generally starts before the peak of the uterine contraction, has a gradual onset, and returns to the baseline at the same time as the contraction returns to its baseline. The nadir of the early deceleration coincides with the peak of the contraction. Because early decelerations are considered benign, interventions are not necessary. However, they should be identified so that they can be distinguished from late or variable decelerations.

Late deceleration of the fetal heart rate is a visually-apparent gradual decrease and return to baseline associated with the uterine contraction. The deceleration begins after the contraction has started, and the lowest point of the deceleration occurs after the peak of the contraction. The deceleration usually does not return to the baseline until after the contraction is over.

Recurrent late decelerations usually indicate the presence of fetal hypoxemia stemming from insufficient placental perfusion. They can be associated with fetal hypoxemia progressing to hypoxia and acidemia progressing to acidosis. They should be considered an ominous sign when they are uncorrectable, especially if they are associated with decreased variability and tachycardia.

Late decelerations caused by maternal supine hypotension syndrome are usually correctable when the woman turns on her side, allowing better return of maternal blood flow to the heart, which in turn increases cardiac output and blood pressure. Late decelerations caused by uteroplacental insufficiency can result from uterine hyperstimulation with oxytocin, pregnancy-induced hypertension, postterm pregnancy, amnionitis, small for gestational age fetus, maternal diabetes, placenta previa, abruptio placenta, maternal cardiac disease, maternal anemia, and anesthetics.
Nursing interventions for treatment of late decelerations are aimed at improving uteroplacental perfusion and include extreme lateral positioning to maximize uteroplacental blood flow; administering an IV fluid bolus of at least 200 to 500 milliliters to correct hypovolemia and increase volume for improved oxygen saturation; administering oxygen by snug face mask at five to 10 liters per minute to maximize fetal oxygenation; decreasing uterine activity by turning off oxytocin or administering a tocolytic per physician order; notifying provider to come and see the patient to review the monitor strip; and prepare for delivery and a neonatal resuscitation.

A variable deceleration is defined as a visual abrupt decrease in the fetal heart rate below the baseline. The decrease is at least 15 beats per minute lasting at least 15 seconds and returns to the baseline in less than two minutes from the time of onset. Variable decelerations occur at any time and are caused by compression of the umbilical cord.

Variable decelerations often have U or a V shape and are characterized by a rapid descent and ascent to and from the nadir, or depth of the deceleration. Some variable decelerations are preceded and followed by brief accelerations of the fetal heart rate known as shouldering, which is an appropriate compensatory response to compression of the umbilical cord. Variable decelerations are commonly observed late in labor with fetal decent and pushing.

Nursing interventions for treatment of variable decelerations are aimed at reducing umbilical cord or fetal head compression and include changing maternal position to relieve pressure on the umbilical cord; administering an IV fluid bolus, which may improve blood volume and perfusion and possibly improve fetal heart rate; administering oxygen when variability of the baseline is decreasing; and administering an amnioinfusion.

Amnioinfusion is used during labor to reduce the severity of variable decelerations caused by umbilical cord compression. Techniques of amnioinfusion vary, but all usually involve administering normal saline or Lactated Ringers through an intrauterine pressure catheter into the uterus. Amnioinfusion is also used to dilute meconium-stained amniotic fluid.
A prolonged deceleration is a visually-apparent decrease in the fetal heart rate below the baseline of 15 beats per minute or more and lasting more than two minutes but less than 10 minutes. A deceleration lasting more than 10 minutes is considered a baseline change. Benign causes of prolonged decelerations are pelvic examination, rapid fetal descent, and sustained maternal Valsalva maneuver.

Other less benign causes include severe variable decelerations, sudden umbilical cord prolapse, hypotension produced by spinal or epidural anesthesia, and tetanic contraction. When the deceleration lasts longer than one or two minutes, a loss of variability with rebound tachycardia usually occurs.

Occasionally, a period of late decelerations may follow. Prolonged decelerations are usually isolated events that end spontaneously. However, when a prolonged deceleration is seen late in the course of severe variable decelerations or during a prolonged series of late decelerations, the prolonged deceleration may occur just before fetal death.

The rewards of watching a newborn take its first breath and helping a new mother put the baby to her breast for the first time make obstetrics a truly wonderful nursing specialty. However, certain areas within obstetrics place a nurse at greater exposure to the risk of legal action related to nursing care. For this reason, nurses caring for pregnant patients in an intrapartum setting should have continuing education in fetal monitoring and competency validation at least every two years.

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