ESSENTIALS OF FETAL MONITORING

THIRD EDITION

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“I have found it helpful to recover a sense of my work not as a career but as a calling.”

— D.H. Smith (June 1994)

“How to Be a Good Doctor in the 1990s: Stand and Deliver”

DISCLAIMER

This book is not intended to replace the manufacturer’s fetal monitor manual. You are encouraged to read the manual before using the fetal monitor.

This book does not include directions on setting the monitor clock or specific features that are unique to only one or two monitors. Therefore, you are encouraged to work with a skilled clinician who will assist you in setting the clock and using the unique features of your monitor. Since clocks are battery-backed, you should only have to set the clock when there is a change in daylight savings time. If you plug in the monitor and there is a message, e.g., “set time/date,” the battery must be replaced. Tag the fetal monitor with a note to replace the clock battery and send it to the Biomedical Department.

Lastly, content of the book is based on references from Antepartal and Intrapartal Fetal Monitoring, Third Edition © 2007 and common knowledge in the field of obstetrics and fetal monitoring. Any questions or concerns you have about content should be sent to Springer Publishing Company, LLC.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td></td>
<td>ix</td>
</tr>
<tr>
<td>Section 1</td>
<td>Systematic Assessment of the Pregnant Woman</td>
<td>1</td>
</tr>
<tr>
<td>Section 2</td>
<td>The Paper</td>
<td>15</td>
</tr>
<tr>
<td>Section 3</td>
<td>External and Internal Fetal Monitoring</td>
<td>31</td>
</tr>
<tr>
<td>Section 4</td>
<td>Uterine Contractions.</td>
<td>53</td>
</tr>
<tr>
<td>Section 5</td>
<td>The Baseline</td>
<td>75</td>
</tr>
<tr>
<td>Section 6</td>
<td>Long-Term Variability</td>
<td>91</td>
</tr>
<tr>
<td>Section 7</td>
<td>Short-Term Variability</td>
<td>107</td>
</tr>
<tr>
<td>Section 8</td>
<td>Accelerations.</td>
<td>127</td>
</tr>
<tr>
<td>Section 9</td>
<td>Early Decelerations</td>
<td>135</td>
</tr>
<tr>
<td>Section 10</td>
<td>Late and Spontaneous Decelerations</td>
<td>141</td>
</tr>
<tr>
<td>Section 11</td>
<td>Variable Decelerations</td>
<td>155</td>
</tr>
<tr>
<td>Section 12</td>
<td>Prolonged Decelerations</td>
<td>171</td>
</tr>
<tr>
<td>Section 13</td>
<td>Strip Evaluation and Categorization</td>
<td>177</td>
</tr>
<tr>
<td>Section 14</td>
<td>NICHD Definitions</td>
<td>189</td>
</tr>
<tr>
<td>Section 15</td>
<td>Skills Validation Tools</td>
<td>203</td>
</tr>
<tr>
<td>Glossary and Abbreviation List</td>
<td></td>
<td>213</td>
</tr>
</tbody>
</table>
INTRODUCTION

The fetal heart rate (FHR) may be evaluated to predict fetal status. Choosing auscultation or the electronic fetal monitor to evaluate the FHR depends on maternal and fetal risk factors, the nurse to patient ratio, and protocol. If you use the fetal monitor, you will be expected to identify FHR pattern components and determine the significance of the FHR and uterine activity patterns. Although interpretation is subjective, no one can argue with the absence of any sign of fetal well-being. Therefore, this book will prepare you to identify the signs of fetal well-being and the more common signs of fetal compromise.

The goals of this workbook are to:
• help you identify maternal and fetal assessment techniques
• prepare you to recognize the most common FHR patterns
• teach you the names of each part of the FHR pattern
• help you select actions to improve fetal oxygenation
• help you evaluate changes in maternal and/or fetal status as a result of your actions
• enable you to identify ineffective actions that delay timely intervention when there is a nonreassuring FHR pattern
• suggest how to document your assessments, actions, evaluations, and communications that reflect the standard of care.

Learning is a journey. This is just the beginning. Knowledge of concepts in fetal monitoring is cumulative. We strongly recommend you plan to attend at least one advanced fetal monitoring course every two years and as many inservice programs as you can to give you more exposure and insight into the fetal condition. Fetal monitors cannot replace hands-on care. They are an adjunct to your care. Therefore, it is important that you touch your patients to palpate contractions and fetal movement.

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SECTION 1
Systematic Assessment of the Pregnant Woman

The maternal condition affects fetal status. Therefore, it is critical to systematically gather important maternal information prior to interpretation of the fetal heart rate (FHR) pattern. If it is available, review prenatal and historical information prior to approaching the pregnant woman. If the prenatal record is not complete, obtain additional information by interviewing the patient. If possible, obtain a complete prenatal record from the clinic or physician’s office. The choice of monitoring methods depends on the practitioner’s orders, the institution’s policies and procedures, and patient requests or needs. Before approaching the patient, you should know if auscultation and palpation are going to be the only monitoring methods, and if fetal monitoring will be intermittent, continuous, or a combination of both auscultation and electronic fetal monitoring.

Use a systematic approach to evaluate the pregnant woman and fetus. Apply the fetal monitor to complete your assessment of the maternal/fetal dyad. You may choose to do all or part of this assessment prior to monitor use.

Maternal/Fetal Assessment

- Perform Leopold’s Maneuvers to locate the fetal back and presenting part
- Estimate fetal weight
- Palpate fetal movement
- Evaluate fetal heart tones by fetoscope
- Assess maternal vital signs and risk factors
- Perform a maternal head to toe assessment
- Determine fundal height – is it appropriate for gestational age?
- Determine uterine activity
- Assess the cervix if there are no contraindications
- Determine the presence of labor and status of membranes
Leopold’s Maneuvers

Preparation
Place the woman on her back in a semi-Fowler’s position. You may wish to place a pillow under her right hip to displace the uterus off the inferior vena cava and aorta.

You will be inspecting and palpating the maternal abdomen to determine fetal lie and presentation. This will also help you locate the fetal back for external ultrasound transducer placement.

First Maneuver: What is in the Fundus?
Stand at the woman’s side and palpate the fundus using both hands. What is in the fundus?

1. First Maneuver - Identify what is in the fundus.
   - the head feels hard and moves when you push against it
   - the buttocks feels soft and round

Second Maneuver: Where is the Fetal Back?
Face the woman and place your hands on either side of her abdomen. While holding one hand still, push on the fetus and feel for the arms and legs and the curve of the fetal back. Now hold the opposite hand still while pushing with the other hand. Can you feel the fetal back? Did the fetus move? You can document fetal movement as “FM palpated” or “FM +.” It is very important to keep one hand still so that if the fetus has died you do not mistake pushing the fetus towards the other hand as fetal movement.
1.2 **Second Maneuver - Find the fetal back.**  

- the back feels firm, curved, and smooth
- the legs, feet, arms, and hands feel irregular

**Third Maneuver: What is the Presenting Part?**  
Grasp the lower uterine segment by pushing in above the pubic bone. Palpate for a hard or soft mass. If in doubt, the vaginal examination may be helpful to confirm the fetal presenting part.

1.3 **Third maneuver - Identify the presenting part.**  

- the fetal buttocks feels soft and round
- the head feels hard and round

Once you have located the fetal back, what’s in the fundus, and the presenting part, you should be able to determine the fetal position. If the back of the baby is on the maternal left (L) side, the occiput (O) is also on the left. The baby will be LOA, LOP, or LOT. The A means anterior, P means posterior, and T means transverse.
This baby is in a left occiput anterior position. (Reproduced with permission of Appleton & Lange from Oxorn, H. (1986). Human labor and birth, 5th ed, Stanford, CT.)

Fourth Maneuver: Where is the Cephalic Prominence?
When the fetal head is the presenting part, the fourth maneuver will identify the cephalic prominence.

1.5 Fourth maneuver - Identify the cephalic prominence. (Reproduced with permission of Appleton & Lange from Oxorn, H. (1986). Human labor and birth, 5th ed, Stanford, CT.)

Face the woman’s feet and slide your hands down the sides of her uterus until your fingers on one hand meet resistance. This is the cephalic prominence. It may be the baby’s forehead or back of the head. If the cephalic prominence is opposite the baby’s back, the head is flexed. This is what you want to find. If the occiput is the cephalic prominence, the baby’s head is in extension which can impede fetal descent. In this illustration, the fetal forehead is the cephalic prominence.
Estimate the Fetal Weight and Palpate Fetal Movement

When doing Leopold’s Maneuvers, you may also estimate the fetal weight. One way to practice is to close your eyes while palpating a 4 pound, 5 pound, and 10 pound sack of sugar which are flat on a table. Feel the difference in the density of the bags. Note the difference between the 4 and 5 pound bag. Is the fetus more like the 5 or 10 pound sack of sugar? As you become more comfortable in estimating fetal weight, it may become easier to predict how well the fetus will fit through the pelvis. Review the maternal obstetric history. Look at the clinical pelvimetry findings in the prenatal record. Does the fundal height suggest a large or small baby? Estimation of fetal weight is important. The risks of fetal macrosomia and fetopelvic disproportion increase with gestational diabetes. Gently place your hand on the maternal abdomen to feel for spontaneous fetal movement.

Evaluate Fetal Heart Rate by Auscultation

Auscultation may be used to intermittently monitor the fetal heart rate, especially in women with no risk factors during labor. Auscultation is not necessary before application of the fetal monitor, but it is desired. Auscultation confirms fetal life and the FHR. Before you assess the FHR, confirm the rate from previous monitoring strips or documentation in the prenatal record. For example, a nonstress test result may be written in the prenatal record or the actual FHR may be recorded by the practitioner during prenatal visits. The FHR drops approximately 1 beat per minute (bpm) per week every week of gestation beginning at 9 weeks. The FHR stabilizes at 35 weeks of gestation.

You can confirm fetal life by auscultating fetal heart tones with a fetoscope prior to application of the ultrasound transducer. The FHR can also be determined by a hand-held Doppler device. A fetoscope or stethoscope allows you to hear tones or the actual sound of the valves. However, the Doppler is a motion detector which determines a rate. If a hand-held Doppler is used, it is best to simultaneously assess the maternal pulse to differentiate it from the FHR. Record both the maternal pulse and the FHR. The fetoscope, stethoscope, or Doppler are placed over the fetal back near the baby’s head. Listen for at least 30 seconds following a contraction to detect any decelerations. You may want to listen and record a rate every 6 seconds for a full minute. This makes accelerations and decelerations easier to detect. Count the rate for 6 seconds ten times, then add a zero to calculate the beats per minute rates. For example, if you count the first 5 rates for 6 seconds each and record 10, 11, 12, 11, 10, the FHR was 100, 110, 120, 110, and 100. Continue counting for a full minute. In a term or postterm fetus, 100 to 110 bpm is in the normal baseline range.

Confirm Fetal Life

Do NOT apply the fetal monitor ultrasound transducer until you are sure the fetus is alive. The printout can be 100% maternal. The woman’s heart rate or doubling of her heart rate can appear on the fetal monitor paper (see 1.6). Sometimes, the maternal heart rate (MHR) doubles because the monitor’s software analysis counts
systole and diastole as two separate beats.

By listening to actual fetal heart sounds with a fetoscope or stethoscope before applying the fetal monitor, you can avoid mistaking the MHR for the fetal heart rate. The hand-held Doppler device is a motion, not a sound, detector. If you use a hand-held Doppler device to assess the fetal heart rate, you must take the MHR simultaneously to identify and differentiate the fetal rate from the maternal rate.

1.6 Maternal heart rate near 87 beats per minute and doubling near 174 beats per minute. The fetus was dead. The nurse did not confirm fetal life prior to application of the fetal monitor. The lack of fetal heart motion was confirmed by real-time ultrasound.
**Apply the Monitor**

To apply the external ultrasound transducer, place the belt under the woman’s back. Locate the fetal back. Apply coupling gel to the transducer. Place the transducer over the fetal back. If you have difficulty finding the FHR, move the ultrasound device slightly to the left or right or use the second Leopold’s maneuver again to locate the fetal back.

![Image](image_url)

**1.7 The ultrasound transducer is placed on the maternal left, over the baby’s back and below the umbilicus. The tocotransducer is at the top of the uterus.**

The presence of a stable FHR, an acceleration, and the absence of a deceleration, during the period of time the patient is auscultated suggests fetal well-being. The lack of fetal well-being requires prompt communication.

*Prompt communication to the midwife or physician about changes in the maternal or fetal status is the nurse’s role.*

Auscultation can be used during labor when a one-to-one nurse to patient ratio is available. Documentation should include the presence of accelerations, the absence or presence of decelerations, and the FHR between accelerations and decelerations. For example, you might mention “no decelerations heard.” Also, document any fetal movement (FM) palpated or reported, e.g., “fetus active per pt., FM palpated.”
**Auscultation: Abnormal Findings**

A FHR greater than 160 bpm, less than 120 bpm if the fetus is preterm, and less than 100 bpm if the fetus is term or post term, or an irregular rhythm should be reported to the midwife or physician as soon as possible. Also, report any FHR which is greater than 20 bpm above or below the baby’s expected rate based on previous monitoring. Apply the electronic fetal monitor if you hear a rate greater than 160, less than 100 in a term or post term pregnancy, less than 120 in a preterm pregnancy, or an irregular rhythm.

**Assess Maternal Vital Signs and Risk Factors**

Take the woman’s blood pressure (BP) and pulse. The cuff must be an appropriate size and should be approximately 20% wider than the width of her arm. The woman should have her BP taken in a semi-Fowler’s or side-lying position versus supine. It is best to take BP between contractions because BP rises during contractions. Compare the readings with the woman’s baseline BP on her prenatal record. If the BP is elevated, pay special attention to her urine protein, edema, and reflexes. Also assess visual disturbances, headache, and epigastric pain. Could she have preeclampsia?

**Respiratory Rate**

Assess maternal respirations. Are they rapid and labored? Quiet and slow? An unusually fast rate (> 24/minute) may suggest anxiety with hyperventilation or a compromised respiratory system requiring further assessment of the woman’s pulmonary or hemodynamic status and temperature.

**Temperature**

If the woman’s temperature is elevated, look for signs of infection such as skin that is warm to the touch, foul smelling vaginal discharge, a tender uterus, fetal tachycardia (> 160 bpm), and/or maternal tachycardia (> 100 bpm). Assess skin turgor, mucous membranes, and lips for dryness. If she is febrile, she may also be dehydrated. Assess her urine for ketones.
Perform a Maternal Head to Toe Assessment

<table>
<thead>
<tr>
<th>FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HEENT (head, eyes, ears, nose, and throat)</strong></td>
</tr>
<tr>
<td>headache, blurred vision, tinnitus, nasal congestion, airway, dizziness?</td>
</tr>
<tr>
<td><strong>Heart</strong></td>
</tr>
<tr>
<td>regular rate and rhythm, murmur, chest pain, palpitations?</td>
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<tr>
<td><strong>Lungs</strong></td>
</tr>
<tr>
<td>clear breath sounds bilaterally, unlabored respirations? absence of wheezing, grunting, adventitious sounds?</td>
</tr>
<tr>
<td><strong>Abdomen</strong></td>
</tr>
<tr>
<td>tenderness, pain, rigidity, distention, heartburn? quality and quantity of contractions? fetal movement?</td>
</tr>
<tr>
<td><strong>Extremities</strong></td>
</tr>
<tr>
<td>edema, reflexes, clonus? Homan’s sign?</td>
</tr>
<tr>
<td><strong>Genitourinary</strong></td>
</tr>
<tr>
<td>urine protein, ketones, glucose, blood? genital vesicles or warts? rupture of membranes?</td>
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Inspection, palpation, and auscultation are used to complete your initial maternal assessment. Observe the woman’s general appearance and body language which provide clues of underlying physical or psychological problems. Ask when she last ate and what she ate. When she is alone, ask if she has been hit, slapped, kicked, or punched any time during this pregnancy. Ascertain if she has had any bleeding problems, a history of previous hemorrhage with birth, or blood transfusions. This may prepare you for the possibility of a postpartum hemorrhage or a newborn with hemolysis as a result of an antibody-antigen reaction. Record your findings. Ask her to urinate prior to her cervical examination. A sterile speculum examination may be done to prevent infection if membranes are ruptured, but she is not in labor.
Determine Fundal Height — Is it Appropriate for Gestational Age?

What is the estimated date of delivery (EDD)? If fundal height has not been measured in the last week, or you are concerned that the placenta may be abrupting, measure the fundal height by placing a tape measure at the top of the symphysis pubis, and stretch it to the top of the fundus. Mark the top of the fundus using a ballpoint pen if you plan to measure and compare findings at a later time.

After the 20th week of pregnancy, the fundal height is similar to the weeks of gestation. If there is a 3 or more centimeter difference, e.g., she is 26 weeks of gestation, but the fundal height is 23 centimeters (cm) or 29 cm, an ultrasound may be done to identify an abnormality in fetal growth or amniotic fluid volume.

When the fundal height is smaller than expected (not within 3 cm of the gestational age), review the prenatal history for persistent vomiting, poor weight gain, hypertension, street drug use, and smoking. These could diminish oxygen and nutrient delivery to the uterus. Hydramnios, macrosomia, a fibroid, and gestational diabetes may be associated with a larger than expected fundal height, and oligohydramnios and/or intrauterine growth restriction with a smaller than expected fundal height.

Determine Uterine Activity

Palpate the woman’s uterus. Assess the symmetry of the abdomen during contractions. During normal labor, the uterus begins to contract at the fundus and the fundus moves forward. Record “mild,” “moderate,” or “strong” uterine contractions. If some are mild and others are moderate, record “UCs mild–mod” or “ctx mild to mod.” Feel your cheek. It’s indentable. That’s how a mild contraction feels. Feel your nose. A little harder, but slightly indentable is how a moderate contraction feels. Feel your forehead. This is how a strong contraction feels to palpation.

Determine the Presence of Labor and Status of Membranes

Labor is defined as regular uterine contractions accompanied by a change in dilatation. Determine the presence of contractions. Evaluate maternal pain by observing the woman’s face, hands, and toes. Is she curling her toes or tightening her grasp? Perhaps she is focused inwardly, suggesting advanced labor progress. Is her pain response what you would anticipate with the contractions you palpate? What impact does her culture have on her display of pain? Nitrazine paper or a Fern test may detect rupture of membranes. If membranes are ruptured, record the color, amount, and odor of the fluid (1 milliliter (ml) of fluid weighs 1 gram (gm)). Determine if there is a vaginal discharge or foul odor. The odor may be recorded as “foul” or “not foul.”
Prior to applying the fetal monitor
• assess comfort or pain, readiness to learn, and previous experiences with the fetal monitor
• address concerns about the electronic fetal monitor (EFM), explain the monitor’s function and plans for use
• adapt the monitoring belts if needed for the obese patient, e.g., attach one belt to another one or hand-hold the ultrasound transducer
• do not use the ultrasound transducer or spiral electrode if the fetus is not viable (≤ 23 weeks) or has died
• do not apply the monitor if the woman refuses it.

If a woman refuses electronic fetal monitor use, the physician or midwife should be informed immediately. Document the patient’s refusal by recording her words in quotation marks.

Secure the tocotransducer (TOCO). Correct placement of the TOCO should detect uterine contractions not maternal breathing movements. The TOCO works best close to term. If the fetus is less than 30 weeks of gestation, place the TOCO under the umbilicus. Ask the woman is she has cramps, intermittent bladder pressure, intermittent leg pain or low backache. These may be indications of preterm labor. Place the TOCO above the umbilicus if the fetus is greater than 30 weeks of gestation (see 1.9).
Assess the Cervix

Defer cervical examinations when bleeding is present until you know the location of the placenta, e.g., avoid a vaginal examination if there is placenta previa. If membranes rupture preterm, the cervix may be examined visually using a sterile speculum. This prevents introduction of bacteria which can stimulate prostaglandin release and contractions.

During cervical examination, assess
- **location** locate the cervical os. Is it posterior, in a midposition, or anterior?
- **dilatation** estimate the size of the opening of the cervix in centimeters using your index and middle fingers. If only one fingertip fits inside, it is “FT” or fingertip dilated. This is equivalent to 1 cm. If the cervix is open more than 9 cm but less than 10 cm, a “rim” is present. If only the top of the cervix remains, an anterior lip (“ant. lip”) is documented.
SUMMARY

- **effacement**
  how thin is the cervix? At term, the cervix is approximately 2.5 to 3 cm long. It may be firm or soft. Effacement occurs when the cervix is soft. It is estimated as the percent that has thinned, e.g. 70% effaced means only 30% remains.

- **presentation**
  vertex, breech, or other, e.g., face, brow, shoulder. Is there caput or molding? cord or compound presentation, e.g., head and hand?

- **station**
  determine the level of the presenting part above or below the ischial spines. When the tip of the baby’s skull is at the level of the ischial spines, that is zero (0) station. Use centimeters: -1, -2, -3, ballottable (all are above the spines), +1, +2, +3, +4, +5 (are below the spines).

**Summary**

Establish a data base that includes maternal, FHR, and fetal movement information. Continue to evaluate the woman and fetus. Once the plan of care is determined, the midwife or physician usually discusses the plan with the woman and her family. Assessment of her initial and ongoing status and behavior may reflect normal or abnormal progress which may influence the FHR. *Always try to respond to maternal and fetal physiology.* It can affect the FHR. Think beyond the paper printout and "know the baby."
SECTION 1: SYSTEMATIC ASSESSMENT OF THE PREGNANT WOMAN

QUESTIONS

Directions: Circle T if the statement is true, F if it is false.

1. A systematic assessment of the pregnant woman includes Leopold’s Maneuvers.
   
2. The choice of monitoring methods depends on the number of registered nurses and patients.
   
3. Auscultation of fetal heart tones is desired prior to application of the fetal monitor.
   
4. When a fetoscope is used, document the fetal heart rate, accelerations, and decelerations.
   
5. The initial assessment may include fundal height to rule out intrauterine growth restriction or fetal macrosomia.
   
6. A cervical examination can confirm the fetal presenting part.
   
7. At 26 weeks of gestation, the tocotransducer should be placed above the umbilicus.
   
8. It is important to consider the impact of maternal and fetal physiology on the FHR.