MONOGRAPH

Fetal Assessment and Safe Care During Labor

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Purpose of this Monograph

Safe care for mothers and babies during labor and birth is the goal of all health care professionals and is an expectation of childbearing women and their families. Fetal assessment is a key aspect of perinatal patient safety. The childbearing population has changed over the last several decades. Severe maternal morbidity has increased, as has maternal age at first birth (Reid, 2024). These factors affect care requirements during labor and birth and intensify the need for timely and accurate maternal-fetal assessment. More evidence has been published about what constitutes normal labor progress and associated maternal-newborn outcomes. These data have been used to redefine routine labor management practices (American College of Obstetricians and Gynecologists [ACOG], 2024a; ACOG & Society for Maternal-Fetal Medicine [SMFM], 2014).

One of the main objectives of the heightened focus on labor management is prevention of the first cesarean birth, which avoids maternal morbidity and mortality related to primary and repeat cesareans (ACOG, 2024a; ACOG & SMFM, 2014). While vaginal birth after cesarean (VBAC) has increased from 12.4% in 2016 to 15.5% in 2024, the rate remains low for eligible candidates (Centers for Disease Control and Prevention [CDC] & National Center for Health Statistics [NCHS], 2025a,b). Labor management guidelines based on current evidence, along with efforts to minimize unnecessary interventions (ACOG, 2019; National Academies of Science, Engineering, and Medicine [NASEM], 2020), may result in longer labors for selected women progressing at the upper limits of normal (ACOG, 2024a). Renewed interest in elective induction of labor at 39 weeks gestation for low-risk nulliparous women after publication of the ARRIVE trial (Grobman et al. 2018) may likewise contribute to a longer intrapartum length of stay. Although longer labors require extended fetal surveillance, many women may be able to have a vaginal birth applying updated labor guidelines whereas in the past, a cesarean for "failure to progress" would likely have occurred (ACOG, 2024a). Patience supported by evidence and clinical guidelines may influence labor outcomes. In some cases, despite the best efforts of all involved, a cesarean birth may be necessary to have a healthy outcome.

The purpose of this monograph is to incorporate the latest natality data and evidence-based labor management guidelines into maternal and fetal assessment during the intrapartum period. A brief review of the definitions for fetal heart rate (FHR) patterns developed by the National Institute of Child Health and Human Development (NICHD; Macones et al., 2008a,b) is offered followed by an overview of FHR interpretation principles, physiologic implications, and intrauterine resuscitation measures. Demographic changes in the childbearing population based on the most recent pregnancy surveillance and natality data are covered, with implications for maternal-fetal assessment and labor management. A summary of the updated recommendations for induction of labor and labor management from the American College of Nurse-Midwives (ACNM et al., 2022), ACOG (2024a) and the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN [Simpson], 2025a) is then presented with discussion of the implications of the ARRIVE trial (Grobman et al., 2018). The monograph concludes with a discussion of aspects of a safe maternity unit culture that support and promote high quality care during labor and birth, including adequate nurse staffing for maternal-fetal assessment based on patient acuity.

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Overview of NICHD Terminology and Interpretation of Electronic Fetal Monitoring Tracings

The NICHD definitions and classifications in the "The 2008 National Institute of Child Health and Human Development Workshop Report on Electronic Fetal Monitoring" were published simultaneously in the *Journal of Obstetric, Gynecologic and Neonatal Nursing and in Obstetrics and Gynecology* (Macones et al., 2008a,b). NCC encourages the reader to obtain the original documents for further review and study.

Nurse's view of EFM tracings of two patients in labor while in patient A's room. Just began covering for patient B while her nurse is on break and notes patient B needs attention including assessment of fetal status and uterine activity.

Operational Principles for Using NICHD Terminology

Operational principles as the basis for defining terms and their interpretive value in assessing fetal heart rate tracings, were standardized in 1997 and reaffirmed in 2008. The most pertinent are listed below:

- Definitions are to be used for visual interpretation.
- Definitions apply to patterns obtained from a direct fetal electrode or an external Doppler device.
- Focus is on intrapartum patterns, but the definitions may also apply to antepartum observations as well.
- FHR patterns and uterine activity are determined through interpretation of tracings of good quality.
- The components of FHR tracings do not occur in isolation; therefore, evaluation of FHR patterns should take into account all components of the FHR pattern, including baseline rate, variability, and presence of accelerations and/or decelerations. EFM tracings should be assessed over time to identify changes and trends.
- No differentiation between short- and long-term variability is made because in practice, they are visually determined as a unit.
- FHR patterns are dependent on gestational age; thus this is an essential interpretative factor for evaluating a FHR pattern. Maternal medical status, prior fetal assessment results, use of medications and other factors also may need to be considered.
- A complete description of the EFM tracing includes uterine contractions, baseline FHR, baseline variability, presence of accelerations, periodic (associated with contractions) or episodic (not associated with contractions) decelerations, and changes or trends of the FHR pattern over time. (Macones et al., 2008a,b).

NICHD Terminology and Definitions

FETAL HEART RATE AND UTERINE ACTIVITY CHARACTERISTICS AS PER NICHD

Term	Definition
Baseline Rate	Approximate mean FHR rounded to increments of 5 bpm during a 10-minute window excluding accelerations and decelerations and periods of marked variability. There must be ≥2 minutes of identifiable baseline segments (not necessarily contiguous) in any 10-minute window, or the baseline for that period is indeterminate. In such cases, one may need to refer to the previous 10-minute window for determination of the baseline.
Normal Baseline	Baseline rate between 110-160 bpm.
Bradycardia	Baseline rate of <110 bpm.
Tachycardia	Baseline rate of >160 bpm.
Baseline Variability	Determined in a 10-minute window, excluding accelerations and decelerations. Fluctuations in the baseline FHR that are irregular in amplitude and frequency and are visually quantified as the amplitude of the peak-to-trough in bpm.
Absent Variability	Amplitude range undetectable.
Minimal Variability	Amplitude range visually detectable but ≤5 bpm. (Greater than undetectable but ≤5 bpm)
Moderate Variability	Amplitude range 6–25 bpm.
Marked Variability	Amplitude range >25 bpm.
Acceleration	Visually apparent **abrupt** increase in FHR. Abrupt increase is defined as an increase from onset of acceleration to peak is <30 seconds. Peak must be ≥15 bpm above the baseline; must last ≥15 seconds, but <2 minutes from the onset to return to baseline. Before 32 weeks of gestation, accelerations are defined as having a peak ≥10 bpm above the baseline and duration of ≥10 seconds.
Prolonged Acceleration	Acceleration ≥2 minutes but <10 minutes in duration. Acceleration lasting ≥10 minutes is defined as a baseline change.
Early Deceleration	Visually apparent, usually symmetrical, **gradual** decrease and return of FHR associated with a uterine contraction. The gradual decrease in FHR is defined as one from the onset to FHR nadir of ≥30 seconds. The decrease in FHR is calculated from onset to nadir of deceleration. The nadir of the deceleration occurs at the same time as the peak of the contraction. In most cases, the onset, nadir, and recovery of the deceleration coincide with the beginning, peak, and ending of the contraction, respectively.
Late Deceleration	Visually apparent, usually symmetrical, **gradual** decrease and return of FHR from the baseline associated with a uterine contraction. The gradual FHR decrease is defined as from the onset to the FHR nadir of ≥30 seconds. The decrease in FHR is calculated from the onset to the nadir of the deceleration. The deceleration is delayed in timing, with the nadir of the deceleration occurring after the peak of the contraction. In most cases, the onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, respectively.
Variable Deceleration	Visually apparent **abrupt** decrease in FHR. An **abrupt** FHR decrease is defined as from the onset of the deceleration to the beginning of the FHR nadir of <30 seconds. The decrease in FHR is calculated from the onset to the nadir of deceleration. The decrease in FHR is ≥15 bpm, lasting ≥15 seconds, and <2 minutes in duration. When variable decelerations are associated with uterine contractions, their onset, depth, and duration commonly vary with successive uterine contractions. Variable decelerations have a depth criteria; they must drop at least 15 bpm or more to be considered a variable deceleration.
Prolonged Deceleration	Visually apparent decrease in FHR from baseline that is ≥15 bpm, lasting ≥2 minutes, but <10 minutes. A deceleration that lasts ≥10 minutes is a baseline change. Prolonged decelerations have a depth criteria; they must drop at least 15 bpm or more to be considered a prolonged deceleration.
Recurrent Decelerations	Occurring with ≥50% of contractions in any 20 minute window.
Intermittent Decelerations	Occurring with <50% of contractions in any 20 minute window.
Sinusoidal Pattern	Visually apparent, smooth, sine wave-like undulating pattern in FHR baseline with cycle frequency of 3-5/minute that persists for ≥20 minutes.
Uterine Activity	Uterine activity is assessed based on the number of contractions that are occurring in a 10 minute segment, averaged over a 30 minute period.
Normal Uterine Activity	5 or less contractions in a 10 minute segment, averaged over a 30 minute period.
Tachysystole	Excessive uterine activity; more than 5 contractions in a 10 minute segment averaged over a 30 minute period. Tachysystole can be the result of both spontaneous and stimulated labor.

Derived from: Macones, G. A., Hankins, G. D., Spong, C. Y., Hauth, J. D., & Moore, T. (2008a, b). The 2008 National Institute of Child Health Human Development workshop report on electronic fetal monitoring: Update on definitions, interpretations, and research guidelines. *Journal of Obstetric, Gynecologic and Neonatal Nursing,* 37(5), 510–515. https://doi.org/10.1111/j.1552-6909.2008.00284.x and *Obstetrics & Gynecology*, 112(3), 661–666. https://doi.org/10.1097/AOG.0b013e318184139.

(See Appendix A for sample EFM tracings with each of these fetal heart rate characteristics)

(See Appendix B for sample EFM tracings with normal uterine activity and tachysystole)

(See Appendix C for sample EFM tracings with sinusoidal pattern)

Factors Affecting Fetal Heart Rate Patterns

There are many factors that affect the FHR. These changes can relate to pre-existing or pregnancy-related conditions, gestational age, substances used by the woman before labor, and medications given to the woman in labor. Other influences include maternal positioning, excessive uterine activity, and maternal pushing efforts. The changes may be transient and benign or require close monitoring and/or intervention/s. In the following two tables (O'Brien-Abel, 2020), factors that have an influence on the FHR and potential clinical causes of decreased uteroplacental blood flow and maternal–fetal exchange are identified.

INFLUENCES ON FETAL HEART RATE CONTROL

PHYSIOLOGY	EFFECT ON FETAL HEART RATE
Parasympathetic Nervous System (branch of the autonomic nervous system)	
• Originates in medulla oblongata • Vagus nerve (10th cranial innervates SA and AV nodes) • Stimulation releases acetylcholine • Pathway for transmission of FHR variability • Variability represents an intact central nervous system pathway through cerebral cortex, midbrain, vagus nerve, and normal cardiac conduction system	• Decreases FHR • With increasing gestational age, slow, gradual decrease in FHR (remains within normal range) and increase in FHR variability • Moderate variability indicates absence of metabolic acidemia • Modulates baseline FHR with sympathetic branch
Sympathetic Nervous System (branch of the autonomic nervous system)	
• Nerve fibers widely distributed throughout myocardium at term • Stimulation releases catecholamines (norepinephrine, epinephrine) • Reserve mechanism to initially improve the heart's pumping ability during intermittent hypoxemia/stress • Blocking with propranolol results in approximately 10 bpm decrease in FHR • Catecholamines may also cause fetal vasoconstriction and hypertension	• Increases FHR • With intermittent hypoxemia, initial normal fetal compensatory response is an increase in FHR or brief tachycardia • At term, tachycardia is not normal • In early gestation, sympathetic dominance results in slightly higher FHR and decrease in variability • Modulates baseline FHR with parasympathetic branch
Cardiac Output	
• In the adult, CO increases or decreases in response to changes in HR or SV as in the following equation: CO = HR x SV • Because the fetal heart appears to operate near the top of its cardiac function curve, SV does not fluctuate significantly. Hence, fetal CO is dependent on HR	• Small FHR variations within the normal FHR range (110-160 bpm) appear to have minimal effect on CO • With fetal tachycardia greater than 240 bpm or bradycardia less than 60 bpm, fetal CO and umbilical blood flow can be significantly decreased
Baroreceptors	
• Protective, stretch receptors • Located in aortic arch and carotid sinuses at bifurcation of external and internal carotid arteries • When arterial BP increases, baroreceptors quickly detect amount of stretch, sending impulses via vagus nerve to midbrain • Further vagal stimulation causes a sudden decrease in FHR, CO, and BP, thereby protecting fetus	• Abrupt decrease in FHR, CO, BP • Variable decelerations
Chemoreceptors	
• Central – located in medulla oblongata • Peripheral – located in aortic arch and carotid sinuses • Interaction of central and peripheral chemoreceptors poorly understood; combined effect FHR slowing • When blood flow falls below threshold for normal respiratory gas exchange, increased PCO_2 stimulates chemoreceptors to slow FHR • Deceleration is late due to circulation time from fetal-placental site to chemoreceptors	• Late decelerations • Variable decelerations resulting from umbilical cord occlusion coupled with hypoxemia • Prolonged deceleration coupled with hypoxemia

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INFLUENCES ON FETAL HEART RATE CONTROL

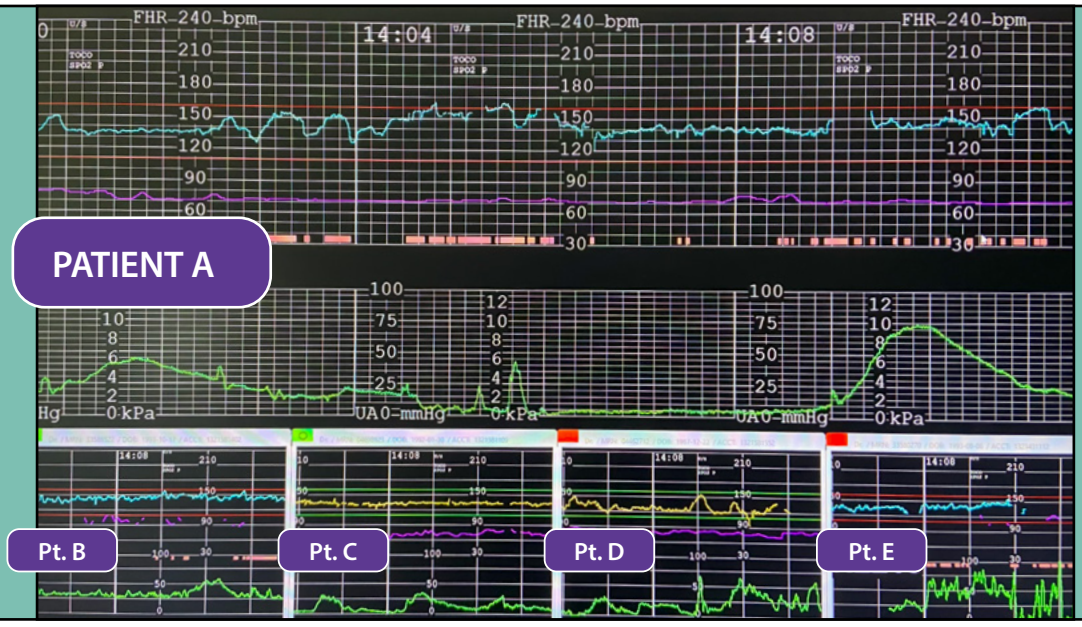
PHYSIOLOGY	EFFECT ON FETAL HEART RATE
Hormonal Influences	
• Epinephrine and norepinephrine (adrenal medulla) – Reserve mechanism to initially improve the heart's pumping ability during intermittent hypoxemia/stress – In response to stress, fetal compensatory response shunts blood away from less vital organs and toward brain, heart, adrenal glands	• Increases FHR, strength of cardiac contractions, CO, arterial BP
• Renin-angiotensin system – Regulates normal fetal circulation by tonic vasoconstriction on peripheral vascular bed – Protects fetus during hemorrhagic stress	• Maintains systemic arterial BP and umbilical placental blood flow
• Prostaglandins – Prostaglandins and arachidonic acid metabolites found in fetal circulation and in many tissues – Maintains patency of fetal ductus arteriosus	• Regulation of umbilical blood flow
Sleep-Wake Patterns	
• Quiet sleep – Quiescence (occasional brief body movements) – Absent REM – FHR stable with narrow oscillation bandwidth	• Normal baseline FHR, minimal variability, accelerations absent • Non-reactive NST • Responds to external stimuli (vibroacoustic stimulation)
• Active (REM) sleep – Frequent gross body movements – Rapid darting eye movements (REM) – FHR with wider oscillation bandwidth and frequent accelerations with movements	• Moderate variability, accelerations present • Reactive NST • At term, duration of periods of active sleep are longer than quiet sleep

Key: AV, Atrioventricular; BP, blood pressure; bpm, beats per minute; CNS, central nervous system; CO, cardiac output; FHR, fetal heart rate; HR, heart rate; NST, non-stress test; PCO_2, partial pressure of carbon dioxide; PO_2, partial pressure of oxygen; REM, rapid eye movements; SA, sinoatrial; SV, stroke volume.

Derived from content in Blackburn, 2018a,b,c; Fineman & Maltepe, 2019; Freeman et al., 2012; King, 2018; King & Parer, 2000; Nageotte, 2019; Parer, 1997; O'Brien & Simpson, 2021; Richardson et al., 2019; Rudolph, 1985

From: O'Brien-Abel, N. (2020). Clinical implications of fetal heart rate interpretation based on underlying physiology. *MCN, The American Journal of Maternal Child Nursing*, 45(2), 82-91. https://doi.org/10.1097/NMC.0000000000000596

Nurse's view of patients' EFM tracings while in patient A's room. She is progressing slowly in latent phase labor and is receiving IV oxytocin at 8 mU/min. Patients B, C, D, and E each have their own nurse as all are having induction of labor with oxytocin.



POTENTIAL CLINICAL CAUSES OF DECREASED UTEROPLACENTAL BLOOD FLOW AND MATERNAL-FETAL EXCHANGE

Maternal conditions
Chronic or gestational hypertension; preeclampsia
Cardiac disease
Diabetes
Maternal hypotension
Supine position (supine hypotensive syndrome)
Regional analgesia/anesthesia (sympathetic blockade)
Hemorrhage/hypovolemic shock
Placental changes
Degenerative (e.g., maternal hypertension, diabetes, nicotine, prolonged pregnancy)
Infection (e.g., chorioamnionitis)
Edema (e.g., hydrops fetalis)
Decreased surface area (e.g., abruptio placenta, small placenta, infarcts)
Excessive uterine activity
Tachysystole
Hypertonus
Medications that cause contractions (e.g., oxytocin, prostaglandins)
Abruptio placenta
Cocaine
Vasoconstriction
Endogenous (e.g., catecholamines)
Exogenous (e.g., most sympathomimetics, except ephedrine; cocaine, amphetamines)

From: O'Brien-Abel, N. (2020). Clinical implications of fetal heart rate interpretation based on underlying physiology. *MCN, The American Journal of Maternal Child Nursing*, 45(2), 82-91. https://doi.org/10.1097/NMC.0000000000000596

Fetal Heart Rate Pattern Interpretation

The primary purpose for use of electronic fetal monitoring is to determine if the fetus is well oxygenated. Fetal heart rate patterns provide information about fetal acid-base status at the time they are observed (Macones et al., 2008a,b). Because the fetal condition is dynamic, frequent reassessment is required to monitor ongoing fetal status considering the context of the complete clinical situation. The three-tiered classification system was developed based on fetal acid-base status at time of observation with the assumption that the FHR tracing changes over time (Macones et al., 2008a,b). Fetal status can move from one category to another as a result of the individual clinical situation, maternal status and various intrauterine resuscitation measures that may be initiated in response to the FHR pattern (ACOG, 2025a; Lyndon & O'Brien-Abel, 2021; O'Brien-Abel & Simpson, 2021). Careful assessment of FHR patterns during labor, accurate interpretation, and timely intervention as appropriate are predicated on nurse staffing based on patient acuity as detailed in the nurse staffing standards from AWHONN (2022d) and AAP and ACOG (2017) to ensure that nurses have the capacity to attend to the woman in labor and her fetus as their clinical status requires.

Moderate variability and/or the presence of accelerations are two features of FHR patterns that reliably predict the absence of fetal metabolic acidemia at the time observed (Macones et al., 2008a,b). However, it is important to note that the absence of accelerations or an observation of minimal or absent variability alone does not reliably predict the presence of fetal hypoxemia or metabolic acidemia (Macones et al., 2008a,b).

An analysis of 48,444 EFM tracings of women in term labor in 10 hospitals in the United States found over the course of labor the majority of fetuses will have FHR pattern characteristics that are both normal (category I) and indeterminate (category II) (Jackson et al., 2011). Abnormal (category III) FHR patterns are rare (0.1%). Jackson et al. reported that when all of labor was considered, 77.9% of the time the tracings were Category I, 22.1% of the time Category II, and 0.004% of the time Category III. In addition, Category II FHR tracings occurred in 84% of labors. Moderate variability and/or accelerations are generally an indication of a non-acidotic fetus when the FHR is indeterminate or category II. There are a wide range of clinical implications associated with the various types of FHR patterns within category II. For example, a FHR tracing with moderate variability and intermittent variable decelerations and a FHR tracing with minimal variability and recurrent late decelerations both meet criteria to be classified as category II FHR patterns. The underlying physiologic causative factors are different, as are the levels of concern for fetal well-being. Therefore, using the FHR category as a major factor to make clinical decisions related to fetal status during labor when the FHR is category II can present significant challenges. Nevertheless, there is evidence to suggest that the longer the FHR remains in category II, especially during the last two hours prior to birth, the greater the risk of neonatal morbidity. Jackson et al. (2011) found if more than 50% of the time was spent in category II in the last two hours prior to birth, there was an increased risk of an Apgar score less than 7 and admission to the neonatal intensive care unit.

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Fetal Heart Rate Pattern Interpretation *(cont.)*

In 2013, an algorithm was developed by fetal monitoring researchers and expert clinicians led by Clark et al. (2013) that included intrauterine resuscitation measures for management of indeterminant (category II) FHR patterns. One of the goals was to identify category II FHR patterns with characteristics that suggested fetal well-being by an evaluation of variability and accelerations, so labor could continue with careful monitoring. Another goal was to assess fetal status with consideration of the likelihood of a timely vaginal birth of a nonacidemic baby. A main objective was to promote the birth of the fetus, when possible, prior to the development of damaging degrees of hypoxemia or acidemia. The algorithm was designed to assist in delineation of FHR patterns in category II that may allow for careful observation from those that may warrant prompt action, based on the presence or absence of moderate variability or accelerations, "significant" decelerations and for how long; the phase and stage of labor; and response to the usual intrauterine resuscitation measures. Significant decelerations were defined as any of the following: variable decelerations lasting longer than 60 seconds and reaching a nadir more than 60 bpm below baseline, variable decelerations lasting longer than 60 seconds and reaching a nadir less than 60 bpm regardless of the baseline, and any late decelerations of any depth.

Application of the algorithm retrospectively to a series of cases of babies born with metabolic acidemia by Clark et al., (2015), found about 50% feasibly could be identified and have an expeditious birth under ideal conditions. They concluded that randomly occurring emergency events during labor along with more rapidly than anticipated worsening of acid-base status at times seen in some fetuses with nonemergent category II FHR tracings contribute to EFM being a valuable but imperfect tool. Shields et al. (2018) adapted the Clark et al. (2013) algorithm focusing on recurrent "significant" decelerations in FHR tracings with moderate or marked variability and used it in a prospective interventional trial in six hospitals. Compliance with use of the algorithm was high. Data from 23 hospitals in the same health system that did not use the standard management of FHR algorithm were compared. Shields et al. (2018) found use of the adapted algorithm was associated with a 24% decrease in Apgar scores less than 7, a 26.6% decrease in severe unexpected newborn complications, and a slight but significant decrease in cesarean birth. More research is needed on the application of a standardized approach to FHR tracing interpretation and management; however, these results are promising. This area of clinical practice has not received enough research attention in recent years.

Category II and category III tracings require evaluation of the possible etiology (ACOG, 2025a, Macones et al., 2008a,b). Initial assessment and intervention may include discontinuation of any labor stimulating agent, a vaginal examination, maternal repositioning, correction of maternal hypotension, an intravenous (IV) fluid bolus of lactated Ringer's solution, assessment for tachysystole (and if noted, reduction in uterine activity), amnioinfusion, and modification of maternal pushing efforts in second stage labor (e.g. pushing with every other or every third contraction or discontinuation of pushing temporarily) (ACOG, 2025a, O'Brien-Abel & Simpson, 2021). Maternal oxygen at 10 liters per minute using a nonrebreather face mask may be administered in the presence of maternal hypoxia, minimal or absent variability or recurrent late decelerations that have not resolved with the initial intrauterine resuscitative measures but should not be used routinely or as a first line intrauterine resuscitation measure (ACOG, 2022, 2025a; AWHONN, 2022a; Simpson, 2008). Moderate variability reliably predicts the absence of fetal hypoxemia or metabolic acidemia at the time observed (Macones et al., 2008a,b), therefore, maternal oxygen administration is generally not necessary or appropriate if the FHR has moderate variability (Simpson, 2008; O'Brien-Abel & Simpson, 2021). When oxygen is chosen for intrauterine resuscitation, there is the assumption that other sources of potential fetal physiologic stress have been minimized; thus, oxytocin should not be infusing concurrently with maternal oxygen administration (O'Brien-Abel & Simpson, 2021; Simpson, 2008; Simpson, 2025a).

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FETAL HEART RATE PATTERN CLASSIFICATION AND INTERPRETATION

Category	Interpretation	Features
I **Normal**	Tracings in this category are strongly predictive of normal acid-base status at the time of observation.	• Baseline rate 110 to 160 beats per minute • Baseline variability moderate • No late or variable decelerations • Early decelerations present or absent • Accelerations: present or absent
II **Indeterminate** All tracings not categorized as category I or III. May represent many tracings that are encountered in everyday clinical practice.	Tracings in this category are not predictive of abnormal acid-base status, however there are insufficient data to classify them as either category I or category III	• Baseline rate: Bradycardia not accompanied by absent baseline variability • Baseline rate: Tachycardia • Minimal variability • Absent variability without recurrent decelerations • Marked variability • Absence of induced accelerations after fetal stimulation • Recurrent variable decelerations with minimal or moderate variability • Prolonged deceleration • Recurrent late decelerations with moderate variability
III **Abnormal**	Tracings in this category are predictive of abnormal acid-base status at the time of observation.	• Absent variability and any of the following: —Recurrent late decelerations —Recurrent variable decelerations —Bradycardia • Sinusoidal pattern

Derived from: American College of Obstetricians and Gynecologists (2025a). Intrapartum fetal heart rate monitoring: Interpretation and management (Clinical Practice Guideline No. 10). *Obstetrics & Gynecology*, 146(4), 583-599. https://doi.org/10.1097/AOG.0000000000006049

(See Appendix C for sample EFM tracings in each of the categories)

INTRAUTERINE RESUSCITATION MEASURES

Clinical Situation and/or FHR Characteristics	Goal	Techniques/Measures
Minimal or absent variability **Recurrent late decelerations** **Recurrent variable decelerations** **Prolonged decelerations** **Tachycardia** **Bradycardia** **Variable, late or prolonged decelerations occurring with maternal pushing efforts** **Tachysystole**	Promote fetal oxygenation	• Lateral positioning (either left or right) • IV fluid bolus of lactated Ringer's solution • Decrease in oxytocin rate • Discontinuation of oxytocin / removal of Cervidil insert / withholding next dose of misoprostol • Modification of pushing efforts; pushing with every other or every third contraction or discontinuation of pushing temporarily (during second stage labor) • Oxygen administration at 10 L/min via nonrebreather face mask; may be considered if there is maternal hypoxia, minimal to absent variability and/or recurrent late decelerations or prolonged decelerations that have not resolved with other techniques (discontinue as soon as possible based on fetal status); should not be used routinely or as a first time intrauterine resuscitation measure • If prolapsed umbilical is identified, elevate presenting fetal part while preparations are made for expedited operative birth
Tachysystole	Reduce uterine activity	• IV fluid bolus of lactated Ringer's solution • Lateral positioning (either left or right) • Decrease in oxytocin rate • Discontinuation of oxytocin / removal of Cervidil insert / withholding next dose of misoprostol • If no response, terbutaline 0.25 mg subcutaneously may be considered
Recurrent variable decelerations	Alleviate umbilical cord compression	• Repositioning • Amnioinfusion (during first stage labor) • Modification of pushing efforts; pushing with every other or every third contraction or discontinuation of pushing temporarily (during second stage labor)
Maternal hypotension	Correct maternal hypotension	• Lateral positioning (either left or right) • IV fluid bolus of lactated Ringer's solution • If no response, ephedrine 5 mg to 10 mg IV push may be considered

Derived from: Simpson, K. R. (2021). Physiologic interventions for fetal heart rate patterns. In A. Lyndon and K. Wisner (Eds.) *AWHONN's Fetal heart monitoring principles and practices*. 6th ed. Association of Women's Health, Obstetric and Neonatal Nurses, page 160.

Uterine Activity Assessment

Accurate assessment and management of uterine activity during labor is fundamental to safe and effective care during labor and birth (Miller et al., 2022; Simpson & Miller, 2011). Poor labor progress may be a result of inadequate uterine activity, while a negative effect on fetal oxygenation can be associated with too frequent contractions or inadequate relaxation time between contractions (Miller et al., 2022; Simpson, 2025a). Palpation is an important aspect of uterine activity assessment. Ideally, contractions are of sufficient strength and regularity to promote labor progress leading to a vaginal birth. Contractions that are occurring at a frequency of more than 5 in 10 minutes averaged over 30 minutes are defined as uterine tachysystole (Macones et al., 2008a,b).

The healthy term fetus experiences uterine contractions as a normal part of labor and birth. Uteroplacental blood flow is reduced by up to 60% during contractions, causing temporary fetal and placental hypoxemia (Turner et al., 2020). When contractions occur at a frequency that allows for adequate fetal and placental reperfusion, and the fetus and placenta are healthy, intermittent decreases in uteroplacental blood flow are well tolerated (Ayres-de-Campo & Arulkumaran, 2015; Uvnas-Moberg, 2024).

When contractions are too frequent, or there is insufficient relaxation time between contractions, decreased intervillous blood flow eventually leads to decreased oxygen transfer to the fetus (Bakker et al. 2007; Simpson & James, 2008; Turner et al., 2020). Bakker et al. (2007) reported that inadequate relaxation time between labor contractions (<60 seconds during first stage labor) increased risk of fetal acidemia at birth. Simpson and James (2008) found contraction frequencies in the range of ≥5 to <6 every 10 minutes over 30 minutes was associated with a progressive decrease in fetal oxygenation; fetal oxygen desaturation was more pronounced when there were ≥6 contractions in 10 minutes over 30 minutes.

Fetal and placental health are not always favorable, which can affect how uterine contractions are tolerated by the fetus during labor. Examples of conditions with risk of decreased maternal-fetal oxygen transfer include preeclampsia, diabetes, maternal hypotension, abruptio placenta or other types of placental dysfunction, and fetal growth restriction with suboptimal metabolic reserves (O'Brien-Abel, 2020; Turner et al., 2020). If fetal oxygenation is diminished to such a degree that fetal metabolic acidosis is produced from anaerobic glycolysis, direct myocardial depression occurs, and the FHR pattern becomes indeterminate (category II) or abnormal (category III) (ACOG & AAP, 2014). There is risk of fetal hypoxia, acidosis, and eventually asphyxia, if the situation continues unresolved and the intermittent interruption in blood flow caused by excessive uterine activity exceeds a critical level (Chandraharan et al., 2022; Franken et al., 2022; Gulumser et al., 2022; Hermesch et al., 2024; Turner et al., 2020; Wray et al., 2021).

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DEFINITIONS OF COMMON TERMS USED IN ASSESSING UTERINE ACTIVITY

Frequency	Time, in minutes from the beginning of one contraction to the beginning of the next contraction. Frequency is generally evaluated over a minimum of 10 min. Frequency is considered normal when there are ≤5 contractions in 10 min, averaged over 30 min. A frequency of >5 contractions in 10 min averaged over 30 min is tachysystole. These terms apply to both spontaneous and stimulated labors.
Duration	Time, in seconds, from the beginning of a uterine contraction to the end of a contraction.
Relaxation time	Time, in minutes and/or seconds, between contractions; measured from the end of one uterine contraction to the beginning of the next uterine contraction.
Strength/ Intensity	Term that applies to both external monitoring using palpation and internal monitoring. When using palpation, strength is usually expressed as mild, moderate, or strong. When using an intrauterine pressure catheter, strength is usually expressed as the peak of the contraction in mm Hg.
Resting tone	Intrauterine pressure during relaxation time, expressed in mm Hg when an intrauterine pressure catheter is in place. Zeroing the intrauterine pressure catheter before assessing resting tone enhances accuracy. When assessing uterine activity with palpation, uterine resting tone is generally expressed as soft or firm.

Adapted from: Simpson, K. R. & Miller, L. A. (2011). Assessment and optimization of uterine activity during labor. *Clinical Obstetrics and Gynecology*, 54(1), 40-49. https://doi.org/10.1097/GRF.0b013e31820a06aa.

Uterine Activity Assessment *(cont.)*

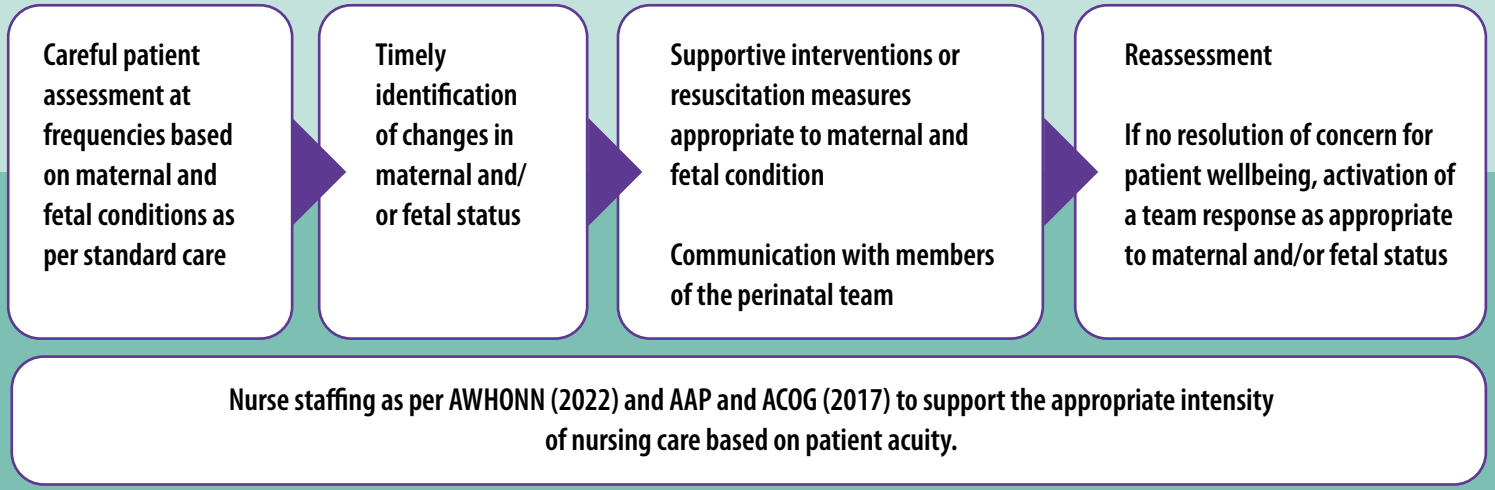
Ideally, and in the context of assessment of maternal and fetal status every 15 minutes for women receiving oxytocin as per standard and recommended practice (AAP & ACOG, 2017; AWHONN, 2024a; Simpson, 2025a), identification and treatment of uterine tachysystole should be timely. Treatment is based on fetal status and may include maternal repositioning as a first step, followed by an intravenous fluid (IV) bolus of lactated Ringers solution, and a decrease or discontinuation of oxytocin. An algorithm for treating tachysystole is offered by AWHONN (Simpson, 2025a).

Communication of Electronic Fetal Monitoring Data

When the FHR pattern is indeterminate (category II) or abnormal (category III), communication among members of the perinatal team is essential in ensuring appropriate and timely response to the clinical situation. Perinatal patient safety depends on clear, concise communication and acknowledgement that there is mutual understanding of the content and urgency of what is being conveyed. Standardizing components of the data communicated is useful in promoting patient safety. The following are suggested aspects of professional communication about fetal status when the FHR pattern is indeterminate or abnormal:

- Baseline rate, variability, presence or absence of accelerations and decelerations
- Clinical context of FHR pattern (e.g., cervical status, labor progress, oxytocin rate and recent titration, timing and amount of last dose of misoprostol, uterine activity, tachysystole, bleeding, timing and amount of last dose of intravenous pain medication, recent initiation or dosage change in regional anesthesia/analgesia, hypotension, length of time of ruptured membranes, amniotic fluid appearance, maternal fever, rapid labor progress, second stage labor pushing, umbilical cord prolapse; trial of labor attempting vaginal birth after cesarean birth)
- Intrauterine resuscitation measures initiated and the maternal-fetal response
- Fetal heart rate pattern evolution (e.g., how long has this been evolving?)
- Sense of urgency (e.g., come to the bedside now; as soon as you can; within 30 min)
- Who was notified and their response
- Next steps if there is no resolution of the fetal heart rate pattern

PATIENT SAFETY DURING LABOR AND BIRTH

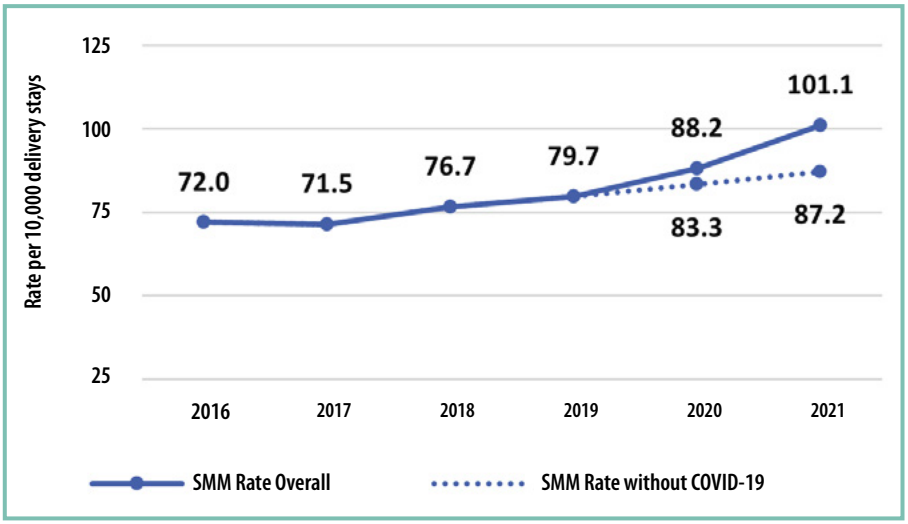


Changes in the Characteristics of Childbearing Women with Implications for Maternal-Fetal Assessment During Labor

Severe Maternal Morbidity (SMM)

Severe maternal morbidity (SMM) has increased significantly from 2006 to 2021 (CDC, 2024; Fingar et al., 2018, Reid, 2024). As per the CDC (2024) and the Agency for Healthcare Research and Quality, SMM is a composite of 21 indicators of unexpected labor and birth outcomes that may result in life-threatening maternal complications (Reid, 2024). Disseminated intravascular coagulation, acute renal failure, and acute respiratory distress are leading indicators of SMM (Reid, 2024). Recent data for annual rates of SMM from 2016 to 2021 were categorized into six groups of complications: hemorrhage, respiratory, cardiac, renal, sepsis, and other (Reid, 2024). Selected maternal populations such as older women and non-Hispanic Black women are at greater risk for adverse events (Fingar et al., 2018, Reid, 2024). COVID-19 caused higher rates of SMM, but data show rates increased even when excluding patients with COVID-19. AWHONN nurse staffing standards (AWHONN, 2022d) offer details on which types of patients require a ratio of 1 registered nurse to 1 woman in labor, including high-risk women with SMM.

RATES OF SEVERE MATERNAL MORBIDITY (SMM), 2016-2021



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2021.

This figure presents trends in the rate of birth hospitalizations with severe maternal morbidity (SMM) during the 2016–2021 period. When examining annual trends in inpatient stays involving SMM, it is important to also understand the influence of the COVID-19 pandemic beginning in 2020. Therefore, data are presented overall and among birth hospitalizations without a COVID-19 diagnosis in 2020 and 2021.

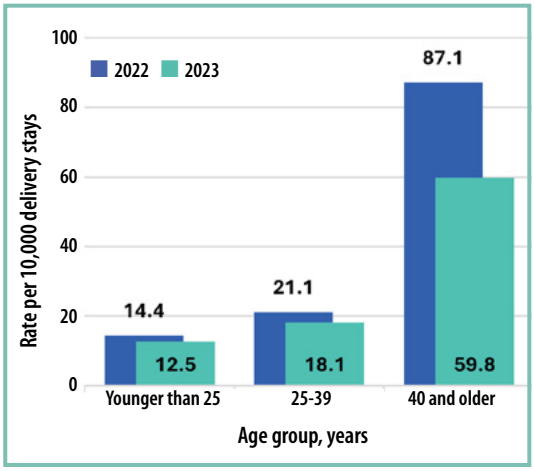
From 2016 to 2021, the overall rate of SMM (i.e., cases with and without a COVID-19 diagnosis) increased 40%, from 72.0 cases per 10,000 birth hospitalizations in 2016 to 101.1 in 2021. Among birth hospitalizations without COVID-19, however, the rate of SMM per 10,000 birth hospitalizations increased 21 percent, from 72.0 per 10,000 in 2016 to 87.2 in 2021.

From: Reid L. (2024, September). *Trends in severe maternal morbidity complications by patient characteristics, 2016–2021* (HCUP Statistical Brief No. 312). Agency for Healthcare Research and Quality, Rockville, MD. https://hcup-us.ahrq.gov/reports/statbriefs/HCUP-SB312-508.pdf

Severe Maternal Morbidity and Maternal Mortality Based on Age

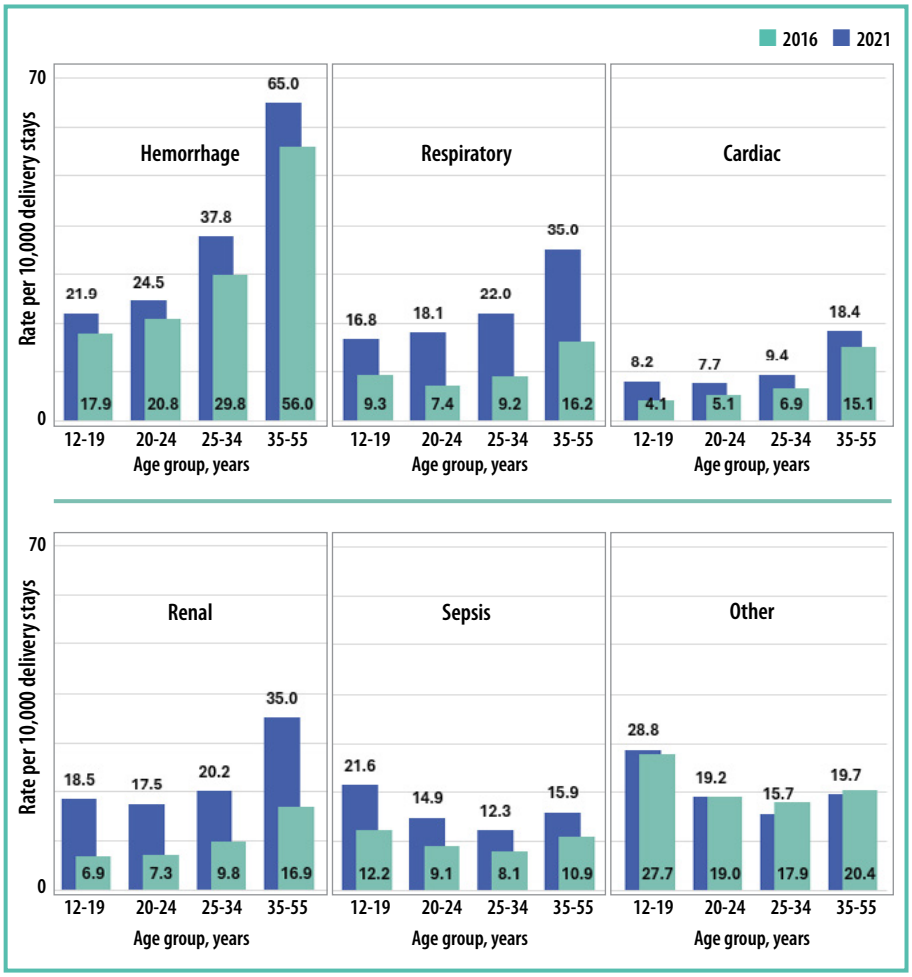
Maternal age at first birth has gradually increased over the years. In 1970, the average age of women giving birth for the first time was 21.4 years (Mathews & Hamilton, 2002) while in 2022, it was 27.4 years (Osterman et al., 2024). As maternal age increases, so do severe maternal morbidity and maternal mortality. The figures include a summary of severe maternal morbidity by maternal age in 6 categories of complications comparing 2016 and 2021 (Reid, 2024) and significant differences in maternal mortality based on maternal age (Hoyert, 2025).

MATERNAL MORTALITY RATE, BY AGE: UNITED STATES, 2022 AND 2023



From: Hoyert, D. L. (2025). *Maternal mortality rates in the United States, 2023*. Health E-Stats, National Center for Health Statistics. https://dx.doi.org/10.15620/cdc/174577

RATES OF SEVERE MATERNAL MORBIDITY (SMM) BY COMPLICATION GROUPS AND PATIENT AGE GROUPS, 2016 AND 2021



Note: Rates of SMM in 2021 include women with and without COVID-19. Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016 and 2021.

Across age and SMM complications, renal-related SMM birth hospitalizations for women aged 12–19 years had the largest percent change in rates from 2016 to 2021 (167 percent increase), followed by respiratory and renal-related SMM birth hospitalizations for women aged 20–24 years (146 and 141 percent increases, respectively).

Rates of SMM were highest among delivery stays for women aged 35–55 years for all complications with two exceptions—the rates of sepsis-related and other-related SMM delivery stays were highest for women aged 12–19 years in 2016 and in 2021.

In 2021, the largest age-related gap in SMM birth complication rates was for hemorrhage-related SMM; rates for women aged 35–55 years were nearly triple those of women aged 12–19 years. In 2016, the age-related gap in SMM birth complication rates was largest among cardiac-related SMM, with rates for women aged 35–55 years nearly four times the rate for women aged 12-19 years

From: Reid L. (2024, September). Trends in severe maternal morbidity complications by patient characteristics, 2016–2021 (HCUP Statistical Brief No. 312). Agency for Healthcare Research and Quality, Rockville, MD. https://hcup-us.ahrq.gov/reports/statbriefs/HCUP-SB312-508.pdf

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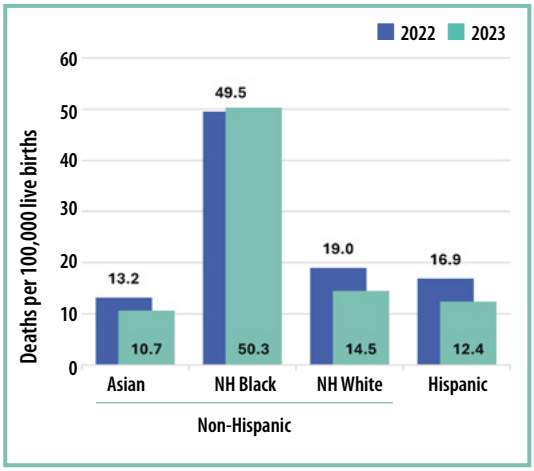
Severe Maternal Morbidity and Maternal Mortality based on Ethnic and Racial Identity

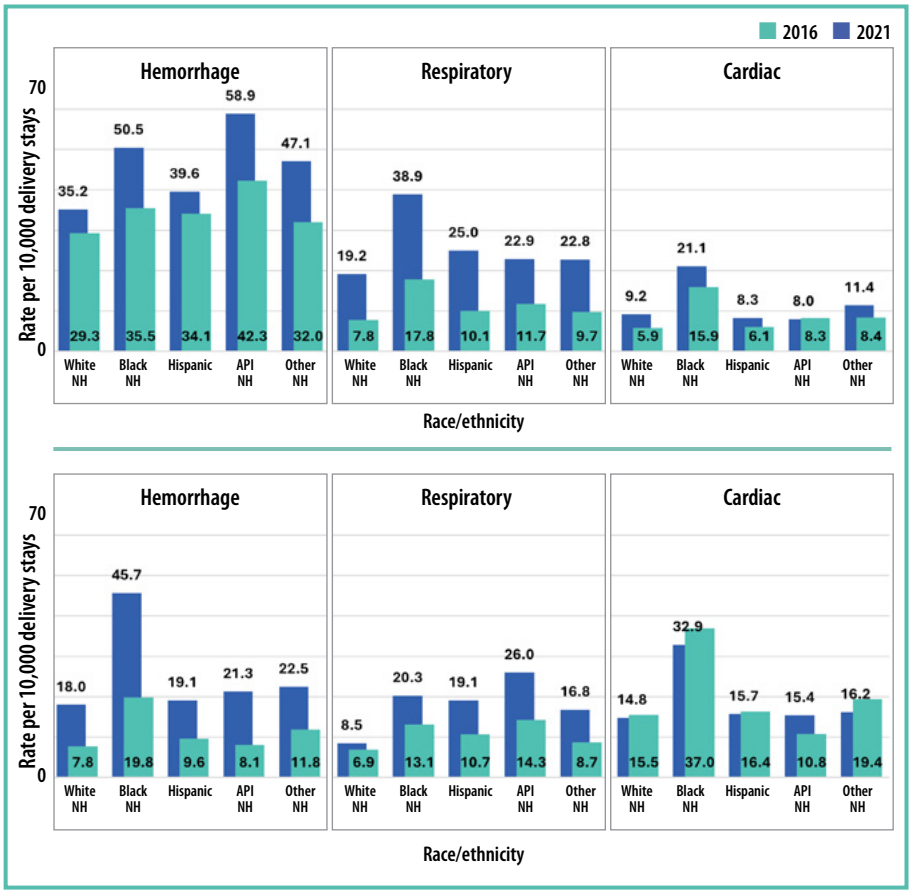
SMM and maternal death are experienced at different rates based on ethnicity and racial identity (Agency for Healthcare Research and Quality, 2022; American Academy of Nursing, 2024; Trost et al., 2024). In four of the six categories of SMM analyzed by Reid (2024) for the years 2016 to 2021, non-Hispanic Black women had higher rates when compared to women of other ethnic or racial groups. The figures show rates of SMM by complication groups and patient race and ethnicity in the United States comparing data in 2016 and 2021 and the differences based on racial identity for maternal deaths in the United States in 2022 and 2023. In 2023, non-Hispanic Black women had a maternal mortality rate more than 3 times that of White women (50.3 per 100,000 live births compared to 14.5 per 100,000 live births) (Hoyert, 2025).

MATERNAL MORTALITY RATE, BY RACE AND HISPANIC ORIGIN: UNITED STATES, 2022 AND 2023



From: Hoyert, D. L. (2025). *Maternal mortality rates in the United States, 2023*. Health E-Stats, National Center for Health Statistics.
https://dx.doi.org/10.15620/cdc/174577

RATE OF SEVERE MATERNAL MORBIDITY (SMM) BY COMPLICATION GROUPS AND PATIENT RACE/ETHNICITY, 2016 AND 2021



Abbreviations: API: Asian/Pacific Islander; NH: non-Hispanic. Note: 2021 SMM rates include those with and without COVID-19.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016 and 2021.

The renal-related SMM rate among birth hospitalizations for Asian/Pacific Islander non-Hispanic (NH) women had the largest six-year increase (165 percent increase) across the SMM complications and racial and ethnic groups from 2016 to 2021, followed by respiratory-related SMM among delivery stays for Hispanic (148 percent increase) and White NH (147 percent increase) women. Birth hospitalizations for Black non-Hispanic women had the highest rates of respiratory, cardiac, renal, and other-related SMM complications.In 2021, birth hospitalizations related to sepsis had the largest racial and ethnic disparity, with the rate for Asian/Pacific Islander non-Hispanic (NH) women (26.0 per 10,000 delivery stays) more than triple the rate for White NH women (8.5 per 10,000).

From: Reid L. (2024, September). *Trends in severe maternal morbidity complications by patient characteristics, 2016–2021* (HCUP Statistical Brief No. 312). Agency for Healthcare Research and Quality, Rockville, MD.
https://hcup-us.ahrq.gov/reports/statbriefs/HCUP-SB312-508.pdf

Changes in Characteristics of Labor and Birth with Implications for Maternal-Fetal Assessment During Labor

Trends in United States Natality 2020 to 2024

Natality data collected from US certificates of live birth show increases in maternal complications such as preterm birth, gestational diabetes, and gestational hypertension (includes pregnancy-induced hypertension and preeclampsia) (CDC & NCHS, 2025a,b). Interventions during labor such as induction of labor and cesarean birth have gradually increased in the last five years, as well as since these types of data were compiled (CDC & NCHS, 2025a,b). The first time that induction of labor data were collected from US certificates of live birth was in 1989 when the induction rate in the United States was 9% (U.S. Department of Health and Human Services Public Health Service et al., 1993). The cesarean birth rate was 4.5% in 1965. These factors influence labor care requirements and nurse staffing (AWHONN, 2022d).

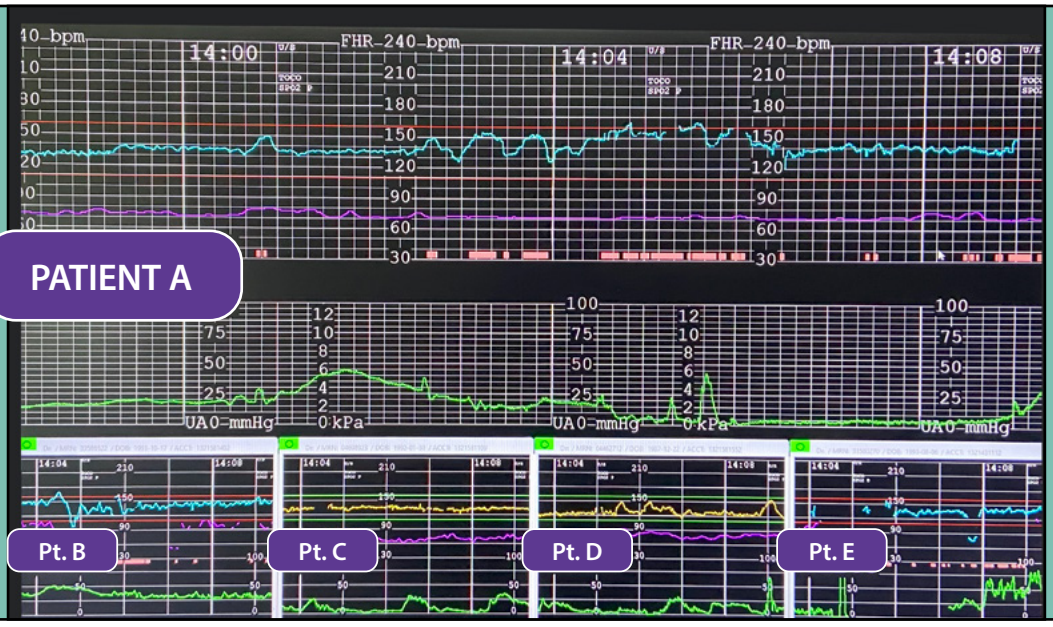
The CDC and NCHS (2025a,b) offer an online natality database with full details of US birth certificate data starting from 2016 (usually it is current up to 3 to 6 weeks prior). Researchers can query these data and calculate rates and other statistics from most fields. Birth certificate data from as far back as 1995 are also available for online search but with limited fields (https://wonder.cdc.gov/natality.html). Changes in the US certificates of live birth in 2003 and gradual adoption by states limit comparisons for some data points. When the reports on final data for births are published for each year by the CDC and NCHS in the National Vital Statistics Reports, they include links to tables of data accessible only online that are rich with much more information than in the print or PDF version of the report.

(continued on next page)

Nurses' view of patients' EFM tracings while in patient A's room. She is 9 cm and oxytocin has been discontinued.

Patients B, C, and D each have their own nurse as all are having induction of labor with oxytocin.

Patient E is about to give birth. Two nurses and a certified nurse midwife are at the bedside.



UNITED STATES NATALITY DATA 2020 TO 2024, SELECTED CHARACTERISTICS

Natality Data	2020	2021	2022	2023	2024
Births	3,613,647	3,664,293	3,667,758	3,596,017	3,618,267
Cesarean Birth rate	31.8%	32.1%	32.1%	32.3%	32.4%
Low Risk Cesarean Birth rate	25.9%	26.3%	26.3%	26.6%	26.7%
Vaginal Birth after Cesarean (VBAC) rate	13.9%	14.2%	14.6%	15.1%	15.5%
Preterm Birth (<27 weeks) rate	10.09%	10.49%	10.38%	10.4%	10.53%
Birthweight					
Low Birthweight (<2500 grams) rate	8.24%	8.52%	8.60%	8.57%	8.5%
Very Low Birthweight (<1500 grams) rate	1.34%	1.38%	1.36%	1.36%	1.32%
Labor Procedures					
Labor Induction rate	31.4%	32.1%	31.9%	33.1%	33.7%
Labor Induction First Birth Mothers* rate	38.9%	39.8%	39.7%	41.2%	41.7%
Labor Augmentation rate	21.7%	21.7%	20.8%	20.9%	20.9%
Epidural or Spinal Anesthesia during Labor	77.2%	77.6%	77.2%	77.9%	78.1%
Pregnancy Complications					
Gestational Diabetes**	77.1/1000	83.0/1000	81.0/1000	82.5/1000	84.0/1000
Gestational Hypertension** *(includes pregnancy-induced hypertension and preeclampsia*	84.3/1000	91.2/1000	95.2/1000	100.6/1000	103.9/1000
Age of Mother at First Birth	27.1 years	27.3 years	27.4 years	***	***
Teen Birth rate (ages 15 to 19)****	15/1000	13.9/1000	13.6/1000	13.1/1000	12.7/1000
Medicaid as Source of Payment	42%	41%	41.3%	41.2%	40%
Place of Birth					
Hospital	98%	97.8%	97.7%	97.7%	97.7%
Freestanding Birth Center	0.61%	0.64%	0.65%	0.64%	0.62%
Home	1.2%	1.4%	1.5%	1.5%	1.5%
Birth Attendant					
Certified Nurse Midwife	10.32%	10.64%	10.90%	11.35%	11.96%
Other Midwife	1.03%	1.16%	1.21%	1.28%	1.32%
Physician	87.7%	85.8%	86.6%	86.1%	85.4%

First birth mothers are those with first live birth and could include mothers who previously had a stillbirth after 20 weeks gestation (1 out of 175 births in the United States)

****per 1,000 live births***

*****Not available in the CDC Wonder Online Database***

******per 1,000 US females aged 15 to 19***

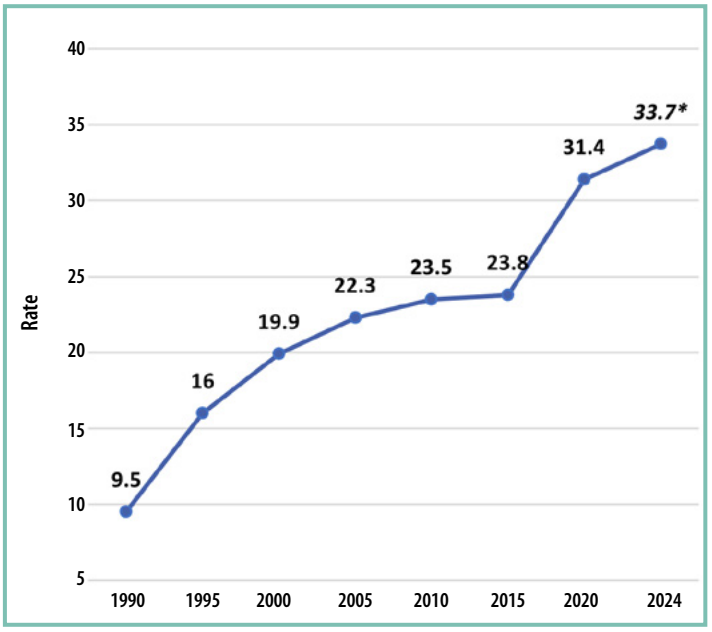
Centers for Disease Control and Prevention & National Center for Health Statistics. (2025b). *National Vital Statistics System, Natality on CDC WONDER Online Database, Provisional natality data, 2023: Births occurring through May 31, 2025*. https://wonder.cdc.gov/natality-expanded-provisional.html

Adapted from: Simpson, K. R. (2025c). Trends in the characteristics of births in the United States, 2020 to 2023. *MCN, The American Journal of Maternal Child Nursing* 50(2), 121-122. https://doi.org/10.1097/NMC.0000000000001073

Induction of Labor

Past natality data from birth certificates on timing of births in the United States indicate that spontaneous labor generally occurs equally over the course of the day with some slight decreases in the middle of the night (Mathews & Curtin, 2015). Births after spontaneous labor generally occur equally over the course of the week including Saturday and Sunday, whereas cesarean births and births following induced labor occur at peaks based on physician office hours and hospital scheduling to accommodate physician and patient preferences (Mathews & Curtin, 2015). Interventions and scheduling continue to influence time of birth. In 2023, approximately 60% of births occurred during the hours between 6 am and 6 pm. Wednesdays and Thursdays have the highest number of births, while Sunday has the lowest number of births (CDC & NCHS, 2025a,b). Compared with weekdays, weekends have a much lower number of cesarean births (Osterman et al., 2024). Artificial peaks in patient volume and acuity can be minimized with promotion of spontaneous labor since births after spontaneous labor occur naturally over the course of the day and the week, therefore reducing nurse staffing challenges caused by procedures scheduled electively on selected days of the week (Simpson, 2025a).

INDUCTION OF LABOR UNITED STATES 1990 TO 2024 IN 5 YEAR INCREMENTS*



Notes: 2025 data are not yet available.

Centers for Disease Control and Prevention & National Center for Health Statistics. (2025b). *National Vital Statistics System, Natality on CDC WONDER Online Database, Provisional natality data, 2023: Births occurring through May 31, 2025*. https://wonder.cdc.gov/natality-expanded-provisional.html

Adapted from: Simpson, K. R. (2022). Trends in labor induction in the United States, 1989 to 2020. *MCN, The American Journal of Maternal Child "Nursing, 47*(4), 235. https://doi.org/10.1097/NMC.0000000000000824

TIMING OF BIRTHS IN THE UNITED STATES 2017-2018 AND 2022-2023 BY HOUR, DAY, AND MONTH

	2017	2018	2022	2023
12 am to 5:59 am	17.7%	17.6%	18.4%	18.5%
6 am to 11:59 am	28.9%	28.9%	28.6%	28.7%
12 pm to 5:59 pm	30.9%	30.6%	30.1%	30.0%
6 pm to 11:59 pm	22.9%	22.8%	22.9%	22.8%
Day with highest number of births	Thursday	Thursday	Wednesday	*
Day with lowest number of births	Sunday	Sunday	Sunday	*
Month with highest number of births	August	August	August	August
Month with lowest number of births	February	February	February	February

Not available in CDC Wonder Online Database

Compiled from data in: Centers for Disease Control and Prevention & National Center for Health Statistics. (2025a). *National Vital Statistics System, Natality on CDC WONDER Online Database, Final natality data for 2016 to 2023 (expanded)*. https://wonder.cdc.gov/natality-expanded-current.html

Centers for Disease Control and Prevention & National Center for Health Statistics. (2025b). *National Vital Statistics System, Natality on CDC WONDER Online Database, Provisional natality data, 2023: Births occurring through May 31, 2025*. https://wonder.cdc.gov/natality-expanded-provisional.html

Martin, J. A., Hamilton, B. E., Osterman, M. J. K., & Driscoll, A. K. (2019). Births: Final data for 2018. *National Vital Statistics Reports*, 68(13), 1–47. https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_13-508.pdf

Osterman, M. J. K., Hamilton, B. E., Martin, J. A., Driscoll, A. K. & V & Valenzuela, C. P. (2024). Births: Final data for 2021. *National Vital Statistics Reports*, 72(1), 1-50. https://dx.doi.org/10.15620/cdc:122047

Cesarean Birth

The cesarean birth rate in the United States has risen dramatically (>600%) over the past 60 years from 4.5% in 1965 to 33.4% in 2024. Of particular concern is the corresponding rate increase for healthy women (women at term having their first baby with a singleton fetus in vertex presentation [NTSV]). In 1990, the rate of cesarean birth for NTSV patients was 19.2%, in 2003, 23.5% (Menacker, 2005), and in 2024, 26.7% (CDC & NCHS, 2025b). These women represent the largest group for which strategies to decrease risk of cesarean birth may be effective (ACOG, 2025c). The two most common reasons for primary cesarean birth are labor dystocia and concern for fetal status based on interpretation of the FHR tracing (ACOG, 2024a; ACOG, 2025c; ACOG & SMFM, 2014). Rates of vaginal birth after cesarean birth have increased slightly in the past several years. In 2016 the VBAC rate was 12.4% and in 2024 it was 15.5% (CDC & NCHS, 2025a,b).

Cesarean birth has contributed to the increase in maternal morbidity and mortality, in large part because of hemorrhage and placental abnormalities in subsequent pregnancies (ACOG & SMFM, 2014; Black et al., 2021; Burke & Allen, 2020; Fink et al., 2023; Korst et al., 2021; Macones et al., 2019; NASEM, 2020; Oot et al., 2021). Cesarean birth is associated with more risk to the mother than vaginal birth. These risks include higher rates of overall severe morbidity, placental abnormalities, post-partum hemorrhage, blood transfusions, hysterectomy, uterine rupture, and admission to an intensive care unit, and maternal death (ACOG & SMFM, 2021; Black et al., 2021; Burke & Allen, 2020; Fink et al., 2023; Korst et al., 2021; Macones et al., 2019; NASEM, 2020; Oot et al., 2021). As the number of cesareans births a woman has increases, so does risk of all of the morbidities associated with a primary cesarean as well as additional complications such as adhesions, surgical injuries, and placental problems including placenta previa, and placenta accreta spectrum, ectopic pregnancy, and stillbirth (Curtin et al., Fingar et al., 2018; Keag et al., 2018; Korb et al., 2019; Lappen et al., 2021; Sandall et al., 2018; Wilson et al., 2018).

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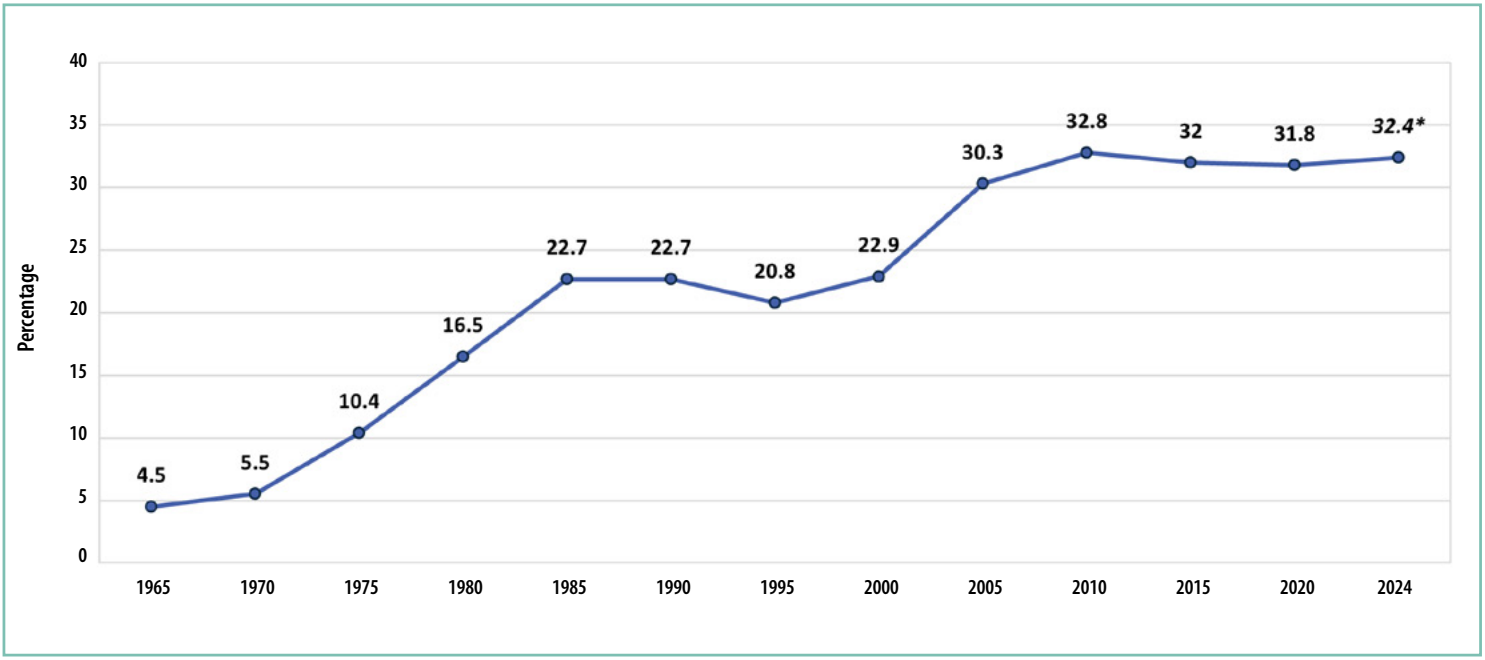
TRENDS IN CESAREAN BIRTH IN THE UNITED STATES – 1965 TO 2024



Notes: 2025 data are not yet available.

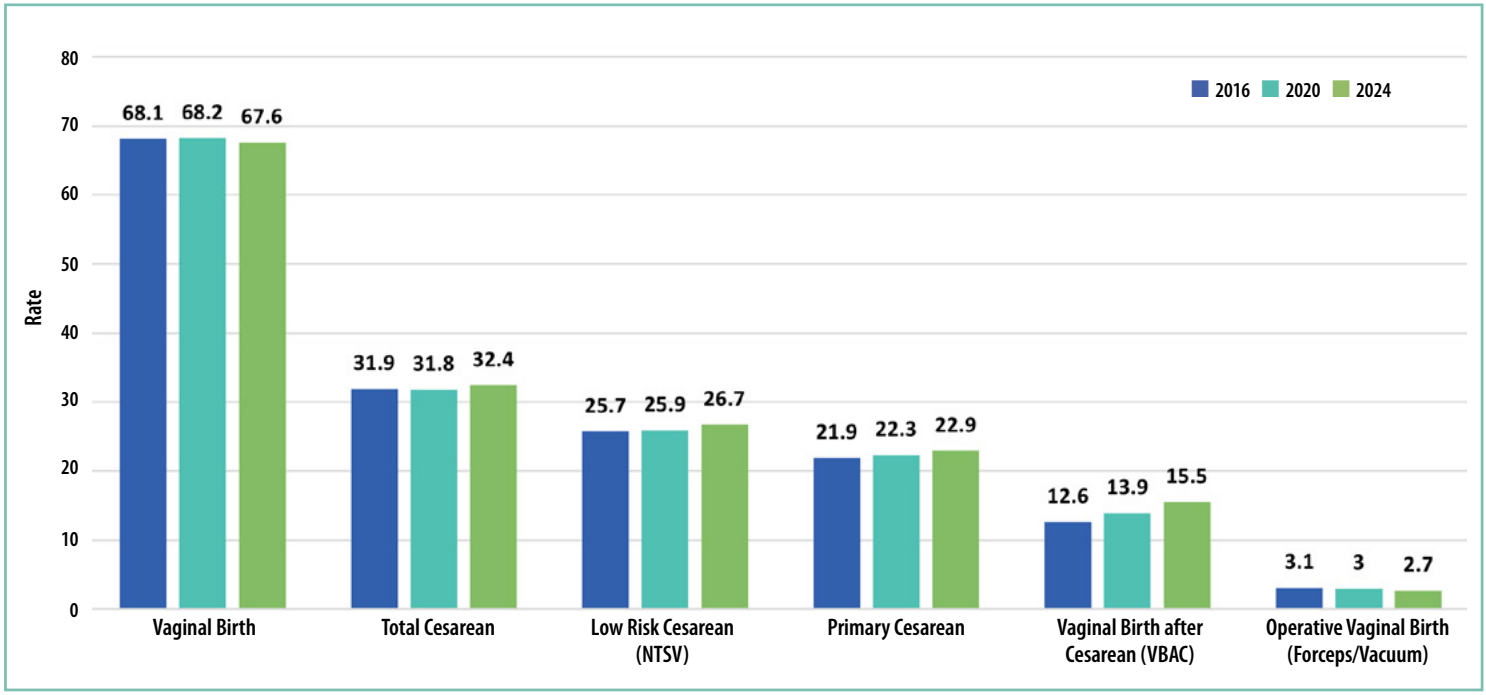
Trends in cesarean birth in the United States from 1965 to 2024. (Compiled from data from Centers for Disease Control and Prevention & National Center for Health Statistics, National Vital Statistics System).

Cesarean Birth *(cont.)*

Costs of cesarean birth and the associated length of stay in the hospital are at least twice that of vaginal births (NASEM, 2020; Sen et al, 2023; Valencia et al., 2022). When women have a cesarean birth, compared to a vaginal birth, there is often an associated delay in initial breastfeeding and a shorter duration of breastfeeding, especially for women with unplanned cesarean birth (Buran et al., 2022; Chen et al., 2018; Cohen et al., 2018; Hobbs et al., 2016; Li et al., 2021). Breastfeeding is an important contributor to short-term and long-term maternal, infant, and child health and wellbeing (Meek et al., 2022), thus the potentially negative implications for breastfeeding can be significant. This public health problem represents a current and future burden on the health care system and the women affected because of maternal morbidity and mortality risks and increased use of financial health resources that could otherwise be allocated to improving maternal and infant outcomes (NASEM, 2020).

Adequate staffing of the maternity service is critical to promote high-quality, safe care that minimizes risk of cesarean birth (ACOG, 2025c). Nurse staffing during labor and birth based on AWHONN (2022d) and AAP and ACOG (2017) nurse staffing standards has been shown to be associated with a decrease in cesarean birth rates and an increase in VBAC rates (Lyndon et al., 2025). There should be enough midwives, nurses, and physicians to meet the needs of the maternity service routinely (ACOG, 2025c). Each type of patient and clinical condition is discussed in detail in the AWHONN (2022d) nurse staffing standards with related professional standards from other organizations and a cumulative body of evidence, so maternity service leaders have ample supportive rationale for nurse staffing based on national standards. AWHONN's (2022b) evidence-based clinical guideline *Labor Support for Intended Vaginal Birth* offers a comprehensive review of nursing strategies to promote vaginal birth.

METHOD OF BIRTH – UNITED STATES 2016-2020-2024



NOTES: Low-risk cesarean is cesarean birth among nulliparous, term, singleton, and cephalic births.

Compiled from: Centers for Disease Control and Prevention & National Center for Health Statistics. (2025a). *National Vital Statistics System, Natality on CDC WONDER Online Database, Final natality data for 2016 to 2023 (expanded)*. https://wonder.cdc.gov/natality-expanded-current.html

Centers for Disease Control and Prevention & National Center for Health Statistics. (2025b). *National Vital Statistics System, Natality on CDC WONDER Online Database, Provisional natality data, 2023: Births occurring through May 31, 2025*. https://wonder.cdc.gov/natality-expanded-provisional.html

Labor Management Guidelines

The American College of Nurse-Midwives (ACNM et al., 2022) and AWHONN (Simpson, 2025a) have published updated clinical guidelines on induction of labor. The ACNM et al. (2022) clinical bulletin includes a review of the science and an extensive discussion about shared decision-making, information that can be discussed with patients, and various procedures involved in induction of labor. AWHONN's (Simpson, 2025a) monograph likewise includes a comprehensive review of the evidence on each method of cervical ripening and labor induction with implications for nursing care during labor and for maternity services.

In 2014, ACOG and SMFM (2014) co-published a consensus statement *Safe Prevention of the Primary Cesarean Delivery*. Recommendations were made to minimize risk of primary cesarean birth and monitor outcomes. Suggestions were offered for appropriate candidates for elective induction of labor based on cervical status and gestational age. Definitions of failed induction and arrest of labor disorders were incorporated into the recommendations. Encouragement of patience and a reconsideration of the parameters of normal labor progress for nulliparous women were major findings. These recommendations were recently further detailed and enhanced by ACOG (2024a, 2025b). In May 2025, a series of solid recommendations for quality improvement strategies to reduce the risk of primary cesarean birth were offered by ACOG (2025c). A summary is offered here; full review of the committee statement is suggested.

All three organizations (ACNM et al., 2022; ACOG, 2025b,c. AWHONN [Simpson, 2025a]) agree that women considering induction of labor require informed consent with a discussion of the potential risks and benefits, including awaiting spontaneous labor. Pregnant women and their support persons should be full partners in their care and be told what to expect for each option. The discussion should be at the appropriate literacy level and in a language patients understand to ensure they have access to all the information needed to make informed decisions about their care. Use an interpreter or an online interpreter program for women who need an interpreter to be able to comprehend the details.

Summary of Updated Labor Guidelines from ACOG (2024a, 2025b)

- The optimal timing of birth between 39 0/7 to 40 6/7 weeks of gestation has not been determined despite multiple studies. A variety of outcomes have been noted for elective induction of labor at term, in part due to different comparison groups and study design.
- Women at term without a medical indication for birth should receive information about the potential risks and benefits of induction of labor at or beyond 39 weeks gestation compared with expectant management.
- Available resources in each maternity service should be evaluated in partnership with members of the perinatal team including nurse, nurse-midwife, and physician leaders with consideration of caring for women at term who desire induction of labor without a medical indication.
- Cervical dilation of 6 cm should be considered the start of the active phase of labor.
- The latent phase of induced labor is significantly longer when compared to spontaneous labor. The active phase of labor is similar between induced and spontaneous labor.
- Active phase arrest of labor should be defined as no progression in cervical dilation in patients who are at least 6 cm dilated with rupture of membranes despite 4 hours of adequate uterine activity or 6 hours of inadequate uterine activity with oxytocin augmentation.
- Amniotomy is recommended for patients having induction or augmentation of labor to reduce duration of labor.
- Neuraxial anesthesia should be offered for pain relief during any stage of labor.
- Intrauterine pressure catheters for women with ruptured membranes and protracted active labor can be helpful to assess strength of contractions.
- Prolonged second stage labor should be defined as more than 3 hours of pushing in nulliparous patients and 2 hours of pushing in multiparous patients. An individualized approach should be used to diagnose second-stage labor arrest; incorporating information about process, clinical factors that may affect the likelihood of vaginal birth, discussion of risks and benefits of available interventions, and individual patient preference is recommended when time in the second stage of labor is extended beyond these parameters. Arrest in the second stage of labor can be identified earlier if there is a lack of fetal rotation or descent despite adequate contractions, pushing efforts, and time.

Summary of Quality Improvement Strategies from ACOG (2025c) to Reduce Risk of Primary Cesarean Birth

- Reduction of primary cesarean birth is supported by a transparent safety culture in which clinicians and leaders are committed to continuous quality improvement (QI), are knowledgeable about evidence-based labor physiology, labor management, and fetal assessment, and use rigorous data generated from their maternity service QI processes and the literature to guide clinical practice.
- The woman and her support person/s are provided adequate information in language they understand to be full partners in their care at each step in the labor and birth process. Informed consent and shared decision-making are integral to safe and equitable care.
- Structure, process, outcome, and balancing measures are in place to evaluate quality improvement strategies to reduce risk of cesarean birth. Examples include: structure measures such as initiating labor support huddles, initiating safety huddles for NTSV patients requiring cesarean birth; reinforcing patient education about labor processes; process measures such as team training, making sure providers are skilled in operative vaginal birth, embedding documentation in the medical record about NTSV decision-making; outcome measures such as primary cesarean birth, NTSV cesarean birth; and balancing measures such as unexpected complications in term newborns, admission to the neonatal intensive care unit.
- Algorithms, care pathways, patient safety bundles, and checklists can be used as part of process improvement and to enhance the likelihood that all team members are in sync with current definitions of labor abnormalities and expected management options in their practice and in discussions with the patient and her support person/s.
- Since labor dystocia and indeterminate or abnormal FHR patterns are common reasons for cesarean birth, interdisciplinary education on those two topics promotes a team understanding of language, definitions, and expected management when there are concerns about labor process or the FHR tracing. "Obstetric units should implement EFM continuing education and certification for staff and obstetric clinicians using Eunice Kennedy Shriver National Institute of Child Health and Human Development nomenclature" (ACOG, 2025c, p. 547).
- Adequate staffing of the maternity service is critical to promote high-quality, safe care that minimizes risk of cesarean birth. There should be enough midwives, nurses, and physicians to meet the needs of the maternity service routinely. Nurse staffing based on AWHONN (2022d) nurse staffing standards should be planned and budgeted to support safe care during labor and birth.
- "Factors such as resource availability, staffing considerations, and patient throughput of labor and delivery units due to prolonged induction and patient desires and preferences should be considered when implementing non–medically indicated inductions in all clinical settings" (ACOG, 2025c, p. 547-548).
- The NTSV cesarean birth rate in any maternity unit "is undeniably influenced by the practice environment in that unit, with personnel and staffing being key aspects of that environment" (ACOG, 2025c, p. 549).

Implications of the ARRIVE Trial on Clinical Practice in the United States

The ARRIVE trial (Grobman et al., 2018) was a rigorously designed multicenter randomized clinical trial with 6106 low-risk nulliparous women, of whom 3062 were randomized to elective induction of labor and 3044 were randomized to expectant management. For the elective induction group, induction was to occur between 39 0/7 weeks to 39 4/7 weeks gestation and for the expectant management group, elective birth was not to occur before 40 5/7 weeks, however, be initiated no later than 42 2/7 weeks. The main purpose was to investigate whether elective induction of labor during the 39th week of gestation for low-risk nulliparous women would lead to decreased perinatal morbidity when compared to expectant management. It has long been known that pregnancy beyond 41 to 42 weeks gestation increases risk or perinatal morbidity and mortality (Grobman et al., 2018; Gregory et al., 2024). In 2022, the fetal mortality rate was 0.63 per 1000 live births and fetal deaths at 39 to 40 weeks gestation, increasing to 5.68 per 1000 live births and fetal deaths at ≥42 weeks of gestation (Gregory et al., 2024). A secondary aim was to evaluate the effect of elective induction of labor for low-risk nulliparous women on risk of cesarean birth. Previous observational studies had suggested that elective induction of labor increased risk of cesarean birth, when elective induction of labor was compared to spontaneous labor (Grobman et al. 2018).

Clinical Context

- The implications for practice apply to low-risk nulliparous women as this group was the subject of the research. The setting was 41 hospitals participating in the Maternal–Fetal Medicine Units Network of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.
- The study was conducted in the context of application of labor management guidelines with definitions of time frames and clinical conditions of labor dystocia to promote vaginal birth and avoid cesarean birth for labor dystocia including (a) cervical ripening for a modified Bishop score <5, b) at least 12 hours in the latent phase after completion of cervical ripening, c) rupture of membranes, and d) use of oxytocin before considering the induction failed. This was suggested for study sites by the investigators but not mandated as part of the study protocol.

Key Findings

- It is safe to await spontaneous labor (no difference between groups on primary outcome; a neonatal composite measure that included perinatal death or severe neonatal complications and consisted of one or more of the following during the antepartum or intrapartum period or during the birth hospitalization: need for respiratory support within 72 hours after birth, Apgar score of 3 or less at 5 minutes, hypoxic ischemic encephalopathy, seizure, infection (confirmed sepsis or pneumonia), meconium aspiration syndrome, birth trauma (bone fracture, neurologic injury, or retinal hemorrhage), intracranial or subgaleal hemorrhage, or hypotension requiring vasopressor support).
- Elective induction of labor at 39 weeks did not increase risk of cesarean birth (rather, cesarean birth was lower in the induction group, 18.6%, compared to 22.2% in the expectant management group). Of note, these rates of cesarean birth were lower than national rate of cesarean birth for low-risk nulliparous women in the United State at the time of the trial enrollment; 25% to 26%. Prior to the ARRIVE trial, many clinicians were concerned that elective induction of labor for nulliparous women increased risk of cesarean birth. Results of this randomized trial minimized those concerns.
- Hypertensive disorders of pregnancy were lower in the elective induction group (9.1%) compared to the expectant management group (14.1%).
- Length of stay in the intrapartum setting averaged 20 hours for the elective induction group and 14 hours for the expectant management group. Postpartum length of stay for the elective induction group was shorter due to fewer cesarean births, when compared to the expectant management group.
- It is estimated that 28 low risk nulliparous women would need to plan to have elective induction of labor to avoid 1 cesarean birth.

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Clinical Implications

One of the most frequently quoted "doctrines" in health care is the 17-year lag between published evidence and adoption into clinical practice (Green et al., 2009; Morris et al., 2011; Westfall et al., 2007). Much has been written about why this occurs and how to speed the process of knowledge diffusion and integration of evidence into practice. In the case of the ARRIVE trial (Grobman et al., 2018), there was great interest in the secondary outcome of lower cesarean birth and almost immediate adoption of elective induction of labor at 39 weeks for low-risk nulliparous women by many physicians, maternity services, and patients.

- United States natality data show a significant increase in induction of labor overall, especially for nulliparous women, after publication of the ARRIVE trial. The induction of labor rate in the United States was 25.7% in 2017, the year before ARRIVE trial publication and 33.6% in 2024, a 30.7% increase. Induction of labor for low-risk nulliparous women (NTSV) was 34.1% in 2017 and 44.7% in 2024, a 31% increase. In the first 5 months of 2025, the induction of labor rate for all US women was 34..8% and for NTSV patients was 46.3% (CDC & NCHS, 2025b).
- Based on results of the ARRIVE trial (Grobman et al., 2018), there was an expectation of lower cesarean birth rates if more low-risk nulliparous women were electively induced at 39 weeks. Yet US natality data show essentially no change in the cesarean birth rate overall, the cesarean birth rate for low-risk nulliparous women (NTSV), or the primary cesarean birth rate. Each of these rates were slightly higher in 2024 compared to 2017 (Data in Table Cesarean Birth Rates by Type over the Last Decade).
- There is no direct cause and effect relationship between publication of the ARRIVE trial (Grobman et al., 2018) and induction of labor or cesarean birth rates in the United States, however most experts acknowledge the trial has influenced obstetric practice (ACOG, 2025b).

Grobman et al. (2018) reported less cases of hypertensive disorders of pregnancy in the elective induction group (9.1%), compared with the expectant management group (14.1%). The National Center for Health Statistics collects data on hypertension from certificates of live birth in three categories (chronic [before pregnancy], gestational [pregnancy-induced hypertension, preeclampsia], and eclampsia). In 2017, the rate of gestational hypertension + eclampsia among NTSV patients was 7.6% and in 2024 the rate for NTSV patients was 11.8% (CDC & NCHS, 2025a,b). The 31% increase in elective induction for low-risk nulliparous women since 2017 has not translated into lower rates of hypertensive disorders for this group (CDC & NCHS, 2025a.b) as it did in the ARRIVE trial (Grobman et al., 2018). Hypertensive disorders of pregnancy have been rising for all women over this same time period (CDC & NCHS, 2025a,b).

CESAREAN BIRTH RATES BY TYPE OVER THE LAST DECADE

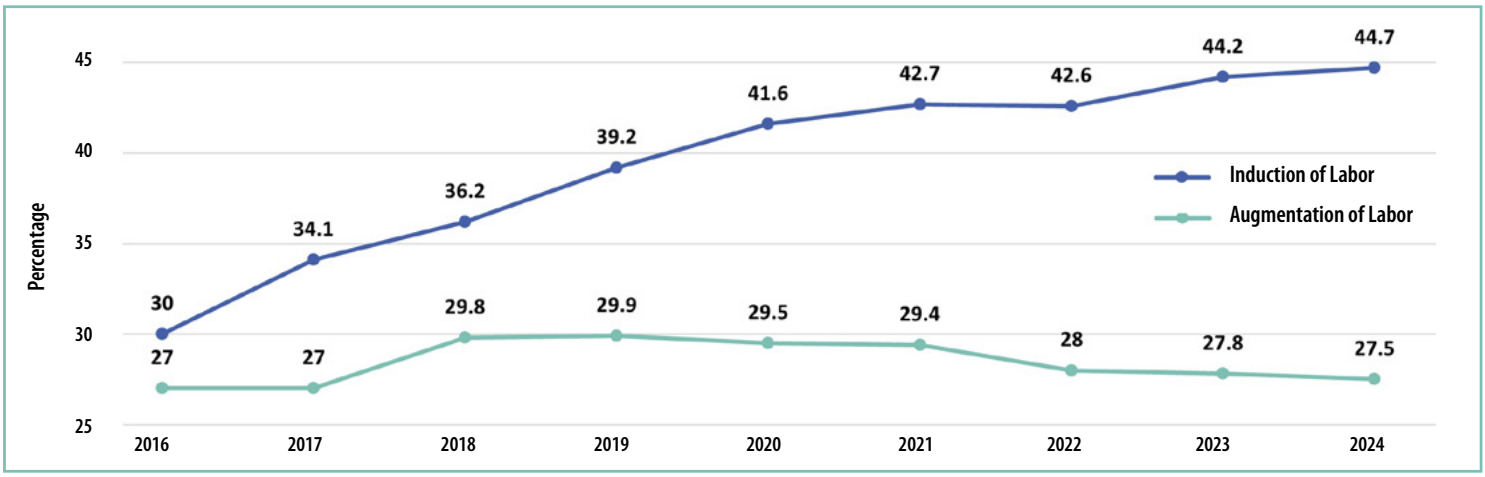
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
All	32.0	31.9	32.0	31.9	31.7	31.8	32.1	32.1	32.3	32.4
NTSV	25.8	25.7	26.0	25.9	25.6	25.9	26.3	26.3	26.6	26.7
Primary	21.8	21.9	21.7	21.6	21.9	22.3	22.5	22.5	22.8	22.9

Compiled from: Centers for Disease Control and Prevention & National Center for Health Statistics. (2025a). *National Vital Statistics System, Natality on CDC WONDER Online Database, Final natality data for 2016 to 2023 (expanded)*. https://wonder.cdc.gov/natality-expanded-current.html

Centers for Disease Control and Prevention & National Center for Health Statistics. (2025b). *National Vital Statistics System, Natality on CDC WONDER Online Database, Provisional natality data, 2023: Births occurring through May 31, 2025*. https://wonder.cdc.gov/natality-expanded-provisional.html

Adapted from: Simpson, K. R. (2025b). Rates of induction of labor and cesarean birth for low-risk nulliparous (NTSV) women in the United States, 2016 to 2024. *MCN, The American Journal of Maternal Child Nursing, 50*(5), 311-312. https://doi.org/10.1097/NMC.0000000000001116

INDUCTION AND AUGMENTATION OF LABOR –LOW RISK NULLIPAROUS WOMEN (NTSV), UNITED STATES 2016 TO 2024



Compiled from: Centers for Disease Control and Prevention & National Center for Health Statistics. (2025a). *National Vital Statistics System, Natality on CDC WONDER Online Database, Final natality data for 2016 to 2023 (expanded)*. https://wonder.cdc.gov/natality-expanded-current.html

Centers for Disease Control and Prevention & National Center for Health Statistics. (2025b). *National Vital Statistics System, Natality on CDC WONDER Online Database, Provisional natality data, 2023: Births occurring through May 31, 2025*. https://wonder.cdc.gov/natality-expanded-provisional.html

Adapted from: Simpson, K. R. (2025b). Rates of induction of labor and cesarean birth for low-risk nulliparous (NTSV) women in the United States, 2016 to 2024. *MCN, The American Journal of Maternal Child Nursing, 50*(5), 311-312. https://doi.org/10.1097/NMC.0000000000001116

Resource Use and Financial Implications

Grobman et al. (2020) analyzed resource use among patients in the ARRIVE trial (Grobman et al., 2018). Women in the elective induction group used less antenatal resources than the expectant management group. They had fewer routine or unscheduled office visits, fewer urgent care, emergency department or OB triage visits, and fewer hospital admissions than women in expectant management group (Grobman et al., 2020). The intrapartum length of stay was 20 hours for the elective induction group compared to 14 hours for the expectant management group.

The extra time in labor has significant implications for patient care requirements and thus, nurse staffing (AWHONN, 2022d). The nurse staffing standard for patients receiving pharmacologic agents for cervical ripening is a ratio of 1 registered nurse to 2 women (AAP & ACOG, 2017; AWHONN, 2022d). The nurse staffing standard for patients receiving intravenous (IV) oxytocin for induction or augmentation of labor is a ratio of 1 registered nurse to 1 woman (AAP & ACOG, 2017; AWHONN, 2022d). It is important to remember that Grobman et al. (2018) estimated 28 low-risk nulliparous women would need to plan to have an elective induction of labor to avoid 1 cesarean birth, thus maternity services may not realize an appreciable decease in their cesarean birth rates with routine elective induction of labor for low-risk nulliparous women. Einerson et al. (2024) conducted a secondary economic analysis of the 1,201 patients from five hospitals in Utah enrolled in the ARRIVE trial (Grobman et al., 2018). Resource use factors associated with higher costs were ultrasound, cervical ripening agents, oxytocin, and fetal scalp electrodes (Einerson et al., 2024). Clinical outcomes associated with higher costs were cesarean birth, maternal complications, and maternal length of stay (Einerson et al., 2024). As elective induction of labor involves more nurse staffing resources, a longer intrapartum length of stay, and potentially more associated hospital costs, there could be a negative effect on other patients who need care (Mann & James, 2024). Safety-net hospitals that are reimbursed less for maternity services due to their high percentage of patients covered by Medicaid compared to other hospitals may be most at risk (Simpson, 2023; Simpson et al., 2023).

The length of stay postpartum was less in the elective induction of labor group due to fewer cesarean births (Grobman et al. 2020). The nurse staffing standard for healthy postpartum women and newborns is 1 registered nurse to 3 mother-baby couplets (AAP & ACOG, 2017; AWHONN, 2022d). The differences in intrapartum and postpartum length of stay for women having elective induction of labor and women with expectant management have major effects on maternity service finances (Simpson, 2015). Hospitals are typically reimbursed for maternity services based on whether the patient had a vaginal birth or cesarean birth (Simpon, 2023). In this payment model, reimbursement for a woman having spontaneous labor with an intrapartum length of stay of 4 hours resulting in a vaginal birth and for a woman with 12 hours of care for Cervidil and18 hours of care during oxytocin induction of labor resulting in a vaginal birth will be the same, but the costs of care are dramatically different as are the nurse staffing requirements.

Creating and Promoting a Culture of Safety to Support Maternal and Fetal Wellbeing During Labor and Birth

Teamwork, collaboration, mutual respect, and care based on rigorous evidence and science are essential aspects of a culture of safety in which fetal monitoring, labor management, and adoption of care bundles can be successfully integrated into safe, effective, and respectful care for mothers and babies (ACOG, 2025c). One way to promote perinatal safety is to collaborate in developing evidence-based clinical guidelines that can be flexibly adapted to local hospitals, health systems, and state-wide perinatal quality collaboratives such as the Alliance for Innovation on Maternal Health (AIM) bundles (2025).

CORE AIM PATIENT SAFETY BUNDLES

Obstetric Hemorrhage
Severe Hypertension in Pregnancy
Safe Reduction of Primary Cesarean Birth
Cardiac Conditions in Obstetric Care
Care for Pregnant and Postpartum People with Substance Use Disorder
Perinatal Mental Health Conditions
Postpartum Discharge Transition
Sepsis in Obstetric Care

From: Alliance for Innovation on Maternal Health (2025)
https://saferbirth.org/patient-safety-bundles/

A culture of safety in perinatal services is founded on colleagues working together in teams with mutual respect, support, and consideration with priority on the best interests of mothers and babies. Support from administrative leaders and clinical leaders is critical, including accountability and financial resources. Threats to patient safety can be categorized by stakeholders and setting. Common threats include lack of administrative and budgetary support, disruptive behavior, inadequate nurse staffing, and an unwillingness to apply and integrate standards, guidelines, and evidence into clinical care. There are still some clinicians who are averse to standardization. Some clinicians remain committed to hierarchy and silos based on professional discipline in care and communication. Still others do not value pregnant women and new mothers as full partners in care and decision-making. Recognition that prior interactions with the health care team including obstetric and gynecologic procedures, childbirth, and feeling heard when reporting concerning symptoms, may have been traumatic or less than ideal is critical to providing trauma-informed care and enhancing trust. Progress has been made, but more change is needed.

In a culture of safety, clinical team members can discuss interpretation of FHR data and associated interventions without fear of hierarchical implications or assumptions that one discipline is more knowledgeable than another. There is no fear of retaliation when speaking up or voicing an alternative perspective. There is a high degree of psychological safety. Near misses are reported and actioned to move from a reactive approach to quality and safety to a proactive one. Conversations are collegial. Clinical disagreements may occur, but they are resolved respectfully. Partnership with women and their families is highly valued and encouraged. All women are treated with respect. Recommendations and strategies for improvement are listed in the table.

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THREATS TO PERINATAL PATIENT SAFETY AND HIGH-QUALITY MATERNITY CARE WITH RECOMMENDATIONS/ POTENTIAL STRATEGIES FOR IMPROVEMENT

Stakeholder/ Setting	Threat/Risk	Recommendations/Potential Strategies for Improvement
Hospitals/ Health Care Systems	Prioritizing cost, convenience, or provider preferences over what is best for mothers and babies	Each unit operation should be based on the answer to the question "What is best for mothers and babies?" Cost, convenience, and provider preferences should be secondary considerations in a high-quality health care system. All women deserve respectful maternity care.
	Prioritizing graduate medical education over what is best for mothers and babies	Administrative and clinical leaders must acknowledge that quality evidence-based patient care, patient safety, and optimal patient outcomes are the primary goals of hospitals and health care systems. Graduate medical education is a secondary and compatible goal. Proper supervision of trainees and patient consent are essential as part of the process.
	Failure to hold leaders accountable for adopting evidence-based national standards and guidelines	Evidence-based national standards and guidelines are the hallmark of safe, high quality perinatal care. Establish processes in which new standards and guidelines promulgated by professional associations and other pertinent bodies are reviewed on monthly basis and plans made for adoption in a timely manner.
	Failure to financially and administratively support clinician leaders in participating in perinatal quality care collaboratives and quality improvement initiatives	Participation in quality care collaboratives and other similar quality improvement processes often meet with resistance. Active participation requires support including a person designated to lead the project, a person/s to monitor practices, allocation of time for lead participants, and resources for data collection.
	Failure to hold leaders accountable for professional behavior and not taking action in the context of disruptive clinician behavior including sexual harassment	Zero-tolerance polices similar to those recommended by Joint Commission (2008; reaffirmed 2021), Joint Commission (2019) and professional organizations such as ACOG (2017; reaffirmed 2019) and ANA (2025) should be in place.
	Failure to support and protect clinicians who speak up in the context of threats to patient safety Failure to create a psychologically safe environment where clinicians feel comfortable speaking up in the context of threats to patient safety	The ANA *Code of Ethics for Nurses* details nursing responsibilities for speaking up to advocate for the rights, health, and safety of patients and the nurse's primary commitment to the patient. Administrative and clinical leaders must support the nurse in these efforts and protect them from retaliation if it occurs. ACOG (2009; reaffirmed 2019) committee opinion on patient safety outlines how all clinicians have responsibility of speaking up and should be able to do so without fear of retribution. A joint publication from AWHONN, ACNM, ACOG, and SMFM offers further guidance on effective professional communication and support of those who speak up as needed to promote and protect patient safety (Lyndon et al., 2015).
	Failure to financially support following the AWHONN (2022d), AAP & ACOG (2017) nurse staffing standards for safe, high quality care during hospitalization for childbirth	Administrative team leaders should review, budget for, and support following the nurse staffing standards.
	Failure to financially support offering continuing education for the clinical team, including a nurse responsible for orientation and continuing education	The importance of education, training, and competence validation care is critical to the provision of safe high-quality care. Accreditation bodies require evidence of this process.
	Failure to engage patients and communities to understand the needs of diverse groups of childbearing women	Effectively engaging with those who have lived experiences of minoritization and marginalization in developing research, organizational and clinical policies and procedures can advance care quality and equity (ACOG, 2024b).

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THREATS TO PERINATAL PATIENT SAFETY AND HIGH-QUALITY MATERNITY CARE WITH RECOMMENDATIONS/ POTENTIAL STRATEGIES FOR IMPROVEMENT

Stakeholder/ Setting	Threat/Risk	Recommendations/Potential Strategies for Improvement
Perinatal Services	Failure to have policies, procedures, protocols, and algorithms based on national standards and guidelines	*Guidelines for Perinatal Care* (AAP & ACOG, 2017) detail the need for perinatal services to have these types of resources available. AWHONN, ACNM, AAP, ACOG, ASA, SMFM each offer numerous publications and clinical guidelines available on their website. Some require membership to access; most do not.
	Failure to make sure all clinicians are competent in knowledge and skills for the responsibilities they are assigned	AWHONN offers details of knowledge and skills required to care for childbearing women (AWHONN, 2024b). *Guidelines for Perinatal Care* (AAP & ACOG, 2017) detail the need for all clinicians to be competent in their area of practice.
	Failure to follow the AWHONN (2022d), AAP & ACOG (2017) nurse staffing standards for safe quality care during hospitalization for child birth; Specific areas of concern include 1 nurse to no more than 3 patients for OB triage; 1 nurse for each woman in labor with complications; 1 nurse for each woman in labor receiving IV oxytocin, at least 2 nurses at every birth (1 for mother and 1 for baby), a full two-hour recovery after every birth with a nurse in attendance and no other patient assignment; no more than 3 mother-baby couplets per nurse; a nurse and a nursery available to care for newborns as per the mother's choice; a nurse with knowledge and skill to help women achieve their breastfeeding goals	Review, budget for, and support following the nurse staffing standards (AAP & ACOG, 2017; AWHONN, 2022d)
	Inflexible, restrictive policies and practices and unit operations that inhibit the choices of childbearing women and families including visitors/support persons, doulas, 24-hour mandatory rooming-in, video recording	Support women in their choices for childbirth. Respect their autonomy. Treat them with respect. Offer information that is comprehensible, literacy-level appropriate, and in language they understand (provide interpretive services as necessary). Build a trauma-informed perinatal workforce by educating clinicians on how to be trauma-informed. ACNM (2022), ACOG (2021a, 2021b), AWHONN (2022c) and Breman et al. (2024)

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THREATS TO PERINATAL PATIENT SAFETY AND HIGH-QUALITY MATERNITY CARE WITH RECOMMENDATIONS/ POTENTIAL STRATEGIES FOR IMPROVEMENT

Stakeholder/ Setting	Threat/Risk	Recommendations/Potential Strategies for Improvement
Clinicians	Failure to keep up with evidence, standards, and guidelines specific to their area of clinical practice	Membership in professional organizations specific to areas of practice such as AWHONN, ACNM, ACOG, ASA, AAP, SMFM is an essential aspect of keeping up with current evidence, standards, and guidelines. Develop processes to actively seek information about new evidence, standards, and guidelines as they are published. Seek certification in specific areas of practice such as EFM, inpatient obstetric nursing (ACOG, 2025c)
	Failure to follow national standards and guidelines	National standards and guidelines are available; unit policies, procedures, practices, protocols, and algorithms should offer details. Safe high-quality care is based on standardized evidence-based national standards and guidelines. AWHONN, ACNM, AAP, ACOG, ASA, SMFM each offer numerous publications and clinical guidelines available on their website. Some require membership to access; most do not.
	Disruptive behavior	Each clinician has a personal responsibility to act in a professional manner in all professional interactions. These resources can be helpful in offering review of behaviors and expectations. ANA (2015; 2025), ACOG (2009; reaffirmed 2019). ACOG (2017; reaffirmed 2019) A joint publication from AWHONN, ACNM, ACOG, and SMFM offers further guidance on effective professional communication and support of those who speak up as needed to promote and protect patient safety (Lyndon et al., 2015).
	Attitudes and care practices that do not respect autonomy of childbearing women	Be open; listen to women. Support women in their choices for childbirth. Respect their autonomy. Treat them with respect. Create a safe physical and emotional environment for patients. Offer information that is comprehensible, literacy-level appropriate, and in a language they understand (provide interpretive services as necessary). If patient safety precludes granting their requests, thoroughly explain rationale and offer alternatives. ACNM (2022), ACOG (2021a, 2021b), AWHONN (2022c) and Breman et al. (2024)
	Failure to recognize that some patients may have experienced trauma in previous interactions with healthcare professionals and related to prior obstetric and gynecologic procedures and childbirths	Be familiar with and universally implement trauma-informed care. Implement universal screening for current trauma and a history of trauma. (ACOG, 2021a)

Adapted From: Simpson, K. R. (2021). Perinatal quality and safety. In K. R. Simpson, P. A. Creehan, N. O'Brien-Abel, C. Roth, & A. J. Rohan (Eds.). *AWHONN's Perinatal nursing* (5th ed.). Philadelphia: Wolters Kluwer.


Conclusion

Electronic fetal monitoring is useful in assessing fetal status during labor. While EFM has limitations and benefits, it has the potential to be most helpful when all members of the perinatal team who are providing care to women in labor use standardized language such as that published by NICHD and supported by ACNM, ACOG, AWHONN, and SMFM in communicating data obtained from the fetal monitor. The value of a standardized set of definitions and classifications for FHR pattern interpretation and professional communication is that everyone on the team is speaking and hearing the same language and is more likely to have the same understanding of fetal status based on the FHR pattern. Expectations for intrauterine resuscitative measures and bedside evaluation by the primary care provider should be based on the NICHD definitions and classifications. A timely and appropriate response based on the FHR rate pattern and the entire clinical picture is needed to promote optimal outcomes. Inter-disciplinary case review using the EFM tracing as a basis for discussion and considering parity and the stage, phase and progress of labor can be useful to support ongoing education and teamwork. Standardized communication of fetal data is one method to promote perinatal patient safety by minimizing risk of errors and avoiding miscommunication among members of the perinatal team during labor.

Labor guidelines may be helpful in promoting vaginal birth by allowing labor to progress based on more recent evidence about normal labor parameters of the contemporary population of childbearing women. The clinical leadership team in each maternity service should engage in quality improvement strategies to decrease risk of cesarean birth for low-risk women including application of structure, process, outcome, and balancing measures. More evidence has emerged in the last few years about safe and effective use of oxytocin for labor induction and augmentation. Elective induction of labor for low-risk nulliparous women may be an option in the context of adequate nurse staffing and other facility resources and should not increase the risk of cesarean birth when labor guidelines are used. Creating and supporting a culture of safety in which all members of the perinatal team are collaborative and respectful to each other and to women in childbirth and their families is essential for optimal outcomes.

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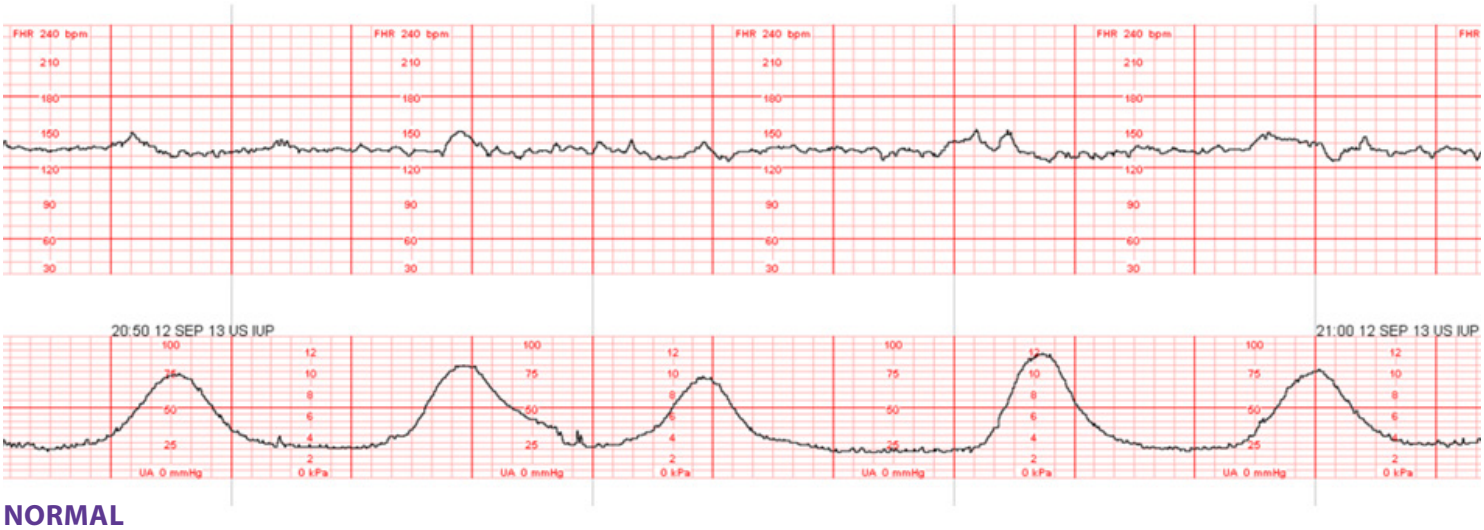
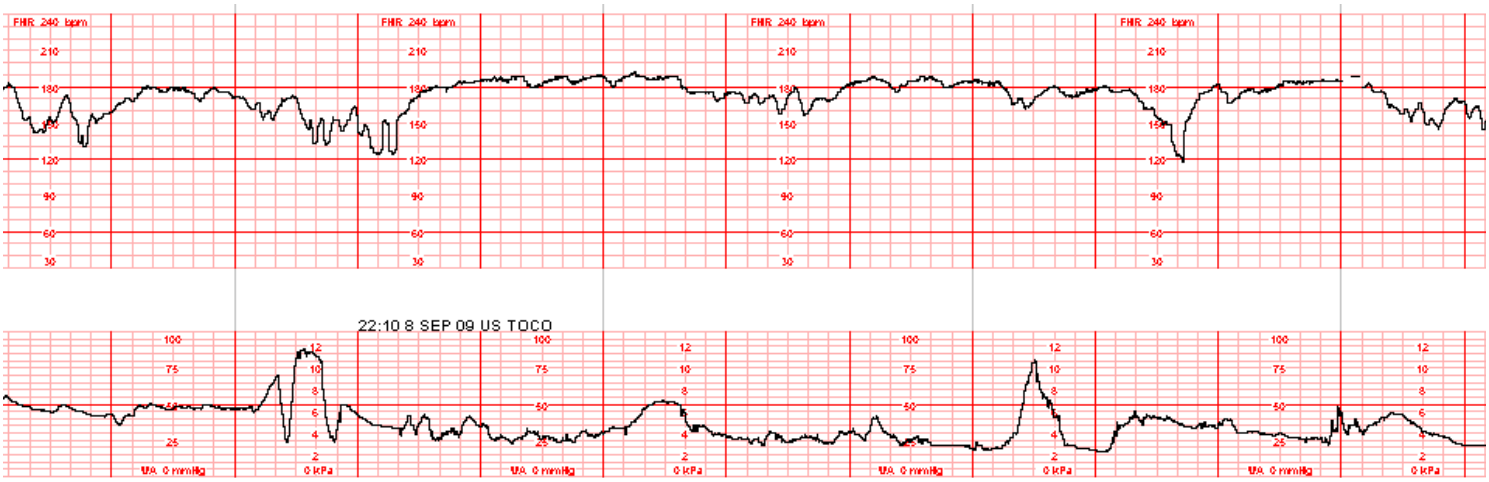
Appendix A - Characteristics of Fetal Heart Rate Patterns

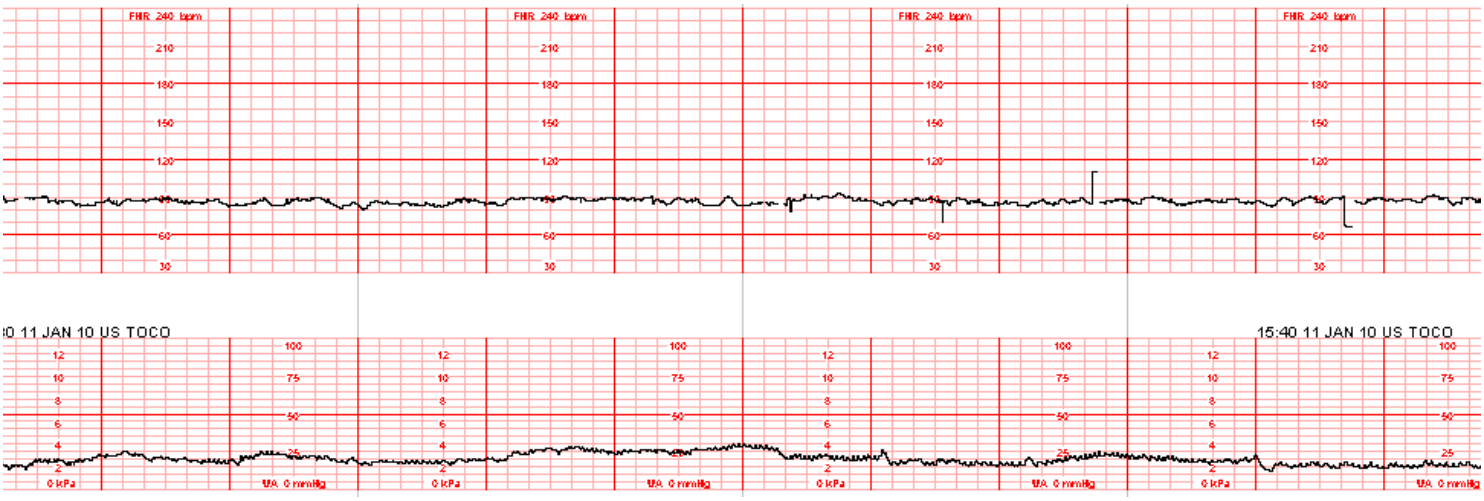
BASELINE



NORMAL



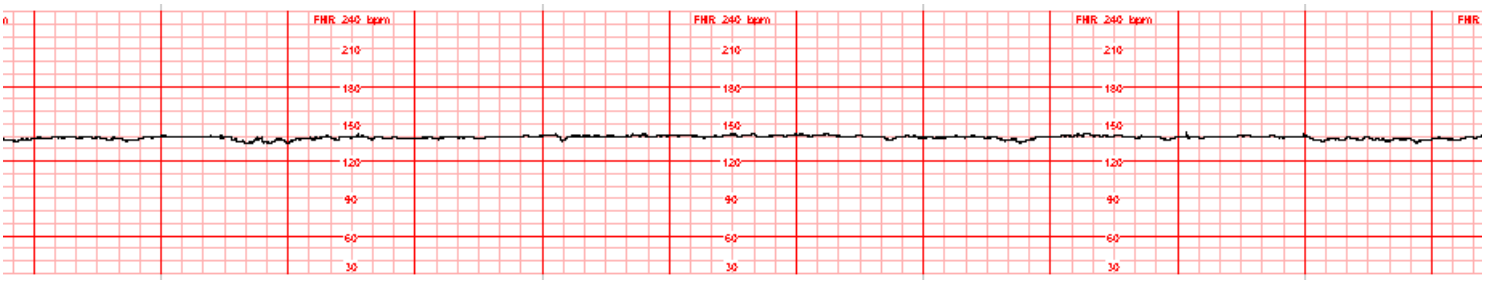
TACHYCARDIA



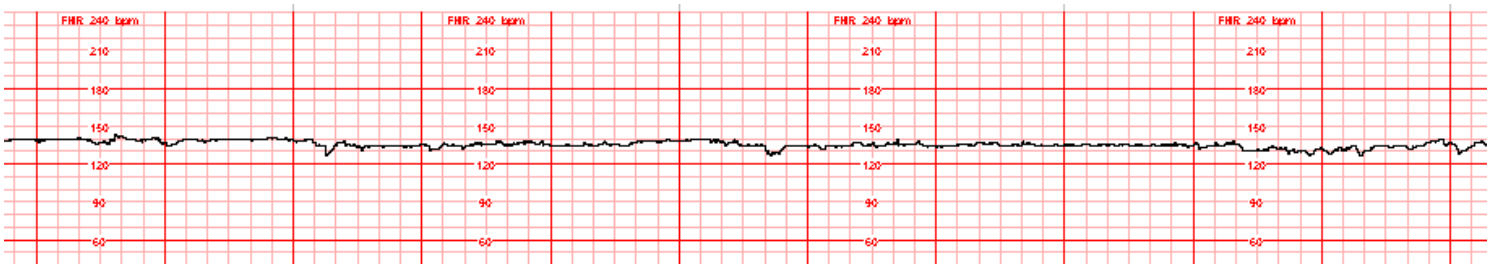
BRADYCARDIA

Appendix A - Characteristics of Fetal Heart Rate Patterns

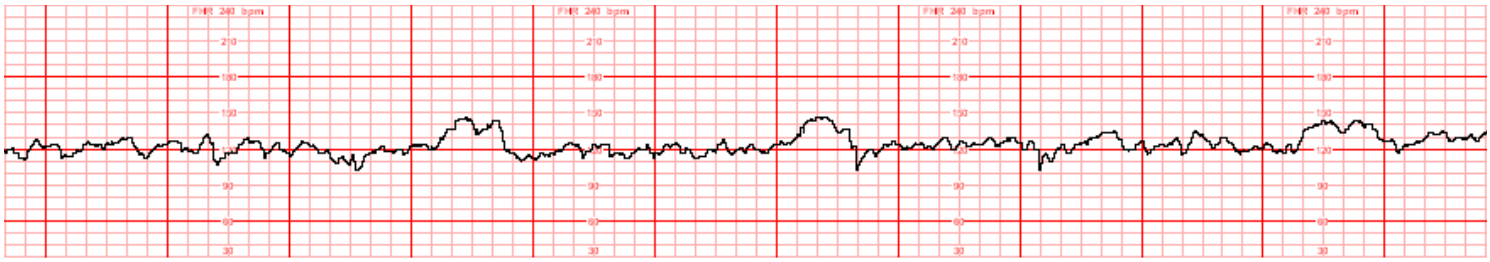
BASELINE VARIABILITY



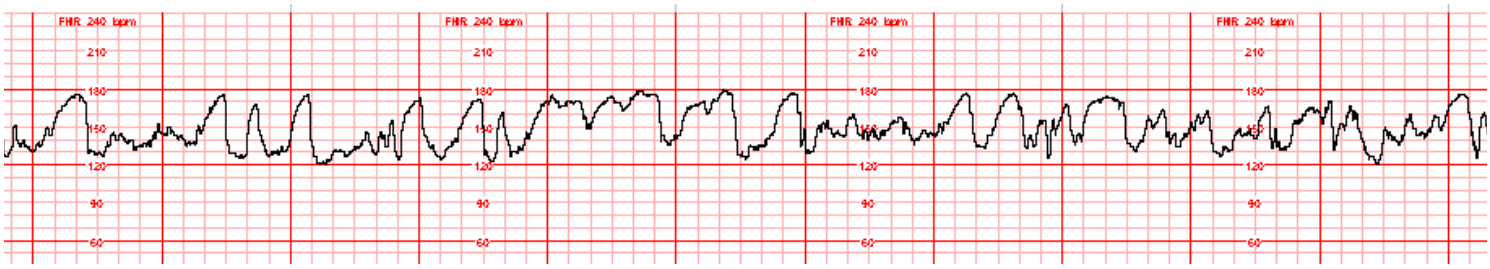
ABSENT - UNDETECTABLE FROM BASELINE



MINIMAL - UNDETECTABLE FROM BASELINE ≤ 5 BPM

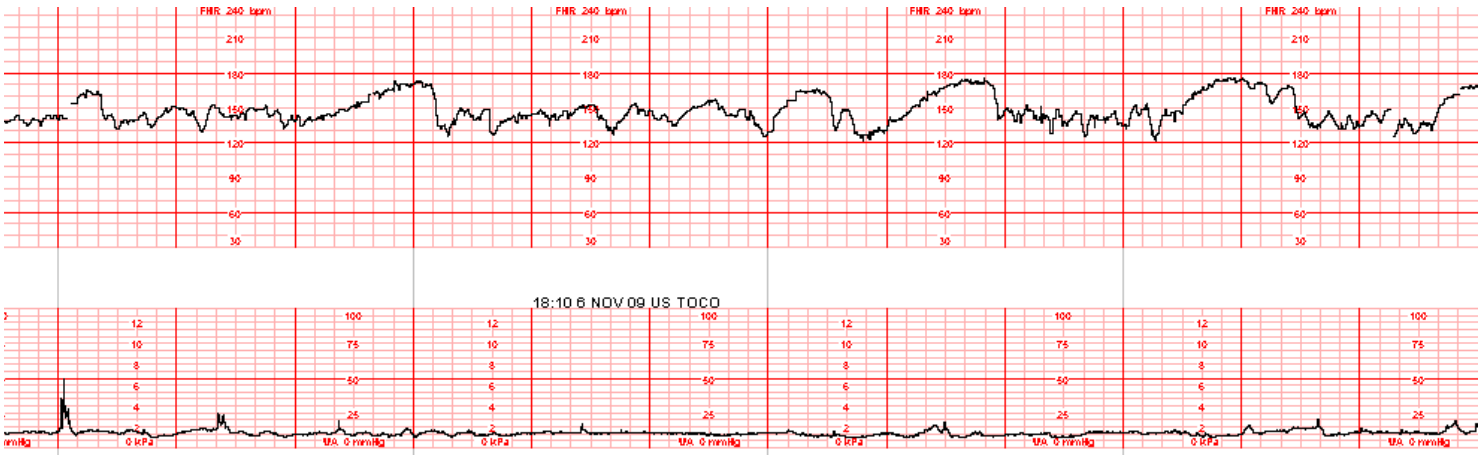


MODERATE - 6-25 BPM

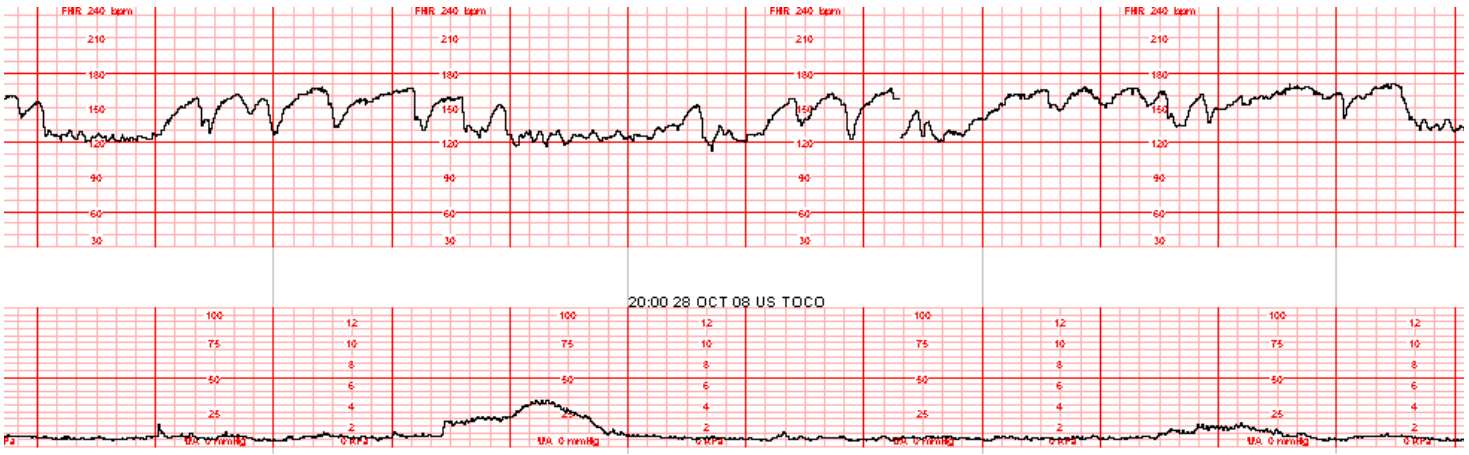


MARKED > 25 BPM

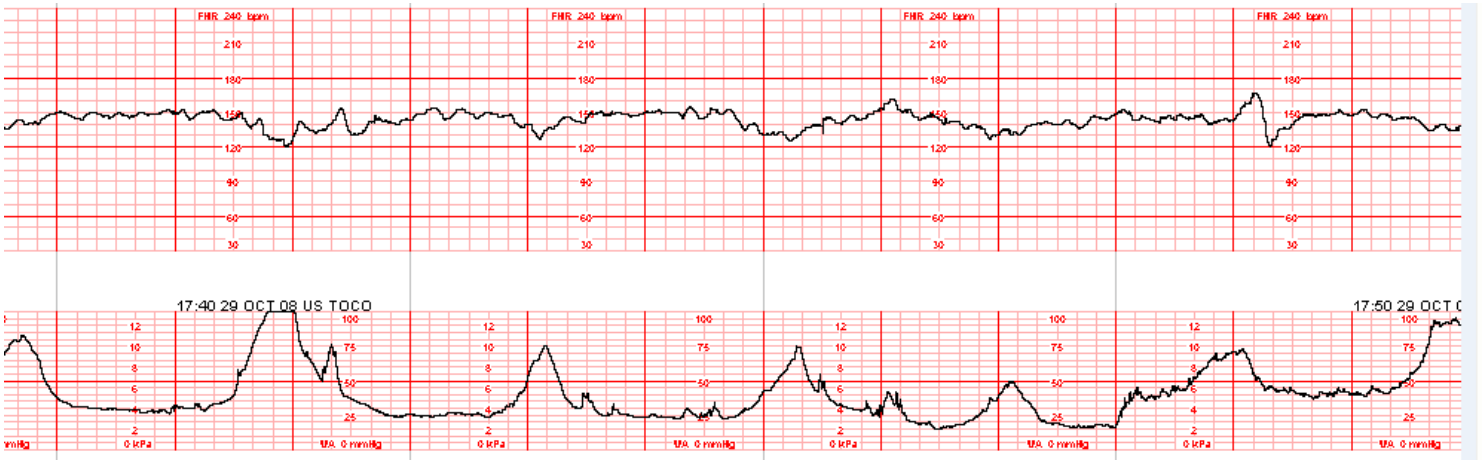
Appendix A - Characteristics of Fetal Heart Rate Patterns



ACCELERATIONS

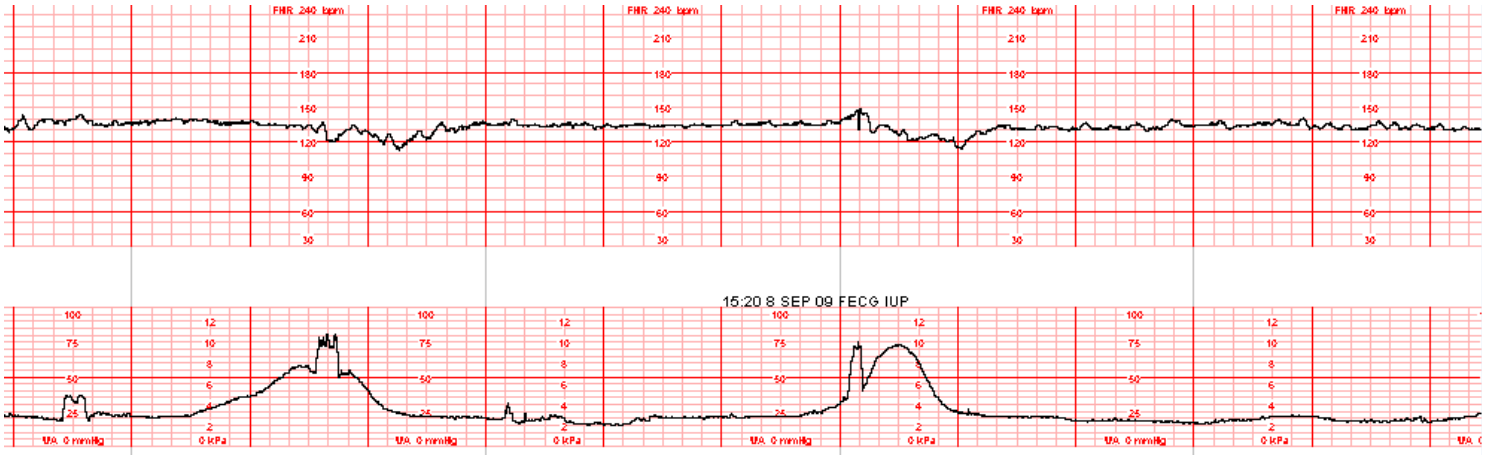


PROLONGED ACCELERATIONS

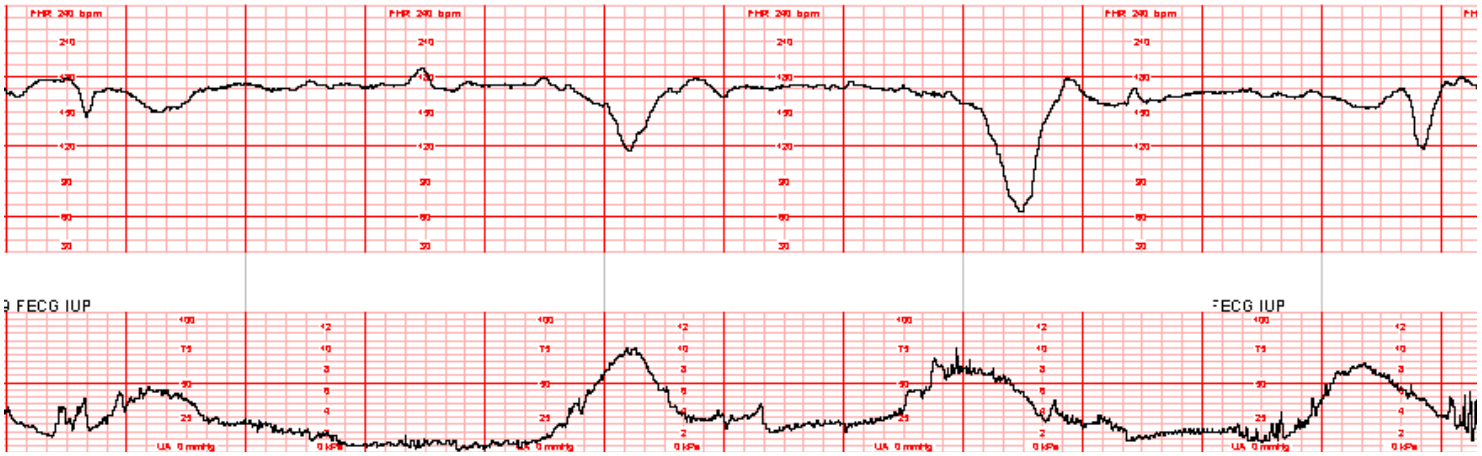


EARLY DECELERATIONS

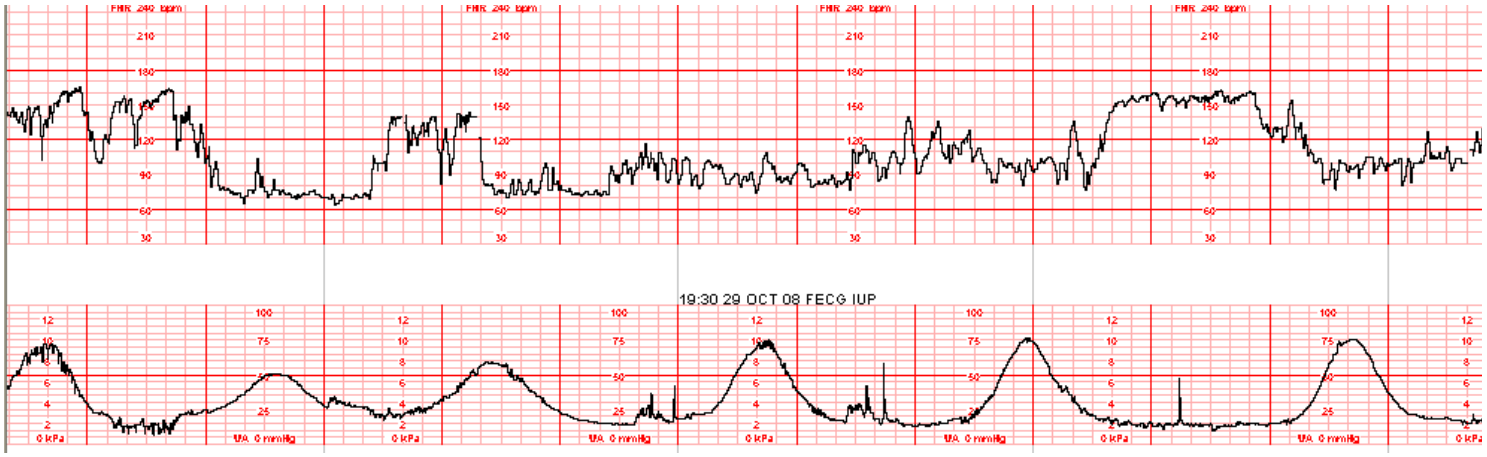
Appendix A - Characteristics of Fetal Heart Rate Patterns



LATE DECELERATIONS

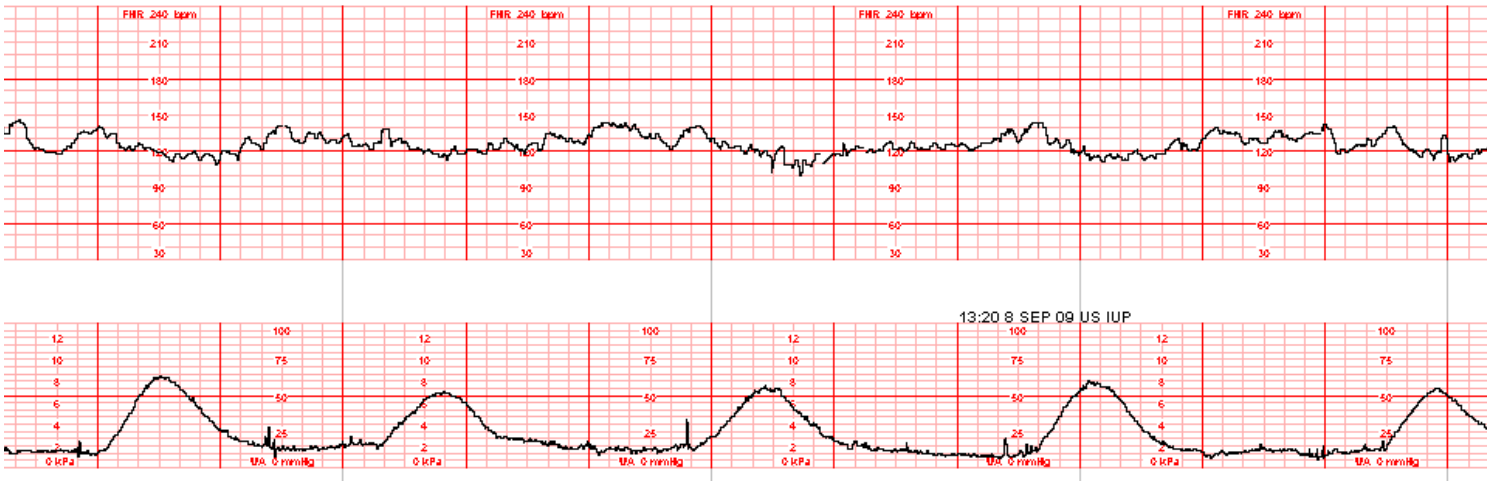


VARIABLE DECELERATIONS

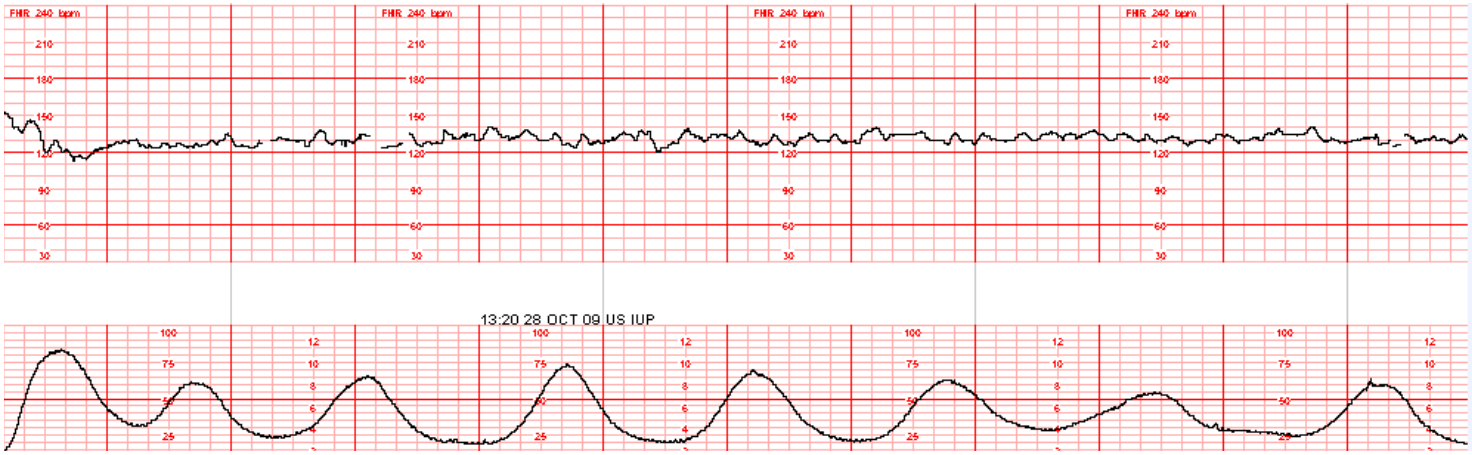


PROLONGED DECELERATIONS

Appendix B - Uterine Activity



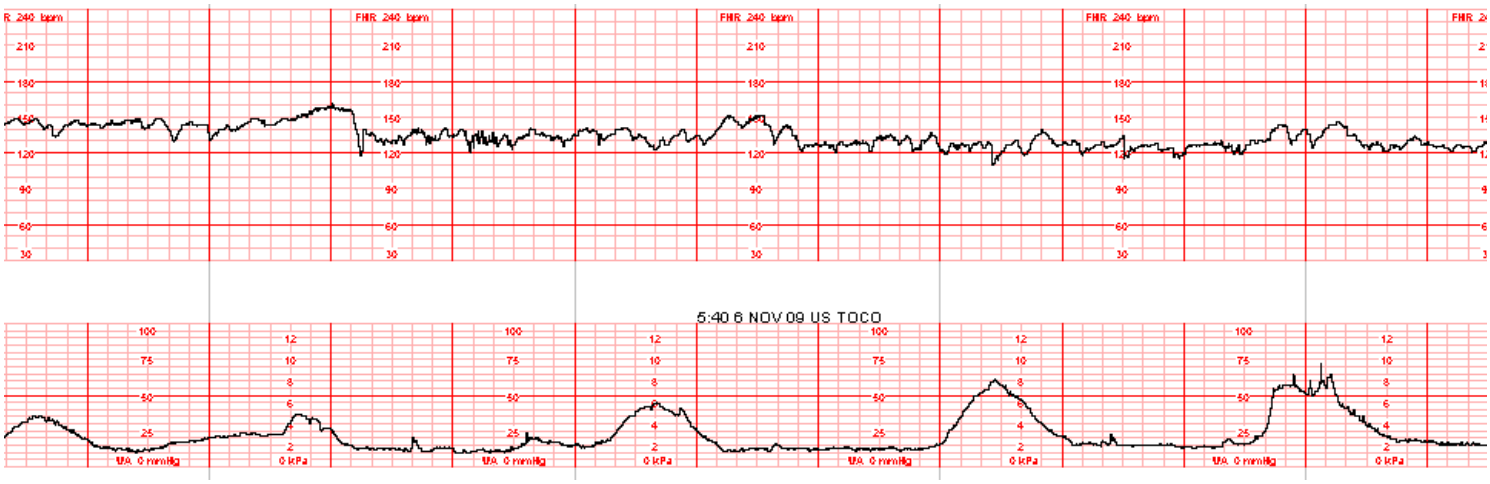
NORMAL UTERINE ACTIVITY

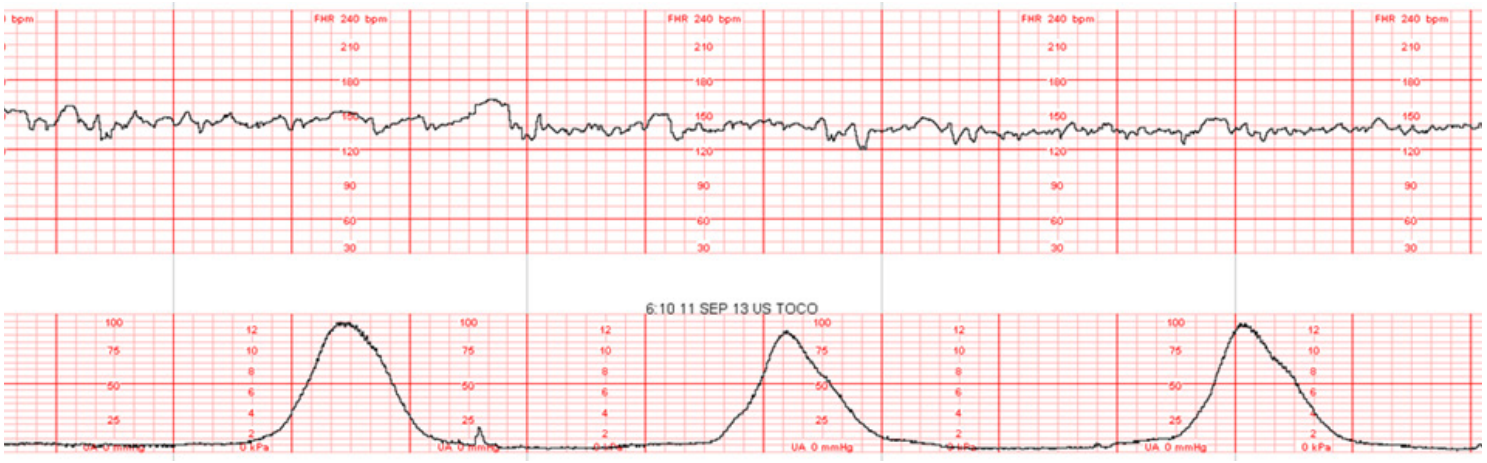


TACHYSYSTOLE

Appendix C - Categories of Fetal Heart Rate Tracings

CATEGORY I - (Normal) TRACING

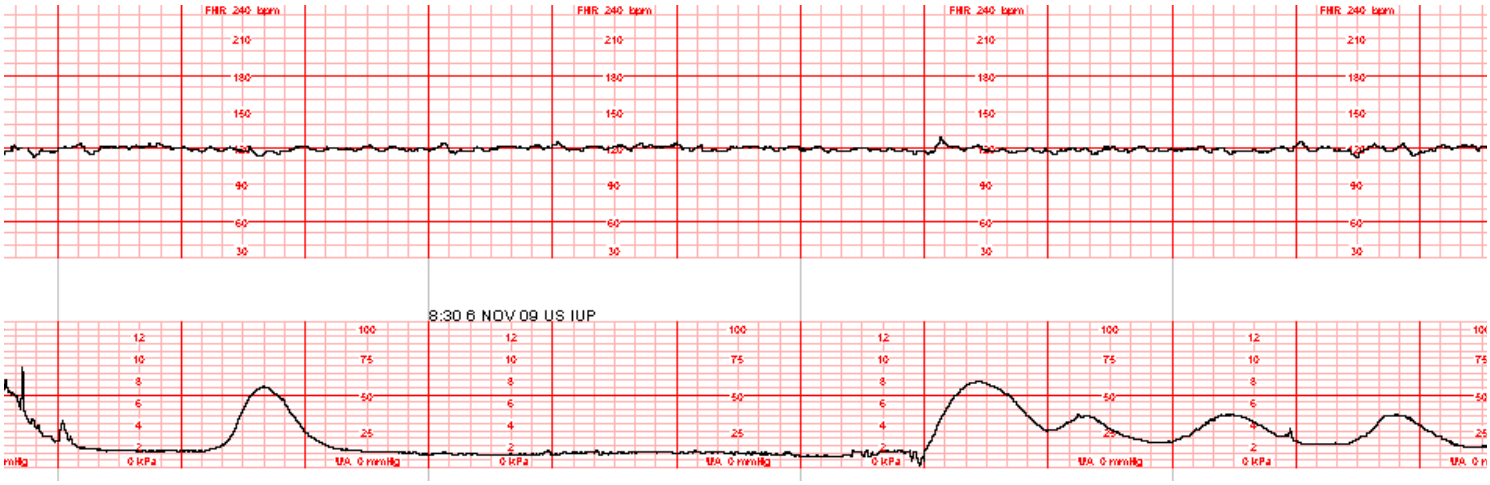




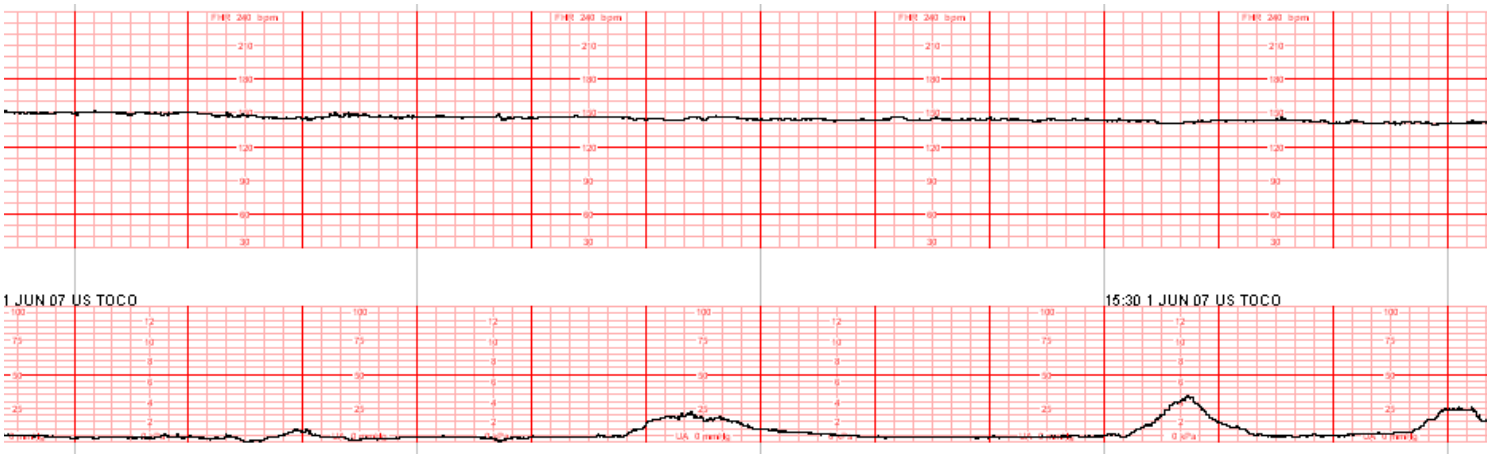
CRITERIA: Baseline rate 110 to 160 beats per minute; baseline variability moderate; late or variable decelerations absent; early decelerations present or absent

Appendix C - Categories of Fetal Heart Rate Tracings

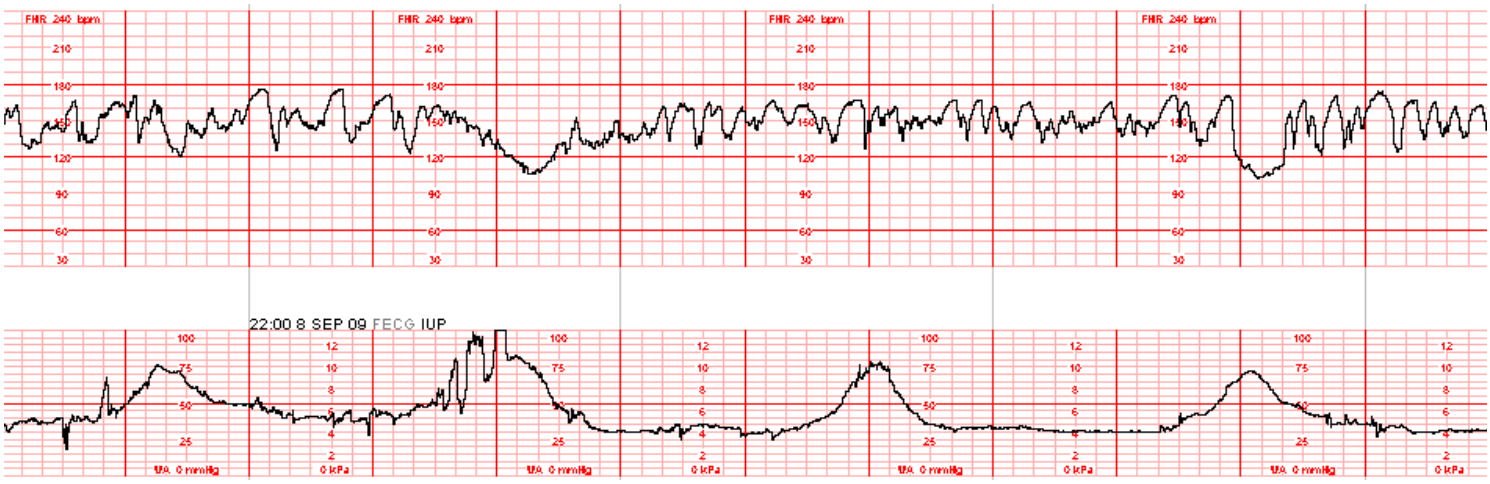
CATEGORY II - (Indeterminate) TRACINGS



CRITERIA: Minimal Variability



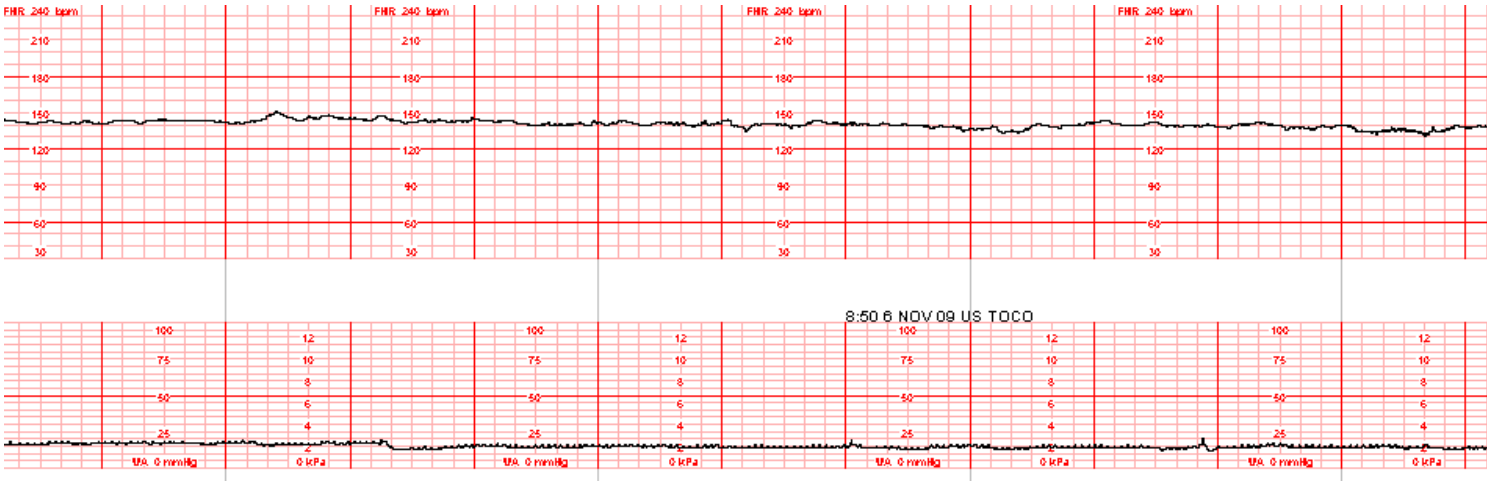
CRITERIA: Absent variability without recurrent decelerations



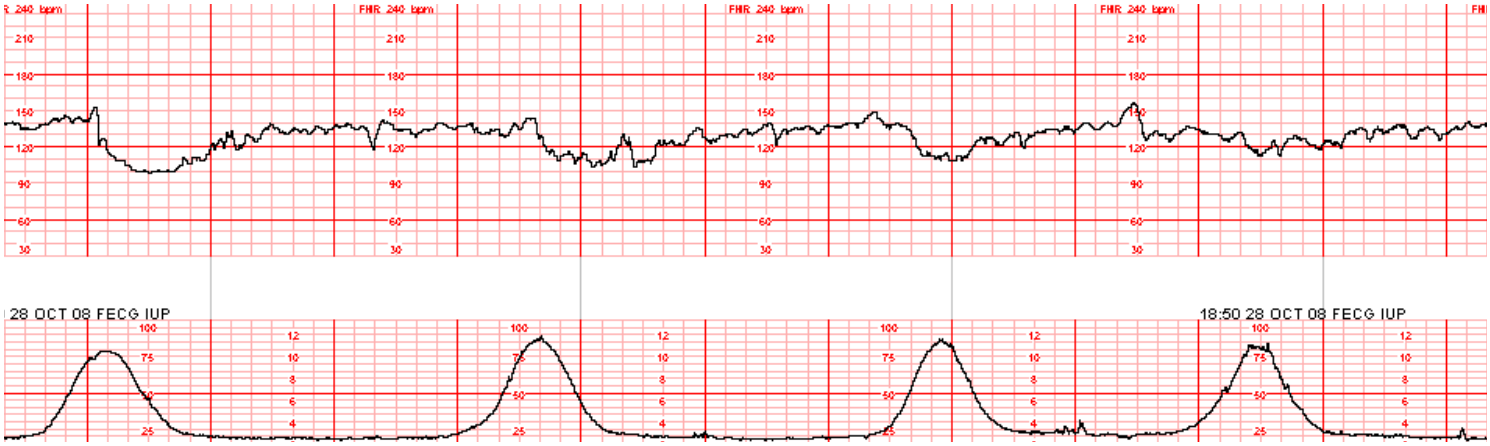
CRITERIA: Marked variability

Appendix C - Categories of Fetal Heart Rate Tracings

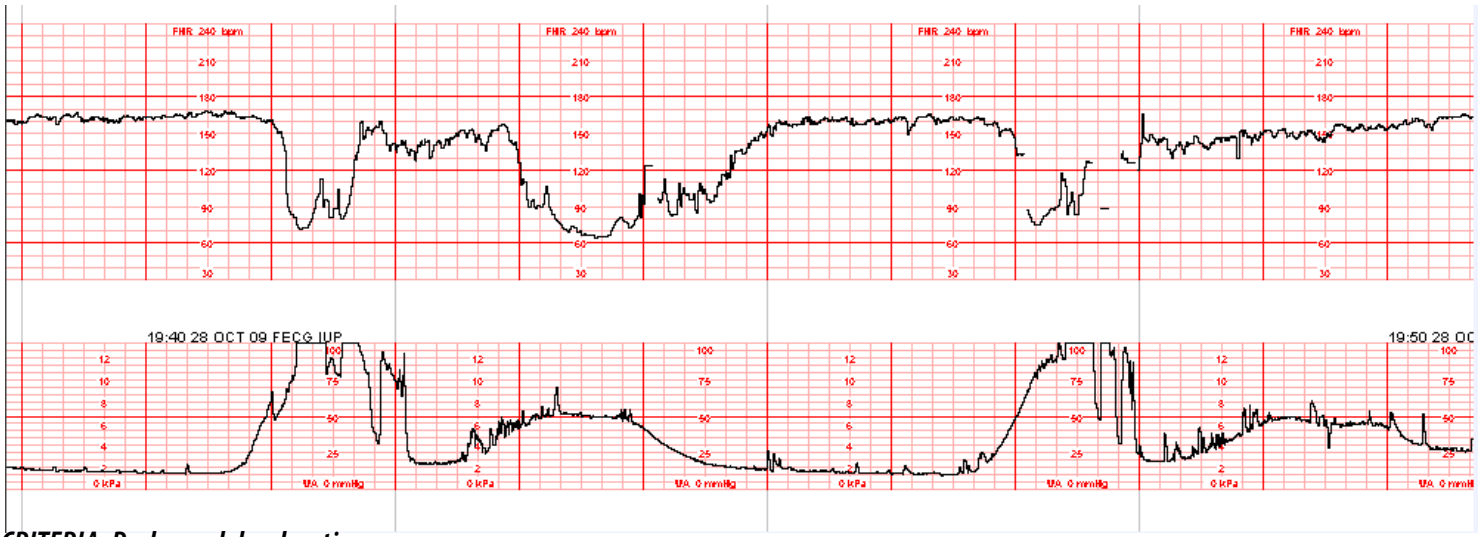
CATEGORY II - (Indeterminate) TRACINGS



CRITERIA: Absence of induced accelerations after fetal stimulation



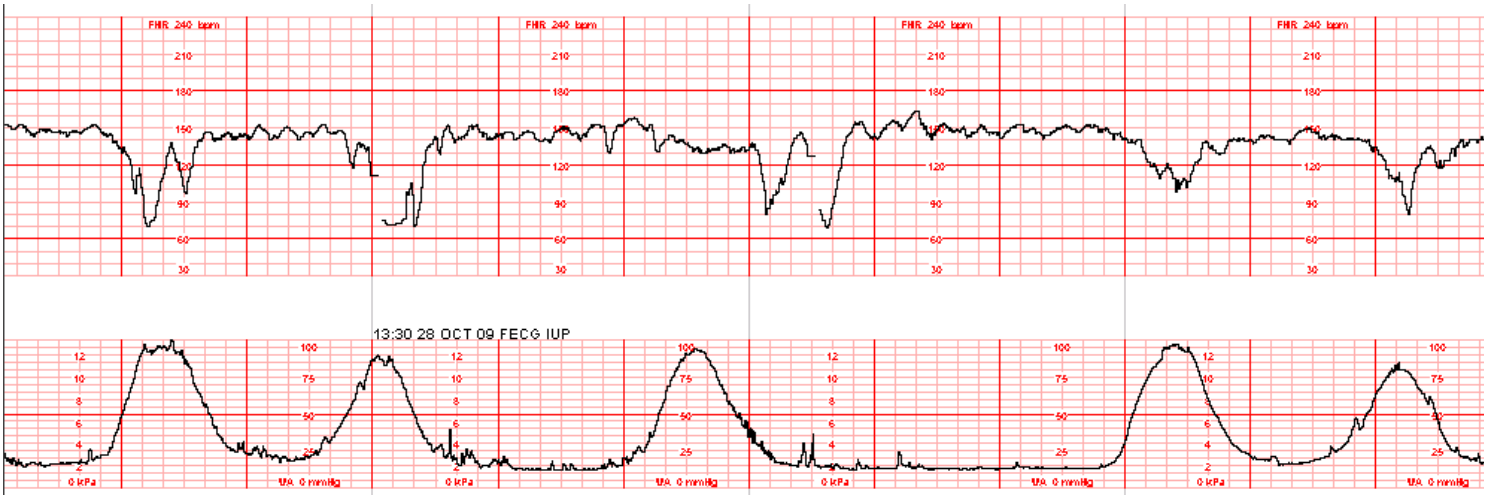
CRITERIA: Recurrent late decelerations with moderate variability



CRITERIA: Prolonged deceleration

Appendix C - Categories of Fetal Heart Rate Tracings

CATEGORY II - (Indeterminate) TRACINGS



CRITERIA: Recurrent variable decelerations with moderate variability

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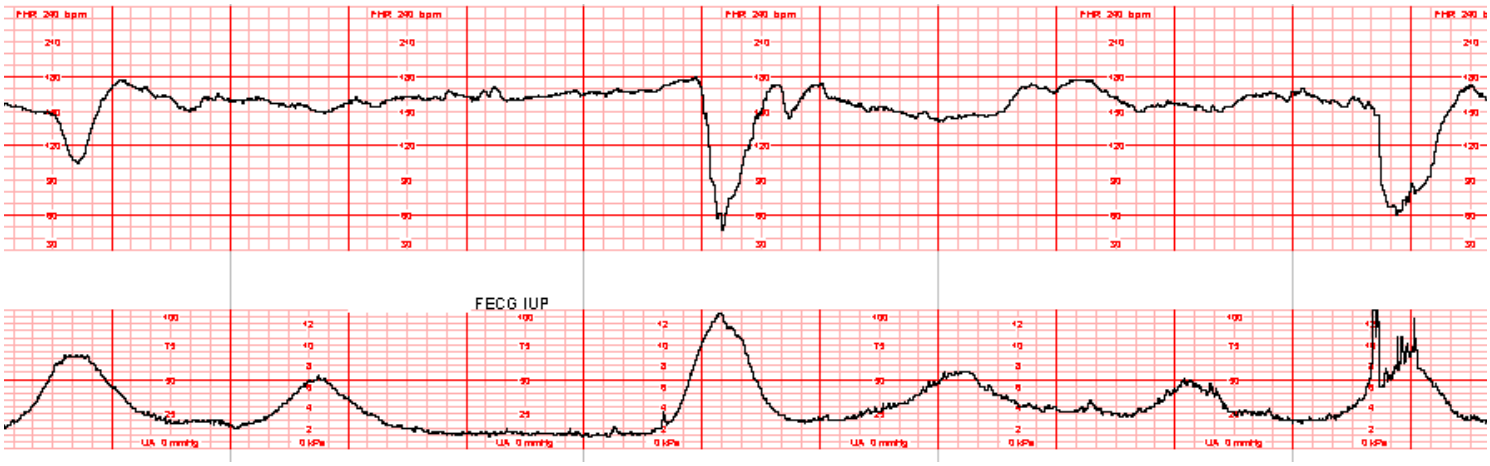
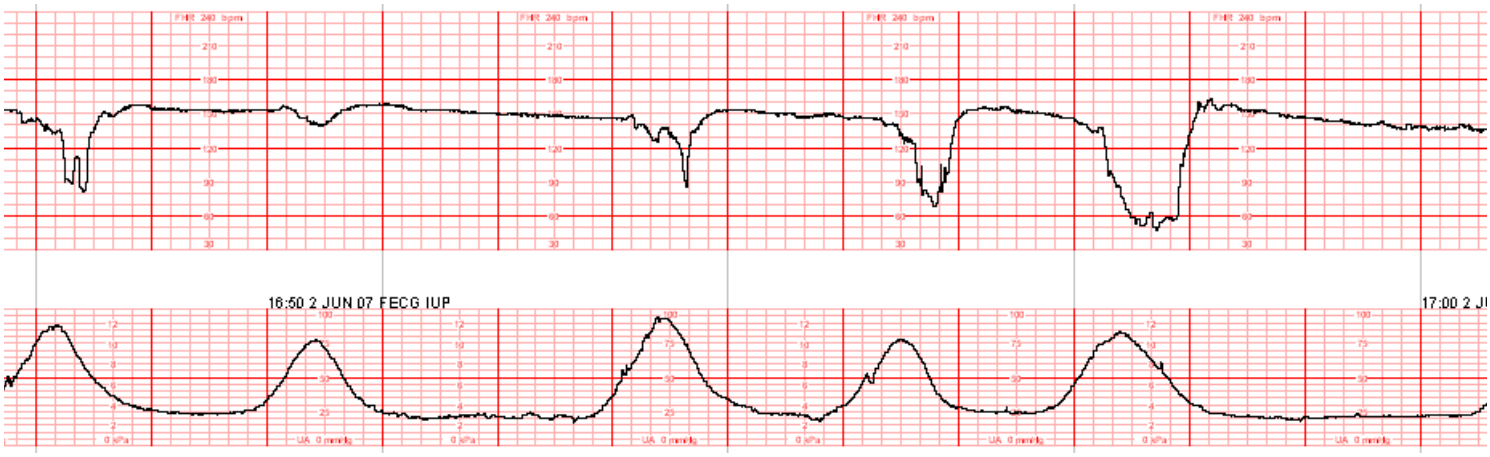


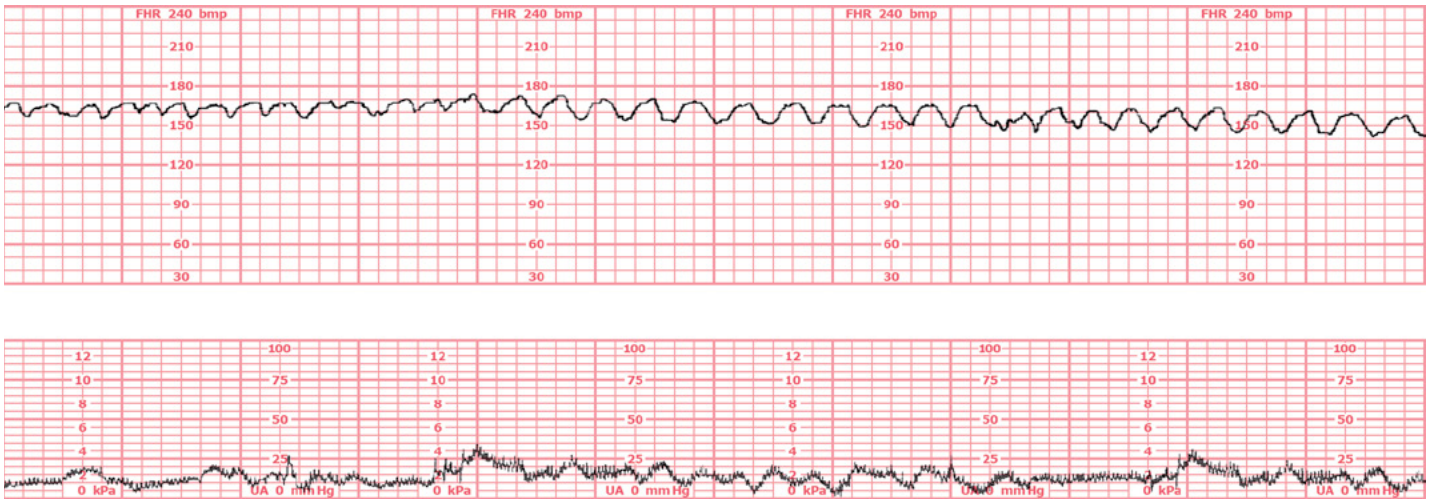
CRITERIA: Variable decelerations

Appendix C - Categories of Fetal Heart Rate Tracings

CATEGORY III - (Abnormal) TRACINGS



Absent variability and recurrent variable decelerations



Sinusoidal pattern

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