

Obstetric Anesthesiology: What's New, What's Old and What's Standard?

How to Avoid Conflict and Achieve Good Outcomes

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Medicine is constantly changing. Not only have new treatments and diagnoses been introduced,

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but how we interact with patients, nurses and other physicians is changing as well. This article will review what national societies have urged or required in their statements, guidelines and standards on obstetric anesthesiology. Note that their effect on communication is particularly important so that as obstetric anesthesiologists, we can interact, perform, and work together with our obstetrician and nursing colleagues to achieve optimal outcomes. In a world of sound bytes, we tend to communicate in short, often vague (and at times cryptic) phrases. Conflicting language use can lead to misunderstanding and errors.

Fetal Heart Rate Monitoring and Terminology

One of the biggest changes in obstetrics has been an overhaul in fetal heart rate (FHR) terminology. Communication between obstetrician, nurse and anesthesiologist is important, especially during times of “fetal distress” and “urgent” or “emergent” clinical decision-making. Everyone must speak and understand the same language. All too often, terminology is used loosely, leading to differing interpretations and subsequent actions, and potentially leading to adverse outcomes. As our obstetrician colleagues have changed much of their key FHR language, we must understand the meaning behind these phrases and their relevance to obstetric anesthesia management.

The term “fetal distress” is dead. It is vague and carries different meanings and significance to different practitioners. In July 2009, the American College of Obstetricians and Gynecologists (ACOG) issued new FHR language and interpretations, replacing the former version released only four years earlier.¹ FHR tracings have been placed into three categories, each with different implications and treatments (Table 1).

TABLE 1: Categorization of FHR Tracings/Patterns According to Risk for Fetal Compromise

Category I (Normal: strongly predictive of normal fetal acid-base status)

- FHR = 110–160 beats per minute (BPM) = normal
- Moderate beat-to-beat variability (6–24 BPM) = normal
- No variable (nadir variable in relation to peak of uterine contraction) or late (nadir after peak of contraction) decelerations (decrease greater than 15 BPM for 15–120 seconds)
- +/- Early (nadir coincides with peak of contraction) decelerations = normal
- +/- FHR accelerations (increase 15 BPM for 15–120 seconds) = reassuring

Category II (Indeterminate)

- Fetal tachycardia (greater than 160 BPM)
- Minimal (less than 5 BPM), absent, or marked (greater than 25 BPM) beat-to-beat variability
- Variable (nadir variable in relation to peak of contraction) decelerations (decrease greater than 15 BPM for 15–120 seconds)
- Late (nadir after peak of contraction) decelerations (decrease greater than 15 BPM for 15–120 seconds)
- Absence of accelerations, both spontaneous and induced by fetal stimulation
- Periodic or episodic decelerations
- Prolonged deceleration (decrease greater than 15 BPM for 2–10 minutes)

Category III (Abnormal: associated with abnormal fetal acid-base status)

- Sinusoidal tracing = sine wave of 3–5 cycles per minute for 20 minutes
- Absent beat-to-beat variability with *either*
 - Recurrent late (nadir after peak of contraction) or variable (nadir variable in relation to peak contraction) decelerations (decrease greater than 15 BPM for 15–120 seconds)
 - or*
 - Bradycardia (FHR less than 110 BPM for more than 10 minutes)

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Terminologically, note that *all* decelerations in Table 1, whether early, variable or late, are defined as a decrease of FHR greater than 15 BPM for 15 to 120 seconds, and therefore, *all prolonged* decelerations would be defined as a decrease of FHR greater than 15 BPM that lasts two to 10 minutes. The term “fetal bradycardia” (“prolonged fetal bradycardia” no longer is used) is defined as a FHR less than 110 BPM for *more than* 10 minutes.

Category I tracing is considered normal and is strongly predictive of normal fetal acid-base status, with no action required except continued monitoring of the fetus at regular intervals. Specifically, a Category I tracing is defined by a normal FHR of 110 to 160 BPM with moderate beat-to-beat variability (amplitude 6–25 BPM) and no FHR decelerations (decrease >15 BPM for 15 to 120 seconds), whether late (nadir after peak of uterine contraction) or variable (variable nadir relative to peak of contraction). Early (nadir coincides with peak of contraction) FHR decelerations are normal and may or may not be present. Accelerations (>15 BPM increase of FHR for 15 to 120 seconds), a reassuring fetal sign, can be present or absent.

Category III tracing is “abnormal” and is associated with abnormal fetal acid-base status. Specifically, a Category III tracing consists of a sinusoidal pattern (no variability, sine wave of 3–5 cycles per minute for 20 minutes) *or* absent fetal heart rate variability *and* either recurrent (late or variable) FHR decelerations *or* fetal bradycardia (less than 110 BPM for more than 10 minutes).

A **Category II** tracing is “indeterminate” and by definition does not fall into either of the other two categories. Category II tracings include fetal tachycardia (>160 BPM), altered (increased, decreased, absent) beat-to-beat variability, absence of accelerations, and periodic or episodic decelerations. **Significantly, Category II includes prolonged fetal deceleration (decrease greater than 15 BPM lasting 2 to 10 minutes)!** This underlines the complexity of FHR monitoring and why we should be familiar with FHR tracing descriptors. Gone is the terminology that spoke to cesareans for “fetal distress” and “late decelerations,” although you may still encounter those terms.

What Has EFM Accomplished?

How useful is electronic FHR monitoring (EFM)? There has been little proven benefit. Indeed, ACOG notes that compared to intermittent auscultation of the fetal heart rate, EFM increased the relative risk (RR) for cesarean delivery by 1.66 and the RR for detecting abnormal FHR and/or acidosis (fetal scalp pH < 7.20) by 2.37.¹ EFM also increased the RR for operative vaginal delivery (forceps or vacuum) by 1.6. On the positive side, EFM did reduce the RR of neonatal seizures by 50 percent, although it did *not* change the incidence of cerebral palsy.

Effect of Drugs on FHR

Because FHR is constantly scrutinized, we should be familiar with drugs that affect FHR. Pain relief by parenteral meperidine compared to epidural analgesia with bupivacaine 0.25 percent significantly decreased both beat-to-beat variability and accelerations.² However, combined spinal-epidural was associated with a higher frequency of FHR abnormalities, bradycardia, and emergent cesarean delivery compared to parenteral meperidine.³ Parenteral butorphanol was associated with transient sinusoidal FHR pattern.¹ Note that ephedrine, especially in doses of 25 mg or greater, will cross the placenta and *can* increase the baseline fetal heart rate by 10–20 BPM for approximately 45 minutes. Potent inhalational agents cross the placenta and will reduce the FHR baseline by about 10 BPM and create minimal or no variability in the FHR tracing. Changes in FHR baseline, *if* not attributed to external medications, can be interpreted as an abnormal finding.

Management of FHR Tracings

In November 2010, ACOG released Practice Bulletin #116, Management of Intrapartum Fetal Heart Rate Tracings,⁴ with the following recommendations:

The management of a **Category I tracing** is continued monitoring (electronic or intermittent) with review every 30 minutes during the first stage of labor, and then every 15 minutes during the second stage of labor.

Category II tracings require continued monitoring and possible corrective measures based on the individual tracing. In the presence of FHR abnormalities, either FHR accelerations or moderate beat-to-beat variability is highly predictive of normal fetal acid-base status. Variable decelerations may be treated with amnioinfusion for suspected cord compression. Late decelerations are indicative of uteroplacental insufficiency, which may be due to maternal hypotension (possibly related to epidural analgesia) or uterine tachysystole (too frequent contractions: more than 5 uterine contractions in 10 minutes, averaged over 30 minutes). However, *late decelerations alone have a low predictive value for fetal acidemia* and only qualify for Category II.

Nonetheless, it would seem prudent to initiate general maneuvers for intrauterine resuscitation of the fetus (supplemental oxygen, increased intravenous fluid administration, left- or right-lateral positioning of the parturient, treatment of hypotension if present, and treatment of uterine tachysystole or hypertonus [incomplete uterine relaxation] *if* present; see Table 2). Tachysystole with FHR decelerations requires decreasing the frequency of uterine contractions with *either* intravenous or subcutaneous terbutaline 0.25 mg, which may produce maternal tachycardia for 15–45 minutes, *or* intravenous nitroglycerin

100–200 mcg or sublingual nitroglycerin 400 mcg, which may decrease blood pressure due to vasodilation. Note that the terms “hyperstimulation” and “hypercontractility” have been discontinued.

Fetal Resuscitation

TABLE 2: Intrauterine Resuscitation of the Fetus
■ Supplemental oxygen
■ Additional intravenous fluids
■ Left- or right-lateral positioning of parturient
■ Elevation of maternal blood pressure, if judged to be too low
■ Pharmacologic relaxation of the uterus, <i>if</i> tachysystole (more than 5 uterine contractions in 10 minutes, averaged over 30 minutes) or hypertonus (incomplete uterine relaxation) is present, with terbutaline or nitroglycerin

If the resuscitative measures fail to improve the FHR tracing, and there is a continued presence of minimal beat-to-beat variability (a non-reassuring sign), and absence of accelerations (a reassuring sign), then fetal acidemia may be present and an “expedited” delivery must be considered (see Table 5).

What about the older concerns with fetal bradycardia? For the presence of fetal bradycardia (less than 110 BPM for more than 10 minutes) *with* absent beat-to-beat variability (Category III), ACOG recommends “prompt” delivery. However, a prolonged deceleration (greater than 15 BPM drop for two to 10 minutes, considered to be Category II) does not by itself require a cesarean delivery. Nonetheless, at five to seven minutes into a deceleration, no one knows whether the deceleration will resolve or continue, turning a prolonged deceleration (Category II) into a fetal bradycardia (Category III). My suggestion is that at about seven minutes into the deceleration, it would be prudent to begin the process of transporting the patient to the operating room, and then once there, recheck the FHR to determine which tracing category is in effect at that moment. This would save valuable minutes (spent worriedly watching the deceleration in the labor room, in full view of the patient and family, until the full ten minutes elapsed) in that it would permit proceeding with an immediate

cesarean delivery if warranted by the situation. Although movement to the operating room at this point may raise concerns in the patient and family, especially if it is then determined that a cesarean is not indicated and the patient is returned to the labor room, ultimately this move may prove to be the most rational course. Keeping the patient and family fully informed of the FHR tracings and their implications in an ongoing manner would lessen any hesitation to make such transportation choices.

Category III tracings are abnormal and may indicate fetal acidosis, with an associated increased risk for neonatal encephalopathy, cerebral palsy, and neonatal acidosis. However, even a Category III tracing does *not* predict poor neonatal neurologic outcome. Nonetheless, if measures for intrauterine resuscitation of the fetus are not successful, then cesarean delivery is indicated.

The Timing of a Cesarean Delivery

The time frame for starting a cesarean delivery is NOT defined! While still in common use, the “30-minute rule” (decision-to-incision) for an emergent cesarean delivery to be based on an abnormal FHR tracing has little scientific evidence, and therefore now is considered inappropriate and incorrect terminology.⁴ In fact, ACOG Practice Bulletin #116 states that “more than 30 percent of the cesarean deliveries began more than 30 minutes after the decision to operate,” yet without an increase of poor neonatal outcomes in those infants! Cesarean delivery for a Category III tracing should be accomplished as “expeditiously” as possible, and decision-to-incision times should be based on maternal and fetal risks and benefits. Maternal stabilization or preparation may be warranted and varies by local institution and practices.

Conflict can arise over the timing of when a patient for a cesarean actually is transferred to the operating room. That many cesareans seem to be “called” before and after office hours as a convenience factor is a different issue. Each cesarean needs to be evaluated based upon the conditions of the mother and the fetus at that time. Confusion arises when conversations are not taking place around the right subject. What does “urgent” or “emergent” mean to you, the nurse, the obstetrician? The real conversation should be centered on the timing of the cesarean. Clearly, it is the obstetrician’s sole responsibility to decide whether to do a cesarean and then how fast to do so. Table 3 lists some of the maternal indications for cesarean delivery; Table 4 lists some of the fetal indications for cesarean delivery.

TABLE 3: Maternal Indications for Cesarean Delivery
■ Bleeding (placenta previa, placenta abruptio, uterine rupture)
■ Cardiopulmonary arrest (perimortem cesarean 5 minutes into resuscitation)
■ Severe preeclampsia with vaginal delivery unlikely within 24 hours or a lesser time, as determined by the obstetrician

TABLE 4: Fetal Indications for Cesarean Delivery
■ Uterine rupture
■ Prolapsed umbilical cord
■ Placenta previa, placental abruption, vasa previa
■ Failed forceps, failed vacuum, failed vaginal birth after cesarean, failed induction
■ Failure to progress, failure to descend, dystocia
■ Shoulder dystocia, history of shoulder dystocia with large baby, macrosomia
■ Human immunodeficiency virus (HIV) infection with high viral load in maternal blood
■ Category III FHR tracing with no response to resuscitative measures
■ Category II FHR tracing with no response to resuscitative measure <i>and</i> lack of reassuring signs <i>may be</i> included in this list of indications
■ Fetal bradycardia (less than 110 BPM for more than 10 minutes), sinusoidal FHR pattern
■ Fetal scalp pH less than 7.20 (no longer a popular test, with pH greater than 7.25 a reassuring sign, but generally has been replaced by the use of vibro-acoustic stimulation to produce accelerations as a reassuring sign)

The “Modern Zakowski Obstetric Anesthesia Dictionary”

That the shortcomings of terminology can lead to miscommunication or malcommunication highlights a key point: the focus should be on what is most beneficial to maternal/fetal physiology. The real issue is, how much *time* does mother or fetus have before there are meaningful physiologic changes that threaten their well-being? This brings any such discussions to something we all can quantify (time) and what we all really care about—good outcomes. Tables 5 and 6 may prove helpful in this regard.

Term	Time element, suggested translation
Elective	Can be done today or tomorrow
Nonelective	Not elective: needs to be done sometime soon
Urgent	Can wait 2 hours
Emergent	Need to go sooner than 2 hours
Crash/stat	Must go <i>now</i> : mother/baby's life in immediate danger
Prompt	Same as “urgent”
Expedited	Same as “emergent”
Expeditiously	Same as “emergent”
30-minute-rule	ACOG declares that there is no data to support this rule, and that 30 percent of its members do not adhere to it. Therefore, it no longer is a standard of care as defined by ACOG. Note that standard of care may also be set locally by hospital policy or by accrediting agencies such as The Joint Commission.

TABLE 6: Suggested Terminology to Enhance Quality of Care

Condition	Communication	Meaning
Mother's and/or fetus's life in immediate danger	"crash/stat"	moving to cesarean as fast as possible, preferably within 10 minutes of decision
Mother and/or fetus showing signs of stress likely associated with fetal acidosis—(e.g., Category III tracing)	"expedited/expeditiously"	going to cesarean in less than 1 hour, sooner better than later
Mother and/or fetus showing signs of stress; may be associated with fetal acidosis but some reassuring signs	"prompt"	going to cesarean within 2 hours
Mother and/or fetus OK, but vaginal delivery is not happening (e.g., failure to progress)	"urgent"	cesarean can wait 2 hours

Note that clinical conditions can change quickly, and generally speaking, sooner may be better than later, unless there is a need to stabilize the mother (e.g., volume replacement) or fetus. Unfortunately, the data supporting some of these time interpretations has not been well studied, but the safest approach is to discuss the timing for delivery using terminology mutually agreed upon (by both anesthesiology and obstetric departments) in that hospital. For instance, if an obstetrician indicates that a cesarean must be done hurriedly, then a clarifying question for the anesthesiologist to ask the obstetrician *might* be, "Do I have ten minutes in order to give a spinal anesthetic?" if that is deemed to be the appropriate anesthetic management.

Conclusion

The stakes are never higher than in obstetrical anesthesia, as we are entrusted with two lives—mother and fetus. In spite of frequent changes in terminology, use of sound bytes, and the all too common use of slang and/or outdated verbiage, we need to be able to communicate with our nursing and obstetrical colleagues with accuracy and ease. Many sources, including ACOG, reaffirm

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that *communication gaps and patient hand-offs are very important causes of medical errors and omissions*.⁵ By learning the new terminology surrounding FHR tracings, as well as ACOG's expected management by their member obstetricians, we can prevent the Tower of Babel from occurring in labor and delivery. Even better, we can steer the conversation away from somewhat artificially defined terms, and toward what anesthesiologists have always remained true to—patient physiology and improved patient outcomes.

References

1. American College Of Obstetricians And Gynecologists (ACOG) Practice Bulletin Number 106, July 2009, Intrapartum Fetal Heart Rate Monitoring: Nomenclature, Interpretation, and General Management Principles.
2. Hill JB, Alexander JM, Sharma SK, McIntire DD, Leveno KJ. "A comparison of the effects of epidural and meperidine analgesia during labor on fetal heart rate." *Obstet Gynecol* 2003;102:333–7.
3. Gambling DR, Sharma SK, Ramin SM, Lucas MJ, Leveno KJ, Wiley J, et al. "A randomized study of combined spinal-epidural analgesia versus intravenous meperidine during labor: impact on cesarean delivery rate." *Anesthesiology* 1998;89:1336–44.
4. American College Of Obstetricians And Gynecologists (ACOG) Practice Bulletin 116, November 2010, Management of Intrapartum Fetal Heart Rate Tracings.
5. American College Of Obstetricians And Gynecologists (ACOG) Committee Opinion Number 459, July 2010, The Obstetric–Gynecologic Hospitalist.

Editor's note: The ACOG Practice Bulletins #106 and #116 referenced above are available in the "Membership" section of the CSA website, www.csahq.org.

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