Management of Category 2 Tracings: A Guideline

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We have no conflicts of interest.

Learning Objectives

As a result of completing this learning activity, the learner will be able to:

1. Identify characteristics of category l and category lll tracings per NICHD guidelines.
2. Identify the characteristics of significant decelerations per this guideline.
3. Describe the management of fetal heart rate strips based on following the Management of Second Stage Guideline by Clark, et al, AJOG Aug 2013.

Why do we care about managing category ll tracings?

- Category ll tracings are a source of discomfort about management among care providers and nursing staff.
- In a study by Cahill including over 500 patients, the last 30 minutes of FHR tracings:
  - 2.3% were Category l
  - **97.6% were Category ll**
  - .09% were Category lll

Cahill, GA, et al. Am J Obstet Gynecol 2012; 207:206

Category 1 and Category 3 Tracings: A review of definitions

Category l includes *all* of the following:

- Baseline rate 110-160 bpm
- Accelerations present or absent
- Moderate variability
- No late decelerations
- No variable decelerations
- No prolonged decelerations
- Early decelerations may be present

Category lll includes at least *one* of the following:

- Absent variability with:
  - recurrent late decelerations
  - recurrent variable decelerations
  - bradycardia for at least 10 minutes
- Sinusoidal pattern for at least 20 minutes

Three-Tier Fetal Heart Rate Interpretation System Obstet Gynecol 2008;112:665

Category 2 Tracings include:

- Baseline Rate:
  - Bradycardia not accompanied by absent variability
  - Tachycardia
- Baseline FHR variability
  - Minimal baseline variability
  - Absent baseline variability not accompanied by recurrent decelerations
  - Marked baseline variability
- Accelerations
  - Absence of induced accelerations after fetal stimulation
- Periodic or episodic decelerations
  - Recurrent variable decelerations with minimal or moderate baseline variability
  - Prolonged decelerations ≥ 2 minutes but < 10 minutes
  - Recurrent late decelerations with moderate baseline variability
  - Variable decelerations with other characteristics, such as slow return to baseline or other atypical features

44 different combinations!!!

CLINICAL OPINION www.AJOG.org

OBSTETRICS

Intrapartum management of category II fetal heart rate tracings: towards standardization of care

Steven L. Clark, MD; Michael P. Nageotte, MD; Thomas J. Garite, MD; Roger K. Freeman, MD; David A. Miller, MD; Kathleen R. Simpson, RN, PhD; Michael A. Belfort, MD, PhD; Gary A. Dildy, MD; Julian T. Parer, MD; Richard L. Berkowitz, MD; Mary D'Alton, MD; Dwight J. Rouse, MD; Larry C. Gilstrap, MD; Anthony M. Vintzileos, MD; J. Peter van Dorsten, MD; Frank H. Boehm, MD; Lisa A. Miller, CNM, JD; Gary D. V. Hankins, MD

There is currently no standard national approach to the management of category II fetal heart rate (FHR) patterns, yet such patterns occur in the majority of fetuses in labor. Under such circumstances, it would be difficult to demonstrate the clinical efficacy of FHR monitoring even if this technique had immense intrinsic value, since there has never been a standard hypothesis to test dealing with interpretation and management of these abnormal patterns. We present an algorithm for the management of category II FHR patterns that reflects a synthesis of available evidence and current scientific thought. Use of this algorithm represents one way for the clinician to comply with the standard of care, and may enhance our overall ability to define the benefits of intrapartum FHR monitoring.

Key words: fetal heart rate monitoring, neonatal encephalopathy, patient safety

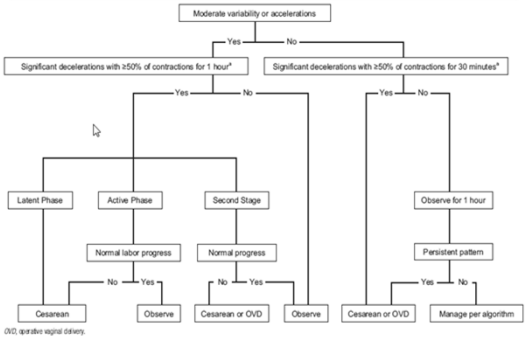
Interpretation and management of fetal heart rate (FHR) patterns during labor remains one of the most problematic issues in obstetrics. Multiple basic science investigations and clinical trials have been published since the introduction of this technique in the late 1950s.[1,2] Unfortunately, this body of work has primarily served to raise more questions than it has answered—as a medical community, we seem to know less than we thought we did 30 years ago regarding the utility of this ubiquitous technique.

In recent years, several specific issues relating to the interpretation and management of FHR patterns have received

patterns in fact prevents cerebral palsy or other types of neurologic impairment.[3-12]

challenging patterns. In a very real sense, the FHR monitor is a medical device that was introduced into clinical practice

FIGURE 1
Algorithm for management of category II fetal heart rate tracings



OVD, operative vaginal delivery.

*That have not resolved with appropriate conservative corrective measures, which may include supplemental oxygen, maternal position changes, intravenous fluid administration, correction of hypotension, reduction or discontinuation of uterine stimulation, administration of uterine relaxant, amnioinfusion, and/or changes in second stage breathing and pushing techniques.

Clark. Category II FHRT. Am J Obstet Gynecol 2013.

How is the guideline supported in the literature?

In a 2003 study of term fetuses, n = 488, Williams and colleagues reported that minimal and absent variability for at least 60 minutes was associated with a pH 7.0 in 12-31% of the cases.

Williams, KP, Galerneau F., AJOG, 2003

How is the guideline supported in the literature?

Term fetuses with an initially normal FRH tracing and normal scalp pH, but who subsequently developed an abnormal tracing, remained non-acidemic (scalp pH >7.25) for at least 90 minutes of the abnormal pattern.

Fleisher A, et al., The Development of fetal acidosis in the presence of an abnormal fetal heart rate tracing. II the average for gestational age fetus, AJOG, 1982

Results of the study by Low and colleagues showed that there was an approximately 60 minute window from th start of FHR patterns containing minimal variability and late or prolonged decelerations, which preceded fetal "asphyxial decompensation".

Low JA, et al., Factors associated with motor and cognitive deficits in children after intrapartum fetal hypoxia, AJOG, 1982.

Low JA, Victory R, Derrick EJ., Predictive value of electronic fetal monitoring for intrapartum fetal asphyxia with metabolic acidosis. OB/Gyn 1999.

How is the guideline supported in the literature?

- Four NICHD defined features demonstrated the greatest association with acidemia:
  - Recurrent variable decelerations
  - Recurrent late decelerations
  - Recurrent prolonged decelerations
  - Tachycardia

  (after adjusting for parity, obesity, fever and prolonged first stage)
- Another factor (not defined by NICHD) that demonstrated superior predictive ability for acidemia was "total deceleration area"

Cahill, Association and prediction of neonatal acidemia, AJOG, Sept 2012; 207;206

How is the guideline supported in the literature?

Considering all labor:

- Category I 77.9%
- Category II 22.15%
- Category III 0.004%

Last two hours prior to delivery:

- Category I 60.9%
- Category II 39.1%
- Category III 0.006%

N = 4444

Results: the longer the time spent in category II in the last two hours, the higher the likelihood of apgars less than 7 at 5 minutes and NICU admission.

Category I and II FHR tracings are common in labor and category III tracings are rare.

Jackson, M., Fequency of fetal heart rate categories and short-term neonatal outcome. Obstet Gynecol Oct 2011;118 803-8)

How is the guideline supported in the literature?

Normal fetal base excess entering labor is -2mmol/L.

In a fetus exhibiting repetitive FRH decelerations for periods of hours
- BE decreased by approximately 4mmol/L during the 2 hours prior to delivery or 1mmol/L per 30 minutes (Low, AJOG, 1997)
- Severe cord occlusion or marked reductions in uterine blood flow (rupture) may decrease BE in sheep or human fetus by 1mmol/L per 2-3 minutes

A frequency of complete umbilical cord occlusion occurring for 1 minute every 5 minutes, allows for sufficient recovery time (4 minutes) resulting in minimal development of metabolic acidosis over time

More frequent umbilical cord occlusion (1 per 2 minutes) may result in rapid development of metabolic acidosis

Sheep study - BE normalizes at 0.1 mmol/L per minute between umbilical cord occlusion or after bradycardic event
- For a fetus with a BE of -12, it would take 2 hours for BE to normalize if undelivered and the insult is completely abated.

Ross, M, Labor and fetal heart rate decelerations: Relation to Fetal Metabolic Acidosis. Clinical OBGYN, 2011;52;74-82

Normal fetal heart rate tracing

↓

Recurrent decelerations
Minimal-absent variability

60 – 90 minutes

↓

Metabolic acidemia and potential injury

AJOG 1982;148:533-539, AJOG 1982;144(1):55-60, OG 1999;93:285–91, AJOG 2003:188:820-3

Important Points of the Guideline

TABLE

Management of category II fetal heart rate patterns: clarifications for use in algorithm

1. Variability refers to predominant baseline FHR pattern (marked, moderate, minimal, absent) during a 30-minute evaluation period, as defined by NICHD.
2. Marked variability is considered same as moderate variability for purposes of this algorithm.
3. Significant decelerations are 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.
   - Any late decelerations of any depth.
   - Any prolonged deceleration, as defined by the NICHD. Due to the broad heterogeneity inherent in this definition, identification of a prolonged deceleration should prompt discontinuation of the algorithm until the deceleration is resolved.
4. Application of algorithm may be initially delayed for up to 30 minutes while attempts are made to alleviate category II pattern with conservative therapeutic interventions (eg, correction of hypotension, position change, amnioinfusion, tocolysis, reduction or discontinuation of oxytocin).
5. Once a category II FHR pattern is identified, FHR is evaluated and algorithm applied every 30 minutes.
6. Any significant change in FHR parameters should result in reapplication of algorithm.
7. For category II FHR patterns in which algorithm suggests delivery is indicated, such delivery should ideally be initiated within 30 minutes of decision for cesarean.
8. If at any time tracing reverts to category I status, or deteriorates for even a short time to category III status, the algorithm no longer applies. However, algorithm should be reinstituted if category I pattern again reverts to category II.
9. In fetus with extreme prematurity, neither significance of certain FHR patterns of concern in more mature fetus (eg, minimal variability) or ability of such fetuses to tolerate intrapartum events leading to certain types of category II patterns are well defined. This algorithm is not intended as guide to management of fetus with extreme prematurity.
10. Algorithm may be overridden at any time if, after evaluation of patient, physician believes it is in best interest of the fetus to intervene sooner.

FHR, fetal heart rate; *NICHD*, Eunice Kennedy Shriver National Institute of Child Health and Human Development.

Clark. Category II FHRT. Am J Obstet Gynecol 2013.

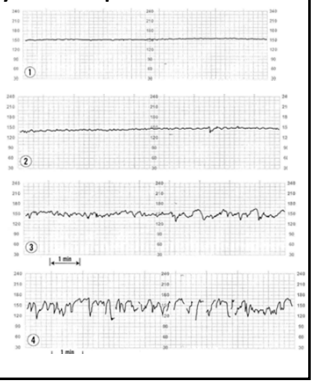
Important Points

- Variability refers to the **predominant** baseline FHR pattern during a 30 minute evaluation period (more than 50% of the time)
- *Marked variability* is considered the same as *moderate variability* for the purposes of this algorithm
- *Minimal* and *absent* variability are considered the same for the purposes of this algorithm.

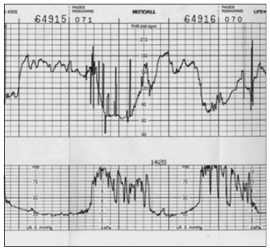
Variability examples

- Absent: undetectable
- Minimal: detectable but less than or equal to 5 bpm

- Moderate: range from 6-25 bpm
- Marked > 25 beats/min



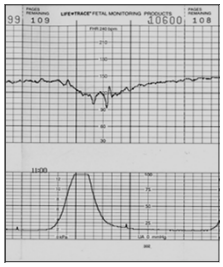
Clarification: Significant Decelerations



- Variable decelerations that are less than 60 bpm at the nadir regardless of the baseline **AND** lasting greater than 60 seconds
- Variable decels 60 x 60 have an association with increased morbidity

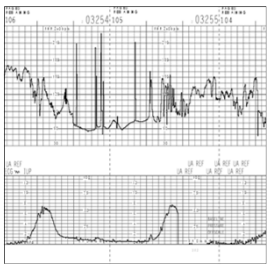
Clark, et al, Management of Second Stage Guideline, AJOG, Aug 2013.

Clarification: Significant Decelerations



- Late decelerations of any depth
- Gradual descent over 30 seconds to the nadir
- Nadir appears after the peak of the contraction.

Clarification: Significant Decelerations



- Any prolonged deceleration as defined by NICHD: > 2 minutes and < 10 minutes
- Identification of prolonged deceleration should prompt discontinuation of the algorithm until the deceleration is resolved

Important clarification

- Application of the algorithm may be initially delayed up to 30 minutes while attempts are made to alleviate category ll pattern with conservative therapeutic interventions.
- Once a category ll FHR pattern is identified, FHR is evaluated and algorithm applied every 30 minutes.
- Any significant change in FHR parameters should result in reapplication of the algorithm.

Further clarification points

- When the algorithm suggests delivery is indicated, such delivery should be ideally initiated within 30 minutes of the decision for cesarean.
- If at any time the tracing reverts to category I status or deteriorates for even a short time to category III status, the algorithm no longer applies. Reinstitute when the pattern reverts to category II.
- This algorithm is not intended to guide management of fetus with extreme prematurity.
- Algorithm may be overridden at any time if, after evaluation of the patient, the provider believes it is in the best interest of the fetus to intervene sooner.

How does this algorithm apply to the SBAR communication process?

The algorithm can be embedded into the SBAR between providers and nurses. Below is an example:

S: Baseline of 125, minimal variability and intermittent variable decelerations. I have initiated a position change, fluid bolus and have seen no improvement in the FHR pattern.

B: 4cm dilated, G1, P0….

A: The FHR has not improved and remains category II for 30 minutes despite interventions.

R: According to the category II algorithm, we should continue monitor closely and evaluate in another 30 minutes. Does this plan sound good to you? When would you like another update?

- Let's look at some case studies and strips

References:

- Clark, et al, Management of Second Stage Guideline, AJOG, Aug 2013.
- Figure 1., Reprinted from AJOG, 209, Clark, et al, Management of Second Stage Guideline, Aug. 2013, with permission from Elsevier
- Cahill, GA, et al. Am J Obstet Gynecol 2012; 207:206
- Three-Tier Fetal Heart Rate Interpretation System Obstet Gynecol 2008;112:665
- Jackson, M., Fequency of fetal heart rate categories and short-term neonatal outcome. Obstet Gynecol Oct 2011;118 803-8
- Ross, M, Labor and fetal heart rate decelerations: Relation to Fetal Metabolic Acidosis. Clinical OBGYN, 2011;52;74-82
- Low JA, et al., Factors associated with motor and cognitive deficits in children after intrapartum fetal hypoxia, AJOG, 1982.
- Low JA, Victory R, Derrick EJ., Predictive value of electronic fetal monitoring for intrapartum fetal asphyxia with metabolic acidosis. OB/Gyn 1999.
- Williams, KP, Galerneau F., AJOG, 2003
- Fleisher A, et al., The Development of fetal acidosis in the presence of an abnormal fetal heart rate tracing. Il the average for gestational age fetus, AJOG, 1982