Management Models

EFM FOR THE EXPERIENCED NURSE

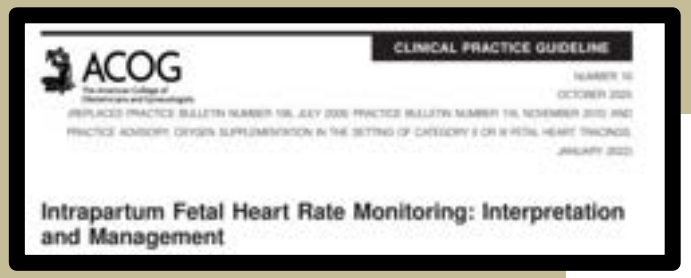

In an Ideal World

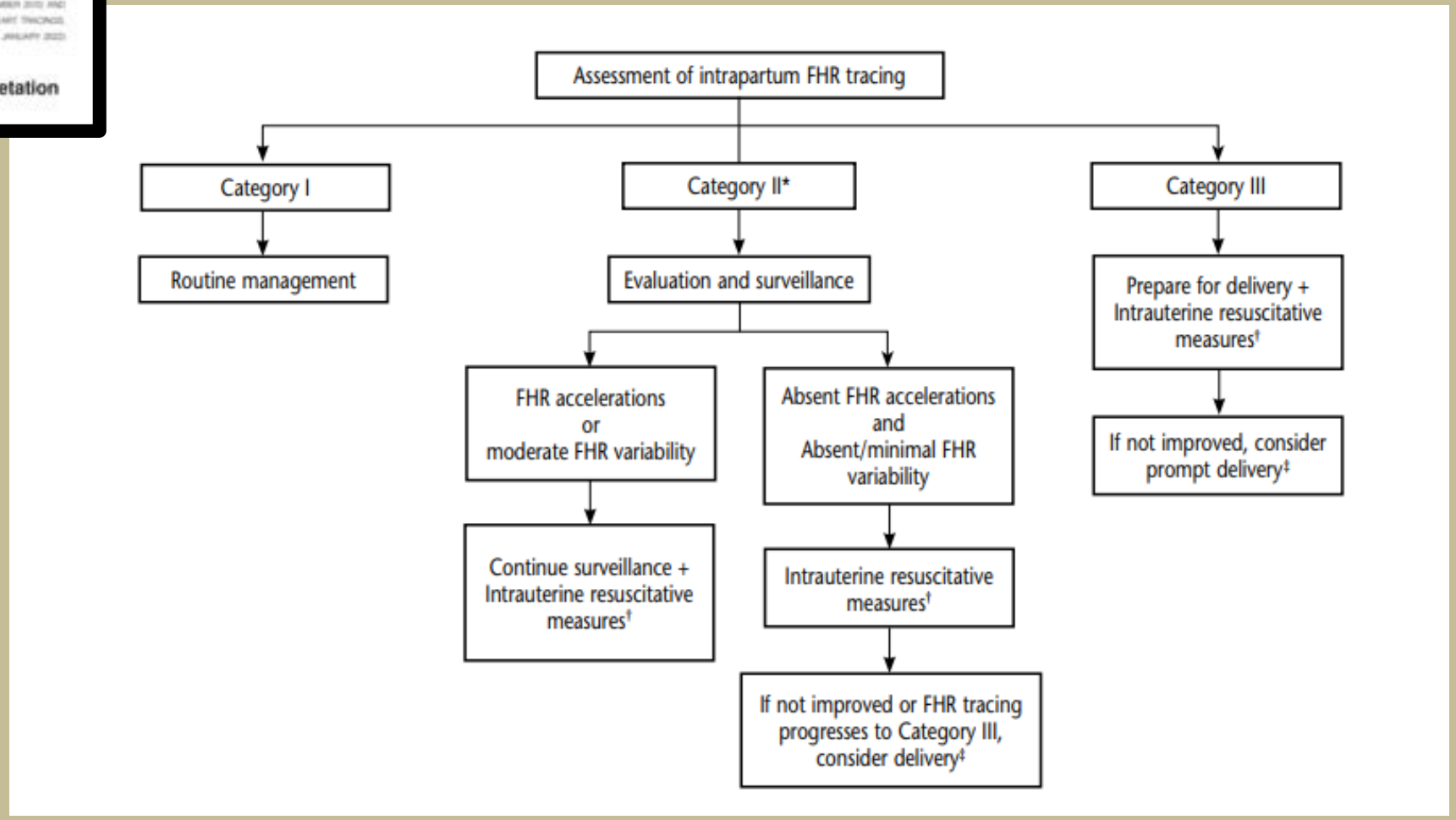
American College of Obstetricians and Gynecologists

Clinical Practice Guideline Number 10

Intrapartum Fetal Heart Rate Monitoring: Interpretation and Management

Replaces Practice Bulletin 116: Management of Intrapartum Fetal Heart Rate Tracings





Management algorithm of intrapartum fetal heart rate (FHR) tracings based on the three-tiered category system. *Given the wide variation of FHR tracings in category II, this algorithm is not meant to represent assessment and management of all potential FHR tracings but to provide an action template for common clinical situations £See Table 2 for a list of various intrauterine resuscitative measures. Timing and mode of delivery based on feasibility and maternal-fetal status.

ACOG INTRAUTERINE MEASURES

Table 2. Potential Interventions Based on Clinical Findings

Finding	Potential Underlying Pathophysiology	Potential Intervention(s)
Fetal heart rate tracing changes associated with maternal hypotension (relative or absolute), commonly seen in the setting of regional anesthesia	Relative hypoperfusion of the placenta	• Maternal IV fluid bolus*,[a] • Administration of IV vasopressor medication[a] • Maternal position changes[a,b,c] • Reduction of basal epidural analgesia infusion rate (if recurrent hypotension noted)[a]
Intermittent or recurrent late decelerations without maternal hypotension	Uteroplacental insufficiency due either to impaired uterine perfusion or increased placental resistance	• Maternal IV fluid bolus*,[d] • Maternal position changes[b,c] • Reduction or cessation of induction or augmentation agents[e]
Intermittent or recurrent variable decelerations	Umbilical cord compression	• Maternal position changes[b,c] • Amnioinfusion*,[f]
Fetal tachycardia	Maternal comorbidities such as infection (including intrapartum intraamniotic infection), hyperthyroidism, dehydration, diabetic ketoacidosis	• Evaluation for and treatment of underlying maternal comorbidity, as applicable[l]
Absent or persistent minimal variability without decelerations	Fetal sleep cycle Medication effect Maternal dehydration Maternal acidemia Fetal acidemia	• Attempt to elicit reassuring findings with vibroacoustic or scalp stimulation[f,g,h,i,j] • Maternal IV fluid bolus*,[f] • Evaluation for and treatment of underlying cause, as applicable[l]
Uterine tachysystole associated with fetal heart rate changes	Relative vasoconstriction of uterine spiral arteries	• Reduction or cessation of induction or augmentation agents[e] • Maternal IV fluid bolus*,[d] • Short acting uterine relaxation agent (eg, terbutaline)[k]

ACOG INTRAUTERINE MEASURES Continued

Table 2. Potential Interventions Based on Clinical Findings (*continued*)

Finding	Potential Underlying Pathophysiology	Potential Intervention(s)
Recurrent decelerations associated with maternal expulsive efforts in the second stage of labor	Relative temporal hypoperfusion of uterine spiral arteries; Cord or head compression	• Modification of cadence of maternal expulsive efforts (eg, pushing every other contraction)† • Modification of maternal position† • Evaluation for operative vaginal delivery†

Data from:

a. Chooi C, Cox JJ, Lumb RS, Middleton P, Chemali M, Emmett RS, et al. Techniques for preventing hypotension during spinal anaesthesia for caesarean section. The Cochrane Database of Systematic Reviews 2020, Issue 7. Art. No.: CD002251. doi: 10.1002/14651858.cd002251.pub4.

b. Carbonne B, Benachi A, Lévèque ML, Cabrol D, Papiernik E. Maternal position during labor: effects on fetal oxygen saturation measured by pulse oximetry. Obstet Gynecol 1996;88:797–800. doi: 10.1016/0029-7844(9600298-0).

c. Abitbol MM. Supine position in labor and associated fetal heart rate changes. Obstet Gynecol 1985;65:481–6.

d. Simpson KR, James DC. Efficacy of intrauterine resuscitation techniques in improving fetal oxygen status during labor. Obstet Gynecol 2005;105:1362–8. doi: 10.1097/01.AOG.0000164474.03350.7c.

e. Simpson KR, James DC. Effects of oxytocin-induced uterine hyperstimulation during labor on fetal oxygen status and fetal heart rate patterns. Am J Obstet Gynecol 2008;199:34.e1–5. doi: 10.1016/j.ajog.2007.12.015.

f. Hofmeyr GJ, Lawrie TA. Amnioinfusion for potential or suspected umbilical cord compression in labour. The Cochrane Database of Systematic Reviews 2012, Issue 1. Art. No.: CD000013. DOI: 10.1002/14651858.CD000013.pub2.

g. Tejani N, Mann LI, Bhakthavathsalan A, Weiss RR. Correlation of fetal heart rate-uterine contraction patterns with fetal scalp blood pH. Obstet Gynecol 1975;46:392–6.

h. Krebs HB, Petres RE, Dunn LJ, Smith PJ. Intrapartum fetal heart rate monitoring. VI. Prognostic significance of accelerations. Am J Obstet Gynecol 1982;142:297–305. doi: 10.1016/0002-9378(8290734-7).

i. Murphy DJ, Devane D, Molloy E, Shahabuddin Y. Fetal scalp stimulation for assessing fetal well-being during labour. The Cochrane Database Syst Rev 2023;1:CD013808.

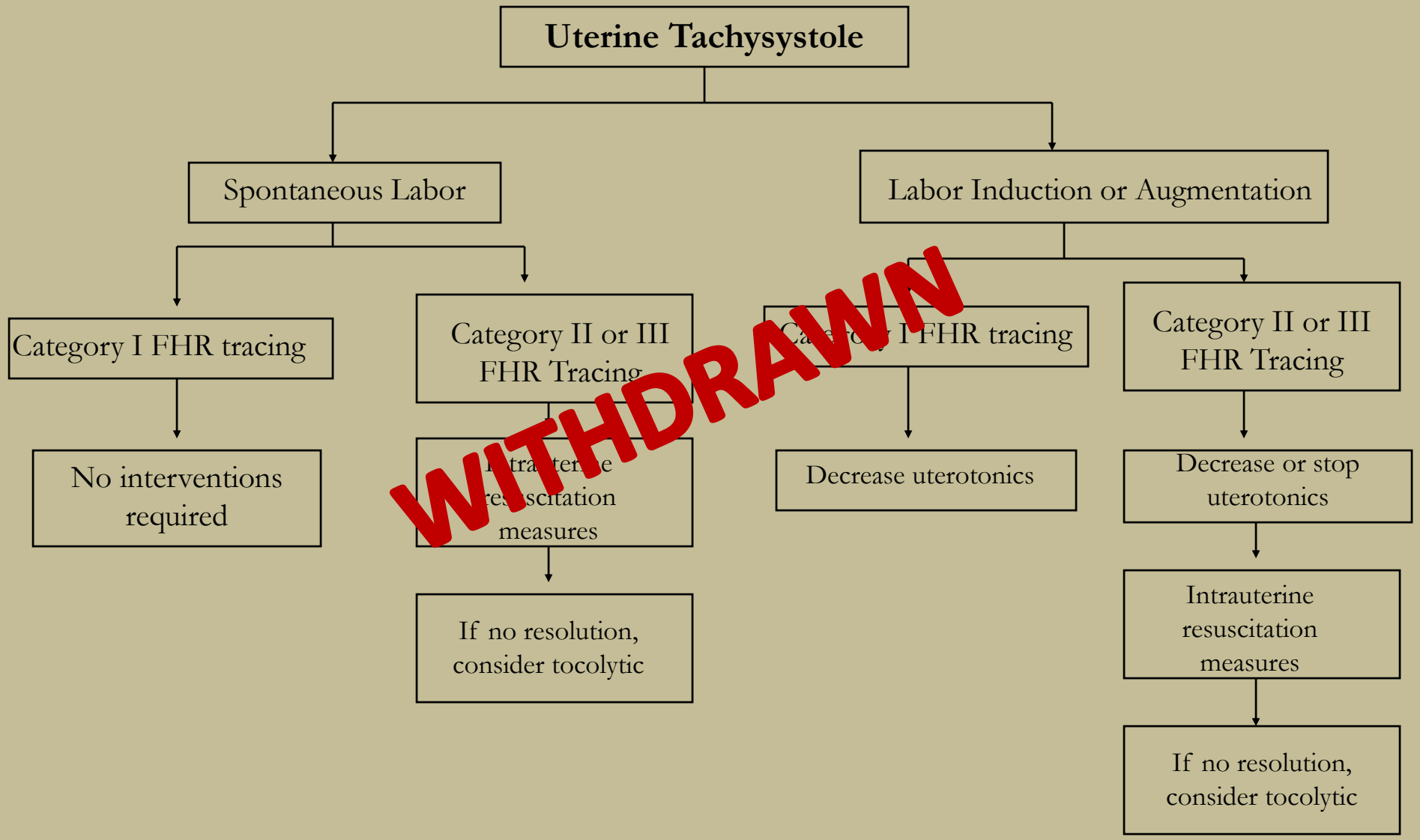
j. East CE, Smyth RM, Leader LR, Henshall NE, Colditz PB, Lau R, et al. Vibroacoustic stimulation for fetal assessment in labour in the presence of a nonreassuring fetal heart rate trace. The Cochrane Database of Systematic Reviews 2013, Issue 1. Art. No.: CD004664. doi: 10.1002/14651858.CD004664.pub3.

k. Xodo S, de Heus R, Berghella V, Londero AP. Acute tocolysis for intrapartum nonreassuring fetal status: how often does it prevent cesarean delivery? A systematic review and meta-analysis of randomized controlled trials. Am J Obstet Gynecol MFM 2022;4:100639. doi: 10.1016/j.ajogmf.2022.100639.

*With caution to avoid fluid volume overload.

†Expert opinion or best practice in the absence of quality data.

Uterine Tachysystole
ACOG 2010

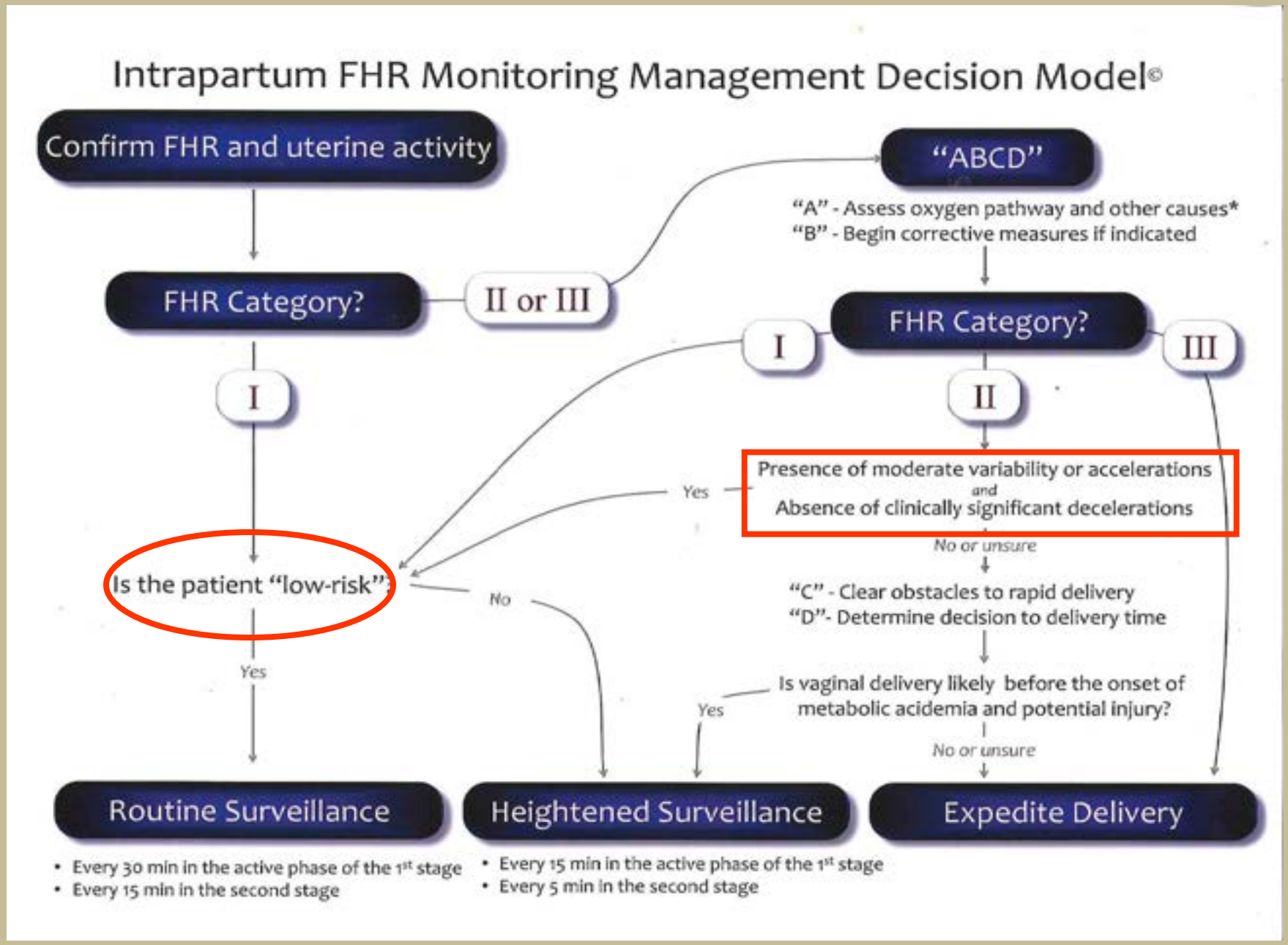


David Miller's 2012 Model

- (previously published in 2010 Contemporary OB/GYN and in 2009 Tucker, Miller, and Miller Fetal Monitoring Text and currently found in Miller, Miller and Tucker (2013) Multidisciplinary Fetal Monitoring Text

Miller's Management Model (2012)

- Structured approach that creates a shared mental model
- Provides a framework for the team to apply and articulate a plan of management



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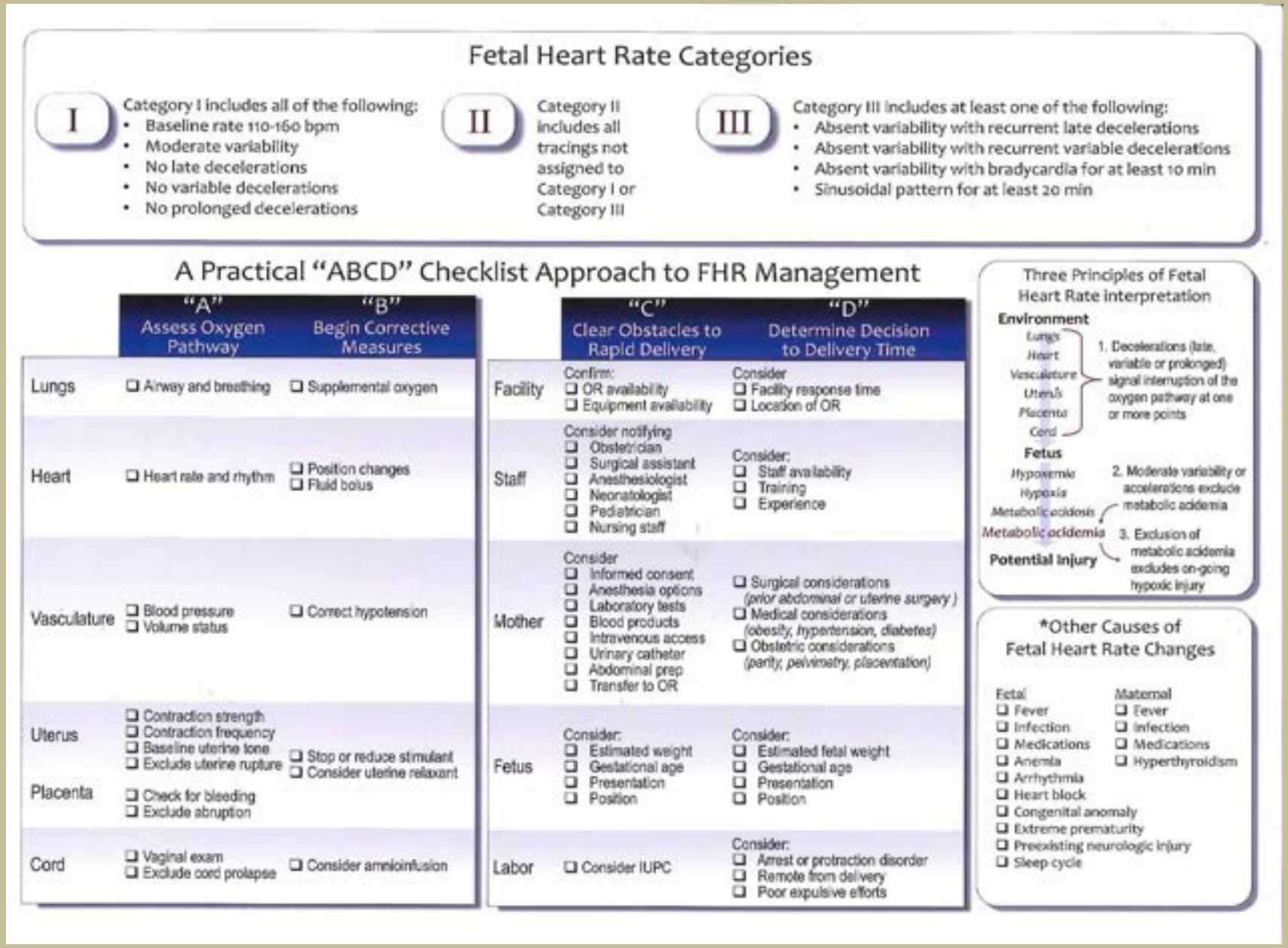
14th Annual National Conference on Fetal Monitoring Maternal-Fetal Assessment and Interventions



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Key Points

- Application of the model still requires clinical judgment
- In general, metabolic acidemia does not appear suddenly but can evolve gradually over a period of about 60 minutes
  - This only applies to normal FHR tracings that go on to develop minimal-absent variability and recurrent decelerations with no acute events
    - Parer et al (2018), p. 137

Miller & Miller (2022)

- “If a decision is made to expedite delivery, the rationale should be documented, and the plan implemented.”
- “If a decision is made to continue wait for vaginal delivery , the rationale and the plan should be documented, and the decision should be revisited after a reasonable period of time.”
- *“It is critical to recognize both medically and legally “deciding to wait” is distinctly different from waiting to decide”.*
    - Miller, Miller, & Cypher (2022), pp. 157-159

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 Miller, MD
- Kathleen R. Simpson, RN, PhD
- Michael A. Belfort, MD
- Gary A. Dildy, MD
- Julian 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 Miller, CNM, JD
- Gary D. V. Hankins, MD

American Journal of Obstetrics and Gynecology (August 2013)
209(2), pp. 89-97.

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

AUGUST 2013 American Journal of Obstetrics & Gynecology

Category II Tracings

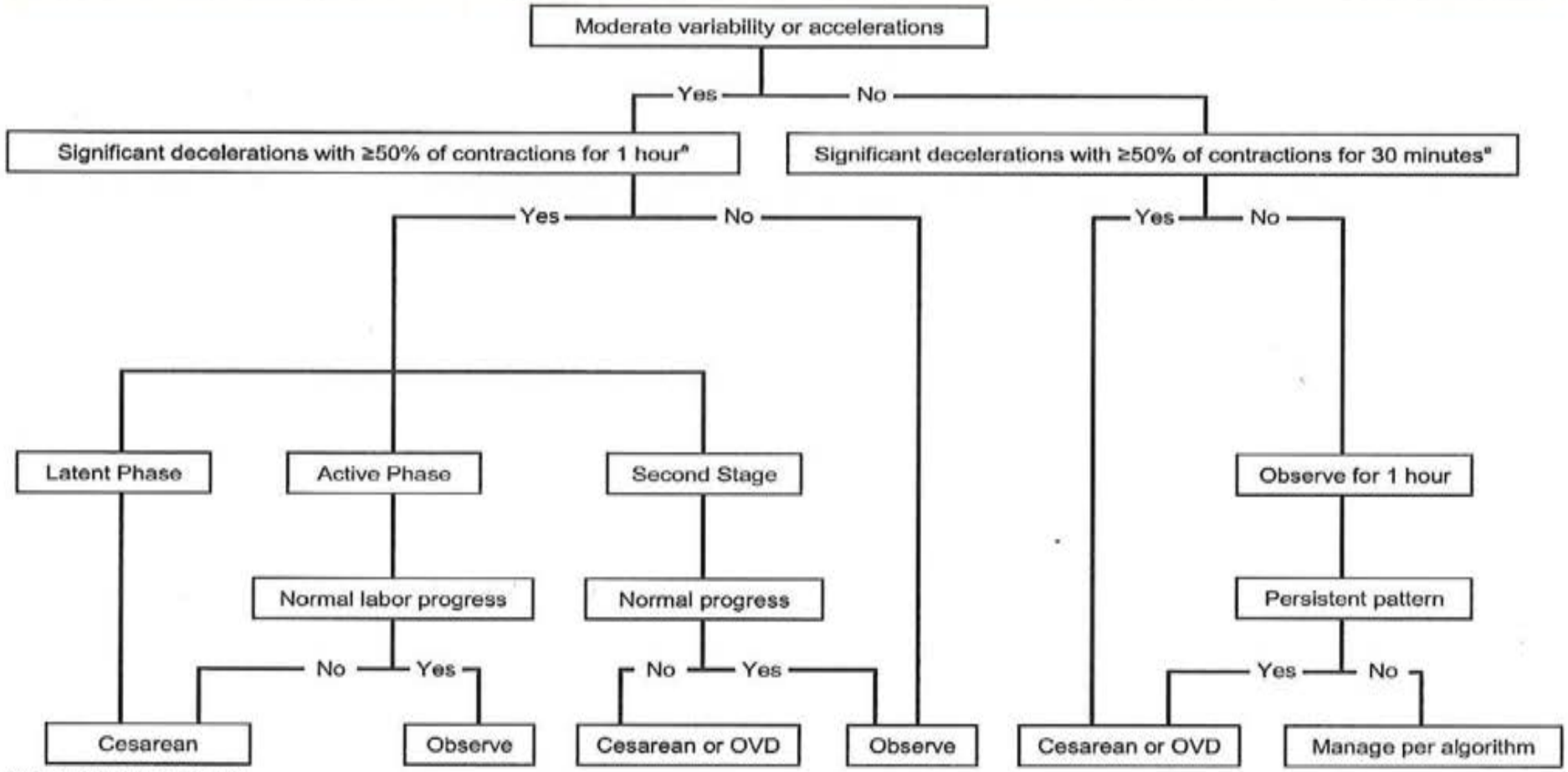
- At least 80% or more of tracings fall in category II
- Wide variety of patterns some of which are more concerning than others…
- Includes some fetuses who are potentially at risk but are not acidemic or have not yet developed a degree of hypoxia/acidemia that would result in neonatal encephalopathy
- Goal is to deliver the fetus, when possible, before the development of damaging degrees of hypoxia/acidemia
    - Clark, et al (2013, p. 91)

Initial Assessment
Category II Tracing

- “There is a great distinction to be made between a patient who initially presents with an abnormal FHR pattern and one who develops an abnormal fetal heart rate pattern during labor”
- A category II FHR pattern lasing ≥ 60minutes or more that was identified on initial presentation with persistently minimal or absent variability and lacking accelerations even in the absence of decelerations is suggestive of a previously compromised or injured fetus
    - ACOG & AAP (2014)

FIGURE 1

Algorithm for management of category II fetal heart rate tracings



OVD, operative vaginal delivery.

[a]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.

Clark, S. L., et al. (2013) . Intrapartum management of category II fetal heart rate tracings: towards standardization of care. *American Journal of Obstetrics and Gynecology*, 209(2), p. 90; used with permission

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.

Clark, S. L., et al. (2013) . Intrapartum management of category II fetal heart rate tracings: towards standardization of care. *American Journal of Obstetrics and Gynecology,* 209(2), p. 91; used with permission

Minimal or Absent Variability…

- Even experts don't always agree on whether the variability is minimal or absent
    - Blackwell, et al. (2011)
- According to Miller, Miller and Cypher (2027- page 114)
    - "The specific relationship among minimal variability , fetal oxygenation, and fetal metabolic acidemia is not know, primarily because the literature has not consistently distinguished between minimal variability and absent variability. In the setting of persistently minimal variability without accelerations or moderate variability, the FHR tracing alone cannot reliably exclude metabolic acidemia. "
- This algorithm uses moderate variability for defining the reassuring feature of the algorithm
    - So that it leans toward the side of safety
        - Directed toward the least, not the greatest level of user competence
            - Clark et al (2013, p. 95)

Key Points Regarding this Model

- Fetal tachycardia or marked variability are not included in the algorithm for intervention
  - This does not mean the patterns are innocuous
  - However, the authors state that they would expect other concerning patterns included in the algorithm to appear along with these patterns prior to the need for intervention

Key Points Continued

- This document is a delivery decision making model for care providers aimed at establishing a shared medical model
  - Physicians/Nurse Midwives
- The use of the algorithm ***has not been*** evaluated for statistical significance
- Clinical judgment is necessary
  - Ex: If an abruption or uterine rupture is suspected, the algorithm does not apply
- Prolonged decelerations not addressed by algorithm due to wide variety of potential causes
- Decision-making depends upon possible cause (ex: hypotension from an epidural versus a ruptured uterus)

A Standardized Approach for Category II Fetal Heart Rate with Significant Decelerations: Maternal and Neonatal Outcomes

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Am J Perinatol 2018;35:1405–1410.

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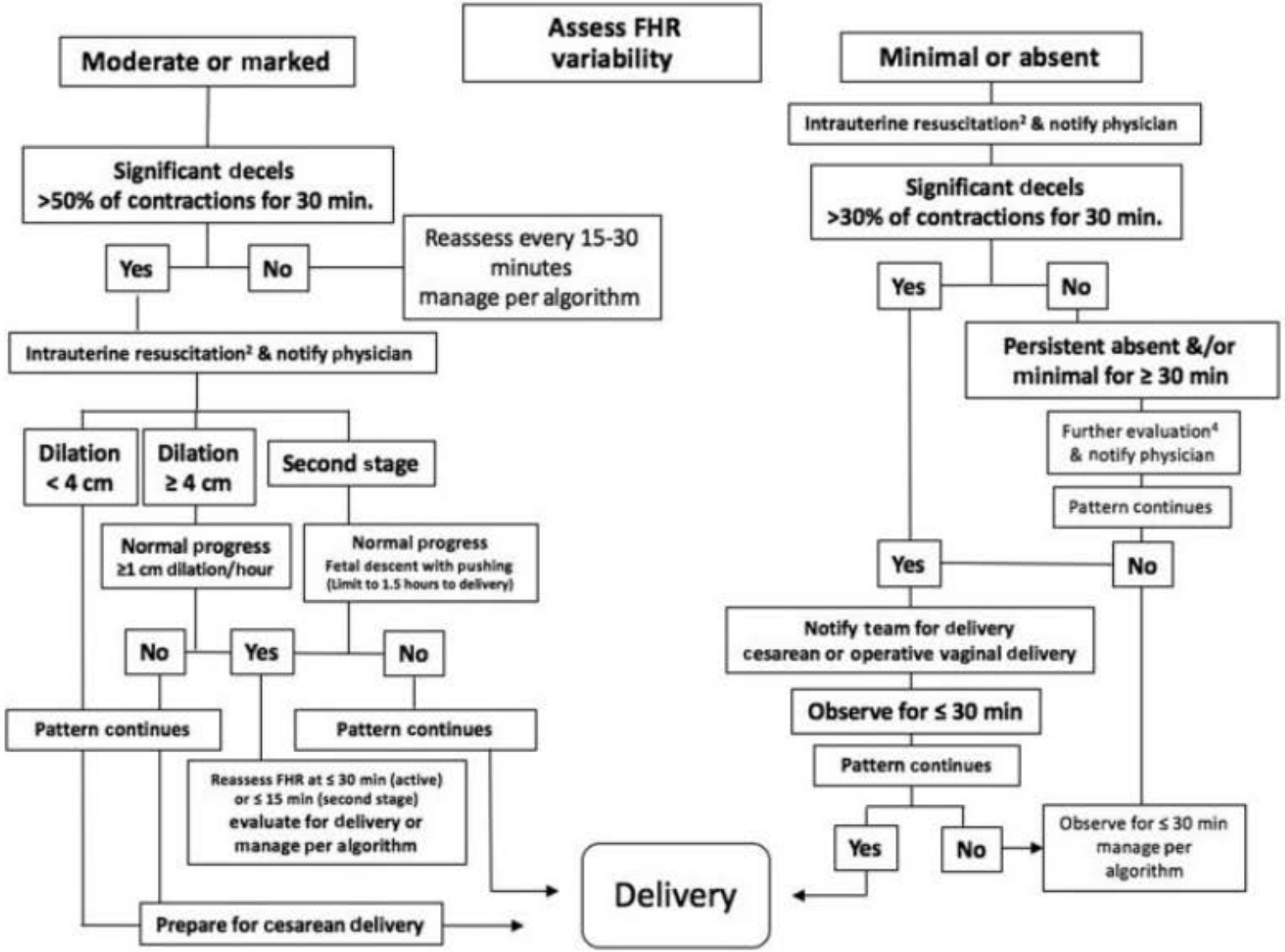


Fig. 1 Management outline for patients with Category II fetal heart rates associated with "significant decelerations" and normal fetal heart rate variability (moderate or marked) and abnormal variability (minimal or absent). FHR, fetal heart rate. Notes: 1. Resuscitative Measures may include: repositioning, O_2 (10L via mask), IV bolus, correction of hypotension. 2. Additional Interventions: consider amnioinfusion for variable decels. 3. Scalp stimulation and/or vibroacoustic stimulation.

A Standardized Approach for Category II Fetal Heart Rate with Significant Decelerations: Maternal and Neonatal Outcomes

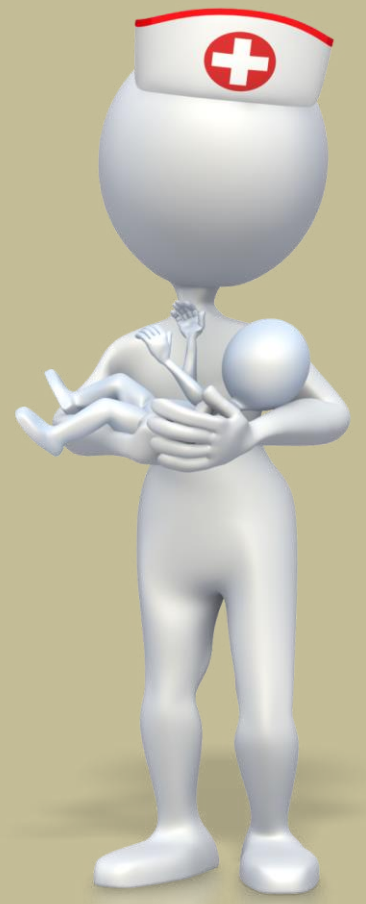
Shields, et. al.

Strength of This Study

- Decrease n the rate of primary cesarean birth was statistically significate (19.8% to 18.3%) in the group that utilized the algorithm
- Use of the algorithm was associated with a significant reduction in low 5-minute Apgars (from 2.3% to 1.7%)
- Use of the algorithm reported a significant reduction (1.6% to 1.2%) in severe newborn complications (respiratory, birth trauma, sepsis, neonatal shock and or injury)
- 23 hospitals who did not use the algorithm had no reduction in low 5-minute Apgar scores or neonatal complications. They did see a reduction in Cesarean Section rates from 19% to 18.2%
- Authors recommend replication of the study
    - Miller, Miller &Cypher (2022) pgs. 158-159

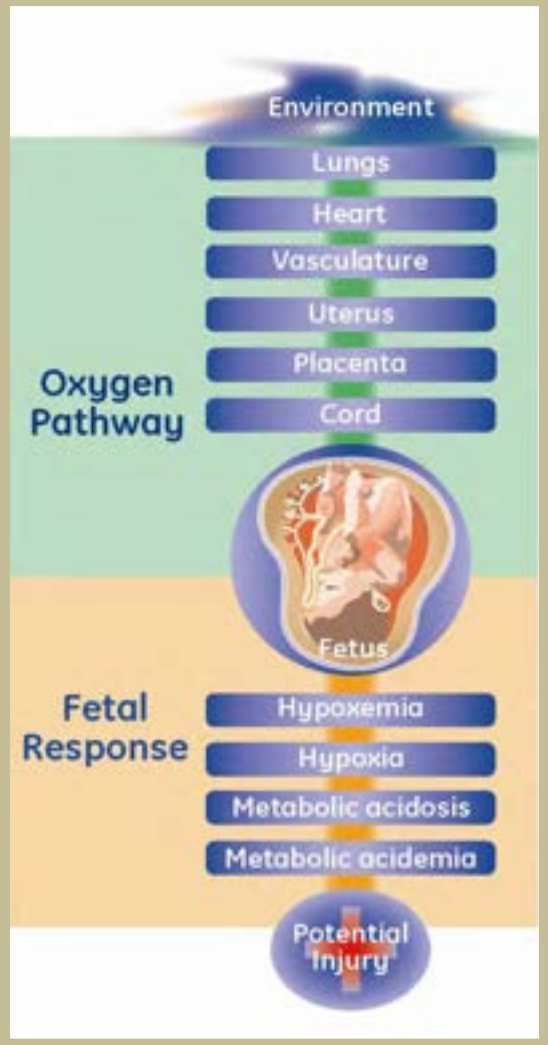
Nursing Role For Management Models and Algorhythm(s)

- Be aware of the different management models and algorhythm(s)
- Share management models and algorhythm(s) with care providers and colleagues to explain your concerns or management of the patient's labor
- Utilize management models and algorhythm(s) to facilitate communication with the care provider regarding the patient's plan of care or changes in the patient's plan of care
- Anticipate possible changes in the patient's plan of care



Look for signs of fetal oxygenation!
Consider the whole clinical picture!

Think Fetal Oxygenation



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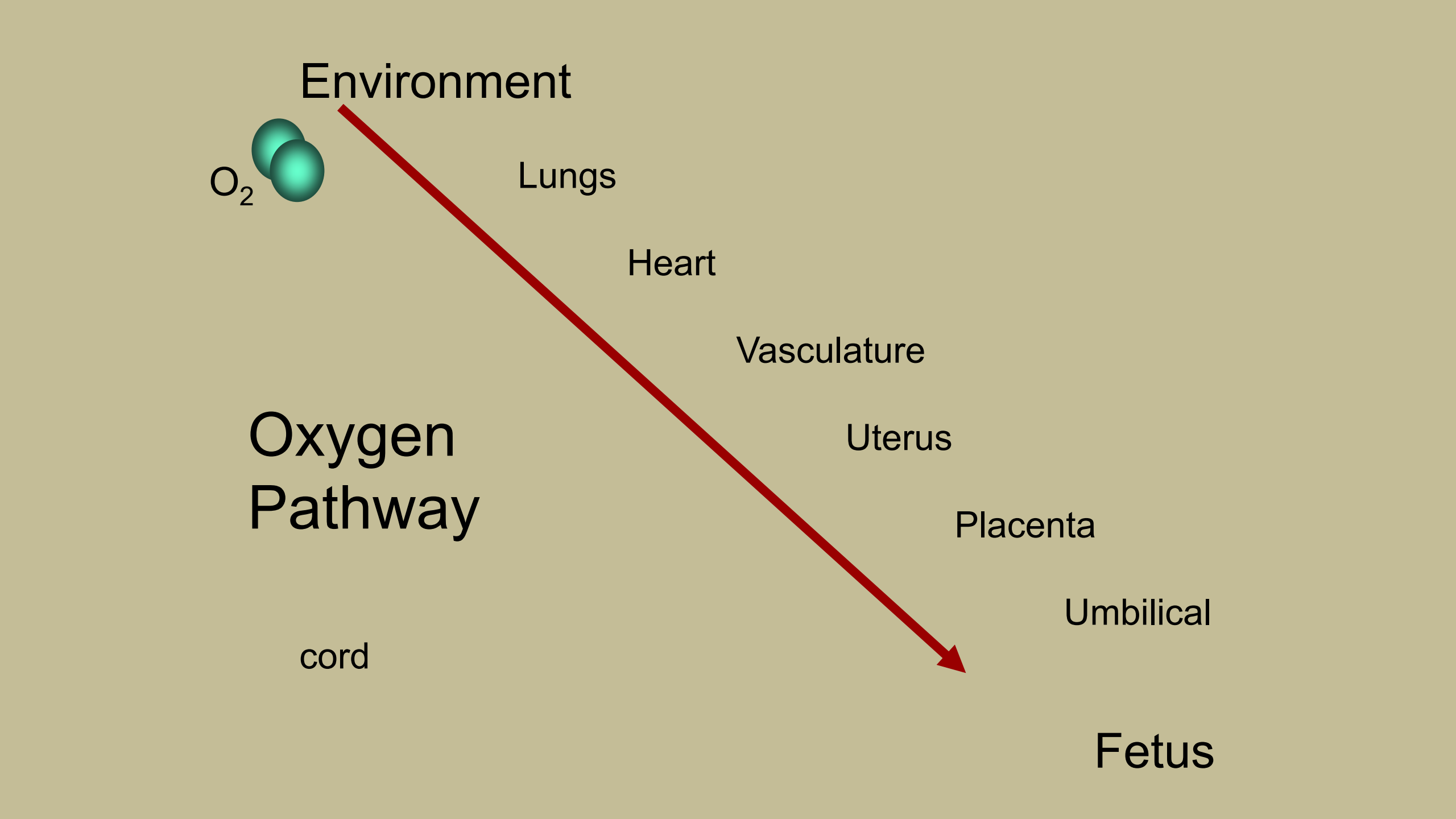

Oxygen Pathway

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