195 Accuracy of growth restriction diagnosis_implications for testing and intervention

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OBJECTIVE: The diagnosis of small for gestational age (SGA) fetal growth impacts antenatal management and decision-making. Fetuses with SGA growth undergo heightened surveillance with antenatal testing as well as planned deliveries between 37-39 weeks to avert the risk for stillbirth. The goal of this study was to examine accuracy of antenatal diagnosis of SGA fetal growth by ultrasound (US) compared to actual birth weight in term fetuses.

STUDY DESIGN: This is a prospective cohort study of all consecutive singleton term deliveries from a single institution from 2010-2014. Estimated fetal weight (EFW) by US obtained within 4 weeks of delivery was classified into <10%ile, <5%ile, and <3%ile by Hadlock 4. Sensitivity, specificity, positive and negative predictive values for the performance of antenatal US classification as <10th, 5th, or 3rd percentiles were compared to the same classification using actual birth weight.

RESULTS: A total of 1,733 fetuses had US EFW available within 4 weeks of delivery. Sensitivity, specificity, and predictive values for each category of antenatal SGA are presented in the Table. Sensitivity of US classification as <10%ile was 81% and specificity was 75%. PPV for antenatal US classification as <10%ile was only 52% corresponding to a 48% rate of misdiagnosing a fetus as SGA with birth weight that is normal (false positive). Conversely the negative predictive value of US EFW <10%ile was 92% corresponding to an 8% risk for misdiagnosing a fetus as appropriately grown antenatally with birth weight actually being less than the 10%ile (false negative). Sensitivity decreases with decreasing EFW percentiles.

CONCLUSION: Antenatal ultrasound classification of SGA <10th, <5th, and <3rd in term fetuses correctly classifies between 72-81% of fetuses with true SGA growth. The low positive predictive values among women undergoing late third trimester ultrasound suggest that US is most likely to over diagnose SGA in normal near-term and term fetuses. Increased antenatal testing and possible iatrogenic prematurity needs to be considered clinically given that almost half of the infants that carry a diagnosis of SGA at term are born AGA.

196 Does the relative efficacy of chlorhexidine-alcohol versus iodine-alcohol antisepsis differ between unscheduled and scheduled cesareans?

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OBJECTIVE: Scheduled and unscheduled cesareans may be at different risks for surgical site infection (SSI). We tested the hypothesis that chlorhexidine-alcohol and iodine-alcohol skin antisepsis are differentially effective for preventing SSI at unscheduled compared with scheduled cesarean.

STUDY DESIGN: This was a planned secondary analysis of a randomized trial in which pregnant women undergoing cesarean were randomly assigned to preoperative skin preparation with either chlorhexidine-alcohol or iodine-alcohol. The comparison groups were scheduled (planned, mostly without labor) and unscheduled (unplanned, mostly during labor) cesareans. The primary outcome was SSI within 30 days after cesarean based on the Centers for Disease Control Nosocomial Infections Surveillance System definitions. Outcomes were compared between the two groups, and the Mantel-Hansel test of homogeneity was used to test for interaction between antiseptic type and scheduled/unscheduled cesareans.

RESULTS: Of 1082 subjects included in the intention-to-treat analysis, 640 (59.1%) were scheduled and 442 (40.9%) were unscheduled. The overall risk for SSI was significantly higher in unscheduled compared with scheduled cesareans (8.1% vs 4.5%, RR 1.80, 95%CI 1.12, 2.89). Chlorhexidine-alcohol was more protective than iodine-alcohol in scheduled (2.5% vs 6.5%, RR 0.38 95%CI 0.17, 0.85) and unscheduled cesareans (6.9% vs 9.4%, RR 0.73, 95%CI 0.39, 1.37), although the difference among unscheduled cesareans was not statistically significant (Table). The test of homogeneity (P=0.22) suggested comparable efficacy of chlorhexidine-alcohol in unscheduled and scheduled cesareans.

CONCLUSION: Unscheduled cesarean is associated with a nearly two-fold higher risk for SSI compared with scheduled cesarean. Chlorhexidine-alcohol appears superior to iodine-alcohol for prevention of SSI in both types of cesarean. Our results suggest that chlorhexidine-alcohol should be the antiseptic of choice at both scheduled and unscheduled cesarean. (ClinicalTrials.gov: NCT01472549)

Table: Relative efficacy of chlorhexidine–alcohol versus iodine–alcohol in preventing surgical site infection in scheduled and unscheduled cesareans.

	Chlorhexidine-alcohol n (%)	Iodine-alcohol n (%)	Relative Risk (95% CI)	Test of homogeneity P-value
All cesareans (N=1082)	23 (4.3)	42 (7.7)	0.55 (0.34 - 0.91)	-
Scheduled cesareans (n=640)	8 (2.5)	21 (6.5)	0.38 (0.17 – 0.85)	0.22
Unscheduled cesareans (n=442)	15 (6.9)	21 (9.4)	0.73 (0.39 - 1.37)	

197 Early intrapartum fetal heart rate patterns and neonatal outcomes in nulliparas

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OBJECTIVE: To determine the association between various fetal heart rate (FHR) patterns identified in early labor and neonatal outcome.

STUDY DESIGN: This is a secondary analysis of data from 5341 nulliparous women randomized to "open" or "masked" intrapartum fetal pulse oximetry. Laboring nulliparas with a singleton, cephalic, living fetus at or beyond 36 weeks of gestation and with cervical dilatation between 2 cm and 6 cm were eligible for randomization. Fetal heart rate tracing collected before randomization were reviewed and the presence or absence of 11 patterns (Table 1) was documented. Intrapartum management was at the discretion of the attending physician and a research nurse was present to confirm the indication for cesarean delivery, and to evaluate the newborn. Primary neonatal composite outcomes are listed (Table 1).

RESULTS: 2130 of 5305 (40%) women included in this analysis had one or more of the 11 FHR patterns prior to randomization and 91 (4.3%) of their neonates had a primary outcome as compared to 107 neonates in the 3175 women with none of the FHR patterns (3.4%). Univariate associations of the 11 FHR patterns with the primary outcome are shown in Table 1. Women with 3 or more of these 11 patterns (n=157) had a low but significant increase in the primary outcome (OR 1.95; 95 CI 1.00, 3.81; p=0.05). Based on the OR and significance values (data in Table 1), the 11 patterns were categorized into Group A (patterns 1-6) and Group B (patterns 7-11). Group A patterns, but not Group B, were associated with an increased primary outcome as compared with none of these patterns (Table 2).

CONCLUSION: In healthy women at 36 weeks of gestation or later with FHR patterns 1-6 earlier in labor had significantly increased adverse neonatal outcomes compared with those with none of the patterns.

Table 1: FHR patterns in early labor and composite neonatal outcomes.

	FHR Patterns (11 tested)	Composite Neonatal Outcome* (n, %)	OR (95% CI)†	P-value†
	Any (≥1) of 11 FHR patterns (2130)	91 (4.3%)	1.28 (0.96, 1.70)	0.09
1	Severe variable decelerations (183)	13 (7.1%)	2.19 (1.21, 3.98)	0.008
2	Late decelerations (400)	21 (5.3%)	1.59 (0.98, 2.57)	0.06
3	Bradycardia (128)	9 (7.0%)	2.17 (0.94, 4.41)	0.04
4	Poor beat-to-beat variability (132)	8 (6.1%)	1.85 (0.76, 3.89)	0.14
5	Variable decelerations and tachycardia (56)	3 (5.4%)	1.62 (0.32, 5.14)	0.44
6	Recurrent prolonged variable decelerations (67)	6 (9.0%)	2.82 (0.97, 6.70)	0.03
7	Tachycardia (250)	9 (3.6%)	1.07 (0.54, 2.14)	0.85
8	Variable decelerations + poor beat-to-beat variability (41)	2 (4.9%)	1.47 (0.17, 5.81)	0.65
9	Sinusoidal pattern (50)	2 (4.0%)	1.19 (0.14, 4.66)	0.69
10	Variable decelerations >30 minutes (1564)	63 (4.0%)	1.20 (0.88, 1.65)	0.25
11	Increased variability (31)	1 (3.2%)	0.96 (0.02, 5.86)	1.0
	None of the 11 FHR patterns (3175)	107 (3.4%)	1 (Ref)	----
	Cumulative FHR Patterns			
	Only one FHR pattern (1581)	62 (3.9%)	1.17 (0.85, 1.61)	0.33
	Two FHR patterns (392)	19 (4.9%)	1.46 (0.89, 2.41)	0.14
	≥3 FHR patterns (157)	10 (6.4%)	1.95 (1.00, 3.81)	0.05

* The neonatal outcome occurred in 198 patients (3.7%): Apgar at 5 or 10 minutes ≤4 (18), UA pH <7.0 or BD >12 mmol/L (133), HIE (1), resuscitation at birth requiring intubation or chest compressions (37), hypotension in 30 mins of birth (6), seizures (8), CPR or ventilator support in the first 24 hours (13), proven early sepsis (17), NN death (1), pressor support (9), extreme hypotonia (3).

† OR and p-value is comparing those with a specific FHR pattern (or group of patterns) vs. those with none of the listed patterns.

Table 2: FHR groups (A/B) and neonatal outcomes.

	Primary Neonatal Outcome n (%)	OR (95% CI)	P-value
Group A – one pattern (700)	34 (4.9%)	1.46 (0.99, 2.17)	0.06
Group A – two or more patterns (122)	10 (8.2%)	2.56 (1.30, 5.03)	0.006
Group B – one pattern (1254)	46 (3.7%)	1.09 (0.77, 1.55)	0.62
Group B – two or more patterns (54)	1 (1.9%)	0.54 (0.07, 3.95)	0.54
No FHR pattern [referent group] (3175)	107 (3.4%)	1.0 (Ref)	

198 Application of fetal heart rate (FHR) algorithms to predict acidemia at birth

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OBJECTIVE: To compare published intrapartum FHR monitoring algorithms for the prediction and early identification of fetal acidemia (arterial cord pH <7.1 at birth) and their effect on cesarean delivery (CD).

STUDY DESIGN: Cases and controls were randomly selected from term, singleton deliveries between 2010 and 2014 with ≥2 hours of FHR monitoring and arterial cord blood gas results. Cases had pH <7.10 without a documented unpreventable cause of acidemia such as cord prolapse. We created rules for intervention from each of 3 published FHR interpretation systems (the 3 Tier (3T), 5 Tier (5T) and Clark systems)[references 1-3] that clearly defined when intervention was indicated, based on recommendations by the authors of each algorithm (figure 1). FHR tracings were reviewed in their entirety in 30-minute intervals by 10 NCC-certified MFM physicians or fellows who were blinded to the outcome. Sensitivity, specificity, false positive and false negative rates were calculated for each algorithm as well as the number of additional CDs that would be expected.

RESULTS: 265 tracings were reviewed. There were 41 cases (15.5%) with a pH <7.1 and 224 (84.5%) with a pH ≥7.1. Figure 2 shows the sensitivity, specificity, false positive and false negative rate for each algorithm. The algorithm recommended early intervention (≥30 minutes prior to actual delivery) in 4/10 cases identified by the 5T system and in 5/9 cases identified by the Clark algorithm. Application of the 5T algorithm would have resulted in 17 additional CDs (increase of 6.4%) while the Clark algorithm would have resulted in 24 additional CDs (increase of 9%).

CONCLUSION: The 3T system does not effectively identify fetal acidemia. The 5T and Clark algorithms perform poorly in identifying fetal acidemia at birth, with detection rates of only 24% and 22%, respectively. Use of either system would result in 4 to 5 additional CD for every case of early detection. Improved methods of predicting fetal acidemia are needed.
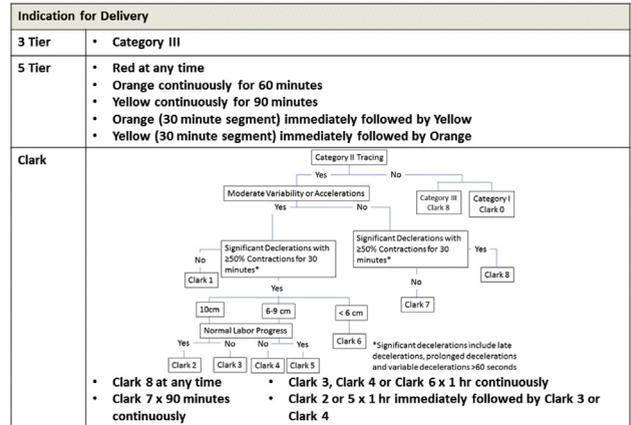
Figure 1: Algorithms for Intervention

Figure 2: Sensitivity and Specificity of 3-Tier, 5-Tier and Clark Algorithms for Fetal Acidemia

3 Tier[1]	pH <7.1 (N=41)	pH≥7.1 (N=224)
Intervention Indicated	1	0
No Intervention	40	224

Sensitivity: 0.02   False Positive Rate: 0
Specificity: 1   False Negative Rate: 0.98

5 Tier[2]	pH <7.1 (N=41)	pH≥7.1 (N=224)
Intervention Indicated	10	37
No Intervention	31	187

Sensitivity: 0.24   False Positive Rate: 0.17
Specificity: 0.83   False Negative Rate: 0.76

Clark[3]	pH <7.1 (N=41)	pH≥7.1 (N=224)
Intervention Indicated	9	54
No Intervention	32	170

Sensitivity: 0.22   False Positive Rate: 0.24
Specificity: 0.76   False Negative Rate: 0.78

References:
1. Intrapartum fetal heart rate monitoring: nomenclature, interpretation, and general management principles. ACOG Practice Bulletin No. 106. American College of Obstetricians and Gynecologists. Obstet Gynecol 2009;114:192-202.
2. Parer JT, Ikeda T. A framework for standardized management of intrapartum fetal heart rate patterns. Am J Obstet Gynecol 2007;197:26.e1-26.e6.
3. Clark SL, Nageotte MP, Garite TJ et al. Intrapartum management of category II fetal heart rate tracings: towards standardization of care. Am J Obstet Gynecol 2013;209(2):89-97.

199 Withdrawn

200 Delayed pushing is associated with increased frequency of cesarean delivery and NICU admission

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OBJECTIVE: To examine the relationship between delayed pushing and perinatal outcomes in nulliparas with singleton term gestations.

STUDY DESIGN: Cohort study of data from deliveries at 25 U.S. hospitals from 2008-2011. Nulliparous women with singleton, cephalic, term births who achieved 10 cm cervical dilation were included for analysis. Women in whom pushing was delayed by ≥60 minutes (delayed group) were compared to those who initiated pushing within 30 minutes (early group). Multivariable regression analyses were used to assess the independent association of delayed pushing with mode of delivery, length of second stage and other maternal and perinatal outcomes.

RESULTS: Of 21,034 analyzable women, pushing was delayed in 18.4% (N=3870). Women who were older, privately insured, or