Antepartum and intrapartum risk factors for the prediction of NNU admission

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Objective
Studies have been conducted to determine the antepartum correlations with neonatal intensive care unit (NICU) admission. However, to date, there are no studies that combine both antepartum and intra-partum factors to predict NICU admission. The purpose of this study was to determine antepartum and intra-partum factors that are associated with admission to NICU among infants delivered between 34.0-42.0 weeks at our institution.

Methods
Medical records from November 2014 to January 2015 were retrospectively reviewed. For this pilot study, 100 consecutive NICU admissions and 100 consecutive non-NICU admissions were included. Exclusion criteria included non-singleton gestations, infants delivered before 34 weeks, stillbirths, and congenital fetal anomalies. Data on demographical, antepartum, intra-partum and neonatal factors were collected. Demographic data included maternal age, BMI, race, and insurance status. Antepartum factors included parity, history of preterm births, history of cesarean deliveries, maternal comorbidities, and use of antenatal corticosteroids. The intra-partum factors assessed included gestational age at delivery, induction of labor, augmentation of labor with oxytocin or artificial rupture of membranes, scheduled cesarean delivery, admitting diagnoses, pain management (meperidine, epidural), length of stages of labor, length of membrane rupture, and mode of delivery. The presence of maternal fever, nuchal cord and/or meconium and fetal heart tracing characteristics were also evaluated. Neonatal characteristics assessed included birth weight, sex, and Apgar scores. The primary endpoint was defined as admission to NICU. Statistical analysis was carried out using IBM SPSS 22.0. Univariate analysis for continuous variables were compared using the Student’s t test or Mann-Whitney U test. Categorical data was compared using Chi-squared test or Fisher’s exact tests. A p value of <0.05 was considered statistically significant. Variables that were statistically significant on univariate analysis were tested for interaction of terms. Non-redundant variables were entered into multivariable logistic regression models to test for adjusted associations.

Results
Demographics were similar for age, BMI, and insurance status with non-significant differences. Compared with non-NICU admission, those with a significantly higher risk of NICU admission underwent induction of labor (8% vs. 21%, p < 0.03) or scheduled cesarean delivery (13% vs 26%, p = 0.02). Decreasing length of first stage (530 vs 299 minutes (min), p < 0.01) and increasing length of second stage of labor (251 vs 330 min, p < 0.01) was associated with an increased chance of NICU admission. Intra-partum factors predictive of NICU admission included presence of preterm labor (11% vs 25%, p < 0.02), maternal fever (7% vs 28%, p < 0.04), presence of nuchal cord (3% vs 27%, p < 0.02), late decelerations (2% vs 14%, p < 0.02), fetal tachycardia (0% vs 7%, p < 0.01) and cesarean delivery (37% vs. 60%, p < 0.05). Protective factors included admitting diagnosis of active labor (28% vs 52%, p < 0.02) and vaginal delivery (62% vs 40%, p < 0.02). Factors that did not reach statistical significance included maternal hypertensive disorders, glucose intolerance, thromboembolic disorders, length of membrane rupture, labor augmentation with oxytocin, artificial rupture of membranes, use of meperidine and/or Category II tracing. Neonatal factors including birth weight, 5 min Apgar score and male sex did not reach statistical significance. After multivariable logistic regression analysis, gestational age at delivery, vaginal delivery, induction of labor, length of first stage of labor, and presence of maternal fever retained statistical significance.

Conclusion
Identification of modifiable risk factors can reduce neonatal morbidity and mortality. Results from this study can be used to develop and validate a risk model based on combined antepartum and intra-partum risk factors. This may improve neonatal outcomes after delivery and possibly reduce costs associated with long-term NICU admissions.