

# A Risk Calculator to Predict the Need for Maternal or Neonatal Hospital-Based Peripartum Intervention: Modelling National Surveillance Data

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## Abstract

Objective: Given growing interest in alternatives to hospital birth, particularly given the COVID-19 pandemic, we developed a peripartum intervention risk calculator (PIRC) to estimate maternal and neonatal risk of requiring hospital-based peripartum intervention. Design: National cohort study. Setting: United States. Sample: Hospital births captured by the Pregnancy Risk Assessment Monitoring System from 2009-2018. Methods: The cohort was stratified by receipt of hospital-based interventions, defined as: 1) operative vaginal delivery (forceps or vacuum), 2) cesarean delivery, or 3) requiring neonatal intensive care unit admission. Gravidas with prior cesarean delivery or fetal malformation were excluded. Main Outcome Measures: Risk of requiring hospital-based intervention. Results: A total of 63,234 births were evaluated (72.6% full-term, 48.5% nulliparous) including 37.9% who received one or more hospital-based interventions. Gestational age was the most predictive factor of requiring hospital-based intervention, with lowest odds at 400/7-406/7 weeks. Previous live births (Ref: none; 1, OR 0.41; 2, OR 0.35; [?]3, OR 0.29;  $p < 0.05$  for all) were protective. Other predictors included advanced maternal age, high pre-pregnancy body mass index, maternal diabetes, maternal hypertension, and not exercising during pregnancy. The resulting seven-factor model demonstrated strong discrimination (optimism corrected C-statistic=0.776) and calibration (mean absolute error=0.009). Conclusions: We developed and validated the PIRC for predicting individualized risk for hospital-based intervention among gravidas based on seven readily accessible prenatal factors. This calculator can support personalized counseling regarding planned birth setting, helping to close a critical gap in current clinical guidance and providing an evidence-based risk assessment for those contemplating alternatives to hospital birth.

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