Conclusion: The PECARN ciTBI rules were externally validated in a large multicenter population with excellent test characteristics. Implementation of this rule would further safely decrease CT use.

53 | All-Inclusive Model for Predicting Invasive Bacterial Infection in Febrile Infants 7 to 60 Days Old

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Background and Objectives: Invasive bacterial infections [IBIs]) in febrile infants are rare but potentially devastating. Current risk stratification algorithms to guide management have limitations. We used retrospective data from a large healthcare system in California to derive and validate a predictive model for IBI among febrile infants aged 7-60 days.

Methods: We identified patient encounters at 37 California Kaiser Permanente (KP) EDs between 2010-2019 for febrile (measured temp >100.3F) infants born at KP and aged 7-60 days. Data were abstracted from electronic health records for infants who underwent an ED work-up with blood and urine cultures. Abstracted data included: demographics, immunizations, history of maternal or neonatal infection, complex chronic condition (CCC), ED vital signs and laboratory results. Our outcome was culture confirmed IBI. We randomly split our dataset into 80% derivation and 20% validation data and developed models using logistic regression, LASSO, decision tree, random forest, and XGBoost, with 10-fold cross-validation for parameter tuning. We used precision recall curves (PRC) as the classification metric due to the imbalanced nature of our outcome to select the best performing model.

Results: There were 4411 eligible infants with a mean age of 37 days (range 7-60, median 39, IQR 24-51), including 2017 infants (46%) having characteristics (respiratory syncytial virus +, vaccination within 48 hours of visit, history of neonatal or maternal infection, CCC diagnosis, gestation < 37 weeks) that would have excluded them from prior existing risk stratification protocols. We found 196 patients with IBI (42 with meningitis). Analytic approaches varied in performance characteristics (AUC range 0.5-0.84, PRC range $0.04-0.29$) with the XGBoost model demonstrating the best PRC performance (AUC 0.84, PRC 0.29). Stratified by age in days, performance was: 7-21d:, AUC .70, PRC 0.17; 22-28d: AUC 0.84, PRC 0.31; 29-60d: AUC 0.86, PRC 0.35 (p-value < 0.05 compared to 7-21d). The top five variables in importance were: serum WBC, maximum temperature, absolute neutrophil count, band count and age in days.

Conclusion: A machine learning model (XGBoost) demonstrated very good performance in predicting a rare outcome (IBI) among febrile infants, including patients excluded from existing algorithms.

54 | Clinical Factors Associated With the Development of Shock in Multisystem Inflammatory Syndrome in Children

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Background and Objectives: Multisystem Inflammatory Syndrome in Children (MIS-C) is a rare condition related to COVID-19. While some children may present with shock upon arrival or early in the emergency department (ED) course, others may develop shock later. Understanding the timing and factors that predict this progression would enable clinicians to assign the appropriate level of care and disposition. We aimed to determine the clinical factors independently associated with the development of shock at >=3 hours after ED arrival in children with MIS-C.

Methods: We conducted a retrospective study of children 3 months to 21 years of age evaluated for MIS-C at 22 participating pediatric EDs in the New York City tri-state area from April 1 - June 30, 2020. We identified eligible patients by ICD-10 code and electronic medical review. We included patients with fever and C-reactive protein performed and defined MIS-C based on the World Health Organization criteria. Equivocal cases of MIS-C were categorized by consensus. Using a standard tool, we collected demographic, clinical and laboratory data. Our primary outcome was MIS-C with shock occurring >=3 hours after initial ED arrival to identify those who did not require initial critical care. We defined shock as the presence of systolic hypotension or clinical hypoperfusion requiring a vasoactive agent or >40 ml/kg intravenous fluid administration. We performed bivariable and multivariable logistic regression analyses to identify factors independently associated with the outcome. For regression, we dichotomized continuous variables based on the sample median.

Results: We identified 261 patients with MIS-C, of whom 35 (13%) had shock < 3 hours of ED arrival and excluded from further analyses. Of the remaining 226, 85 (38%) developed shock >=3 hours