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Development of a Pediatric Hydrocephalus Severity Index (PHSI) to Predict Long-Term Clinical Outcomes

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Hydrocephalus is a disorder of cerebrospinal fluid physiology resulting in abnormal expansion of the cerebral ventricles and increased intracranial pressure. Despite its prevalence, there is little information on clinical outcomes in children treated for hydrocephalus or how neurosurgical practices affect outcome. The goal of this study is to create a composite index for classifying the severity of disease at baseline and predicting outcomes among children treated, in order to inform both treatment and research for this condition. The Hydrocephalus Outcome Questionnaire will be administered in person or online to the parents of 150 patients between the ages of 5-18 years who are followed at the Neurosurgery Clinic at St. Louis Children's Hospital for hydrocephalus. Potential risk factors will be identified on retrospective medical record review. We will create a clinical prediction rule, called the PHSI, to stratify patients on likelihood of experiencing poor long-term outcomes after surgical treatment. We will use a combination of bivariate analysis and clinical reasoning to restrict the number of factors for further analysis, and multivariate logistic regression to build a predictive model for poor outcomes. Creation of the PHSI will involve assigning integer values to adjusted odds ratios for significant risk factors at a 95% confidence level. We anticipate risk factors including signs and symptoms at onset (bulging fontanel, splayed sutures, papilledema, up-gaze palsy, headache, vomiting, lethargy), head circumference above the 97th percentile, frontal-occipital horn ratio greater than 0.4, etiology of meningitis or neonatal intraventricular hemorrhage, central nervous system comorbidities (seizures, Chiari malformation, scoliosis, periventricular leukomalacia), preoperative infection or sepsis, and frequent shunt revisions or infections, will be predictive of long-term clinical outcome. We hypothesize a PHSI would be a major advance in clinical hydrocephalus research as it will be a valuable tool for stratifying patients and aiding prognosis in clinical situations.