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Recommendation for the Enrollment of Hydrocephalus Patients in Children's Special Health Care Services

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Background: Pediatric hydrocephalus is a devastating and costly disease. The mainstay of treatment is surgical shunting of cerebrospinal fluid. These shunts fail at a high rate. The relationship between clinical decision making and shunt failure is poorly understood and multifactorial. Treatment paradigms have changed little since the 1980s. In order to investigate factors that affect outcomes, we have established the Wayne State University shunt biobank.

Methods: Children's Hospital of Michigan is one of the participating centers in our biobank and has enrolled 73 patients from whom we have collected 115 shunt samples and 40 CSF samples. Samples were directly obtained from the OR. CSF samples were kept cold until they were spun down and put on liquid nitrogen. The shunt samples were fixed in PFA and stored in PBS+ azide. Clinical data was taken from electronic medical records and maintained in a REDCap database under coded identifiers. Regression analysis was performed to determine factors affecting number of revisions.

Results: Patient age and Medicaid usage were found to be significant predictors of the number revisions; patient weight and the median income of the family's zip code were not significant predictors. The number of revisions also significantly varied by type of shunt system used.

Conclusion: Many studies have used median income of a patient's zip code as a stand in for socioeconomic status, our study found Medicaid enrollment to be a more significant predictor than income. This variable is commonly available in patient EMRs and merits further investigation for its usage in larger cohorts. Moreover, given that the Michigan Department of Health and Human Services has a free program to provide specialist care to children with a number of congenital conditions, among which hydrocephalus is included, it is our recommendation that hospital centers make efforts to enroll their patients in this program as it was associated with better outcomes than Medicaid. Unsurprisingly age was a very significant predictor of the number of shunt failures. The relationship between number of shunt revisions and shunt system type needs further examination to yield prognostic insight, as most patients are only placed on non-standard shunt systems after experiencing multiple failures with the standard ventriculoperitoneal shunt.