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Can AI Predict Surgical Issues In Chiari?

Artificial intelligence, or AI, is everywhere these days. From students using ChatGPT to do homework, to engineers working on self-driving cars, to Microsoft Word predicting what the next words I want to use for this article are, AI is rapidly becoming intertwined with our daily lives. Now, a group of researchers has looked at whether AI can be used to predict which pediatric Chiari patients are at risk for hospital readmission or reoperation after decompression surgery.

Specifically, they built and compared several machine learning models using a national surgical database to predict 30-day readmission and reoperation using information from over 7,000 pediatric surgical cases. Machine learning is a branch of AI which uses large data sets to 'train' statistical models to make predictions. The group used 80% of the data to train their models and then the remaining 20% to test them. The best performing model achieved better than 80% accuracy in predicting readmission and better than 90% accuracy in predicting reoperation.

Overall, 7.5% of the patients were readmitted to the hospital within 30 days of the initial surgery, primarily due to headaches and wound complications. In addition, 3.4% underwent some type of additional surgical procedure within 30 days, most commonly for wound revisions, fluid drainage, and CSF issues such as shunting.

The final model identified gender as the single strongest predictor of both readmission and reoperation. Specifically, males were significantly more likely to have issues than females. While the authors do not have a definitive explanation for this, they do point out that limited adult studies have also found that males are at higher risk for readmission. A history of developmental delays and/or premature birth was also a strong predictor for both negative outcomes, while Hispanic ethnicity was a strong predictor for reoperation. Significant, but less impactful predictors for both outcomes included comorbidities such as syringomyelia and hydrocephalus.

Any machine learning model is only as good as the data that it is trained on, and the authors acknowledge that the database they used was missing some potentially important elements, such as imaging measurements and specific symptoms. They also stress that this only looked at two very specific, short-term outcome measures, and that the results would likely be different for long-term outcomes. However, this study does show the potential that machine learning has if a large enough and extensive enough dataset could be constructed.

Source: Machine learning for enhanced prognostication: predicting 30-day outcomes following posterior fossa decompression surgery for Chiari malformation type I in a pediatric cohort. El-Hajj VG, Ghaith AK, Elmi-Terander A, Ahn ES, Daniels DJ, Bydon M. J Neurosurg Pediatr. 2024 Apr 12:1-9. doi: 10.3171/2024.2.PEDS23523. Online ahead of print. PMID: 38608292

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