



# Predicting CSF Diversion After Posterior Fossa Tumor Resection: A Systematic Review of Conventional and AI Based Tools



*From regression to artificial intelligence: toward precision perioperative care*

Sundas Irshad<sup>1</sup>, Amna Sohail<sup>2</sup>, Raahim Bashir<sup>3</sup>, Fiza Ismail<sup>4</sup>, Sabeel Mahmood<sup>5</sup>, Syeda Aleena Hassan<sup>6</sup>, Sameed Safdar<sup>5</sup>, Hania Fatima<sup>7</sup>, Haseeb Mehmood Qadri<sup>1</sup>, Sabino Luzzi<sup>8</sup>, Asif Bashir<sup>1</sup>

<sup>1</sup>Punjab Institute of Neurosciences, Lahore · <sup>2</sup>Chengde Medical University, China · <sup>3</sup>CMH Medical & Dental College, Lahore · <sup>4</sup>Continental Medical College, Lahore · <sup>5</sup>Allama Iqbal Medical College, Lahore · <sup>6</sup>Fatima Jinnah Medical University, Lahore · <sup>7</sup>Aga Khan University, Karachi · <sup>8</sup>University of Sassari, Italy | [sundasirshad3011@gmail.com](mailto:sundasirshad3011@gmail.com)

**10** studies, 1,597 patients

**9** models compared

**0.938** AUC, AI model

**22.9%** needed CSF diversion

## 1 Background & Objective

Some patients need permanent CSF diversion after posterior fossa tumor resection (persistent hydrocephalus: **≈30% of children, 1.2–6.9% of adults**).

**Aim:** compare tools predicting CSF diversion risk.

## 2 Methods

**264** records

**–46** duplicates

**218** screened

**20** full text

**10** included

PRISMA-guided · PROSPERO CRD420251019237 · PubMed, Google Scholar 2021–25 · PROCAST

## 3 Who Was Studied

**67.3%**  
children (n=1075)  
mean age 7.18 y

**19.4%**  
adults (n=402)  
mean age 53.07 y

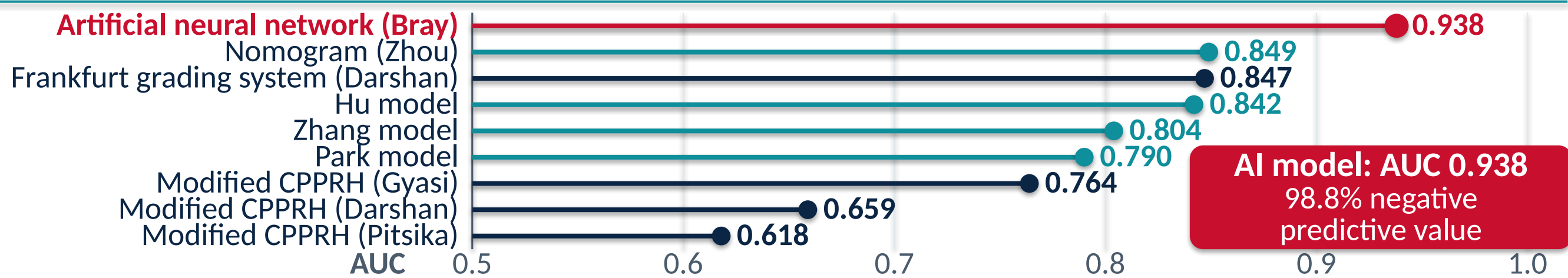
**50.9%**  
male  
47.2% female

100% retrospective · 80% single-center · USA 40% · China 40%  
Medulloblastoma 26.6% · astrocytoma 13.9% · schwannoma 6.9% · ependymoma 5.6% · metastasis 17.1%

## 4 Hydrocephalus

Preoperative hydrocephalus **52.4%**  
Needed CSF diversion after **22.9%**  
Shunt rate, preop hydrocephalus **25.1%**  
Shunt rate, none preop **13%**

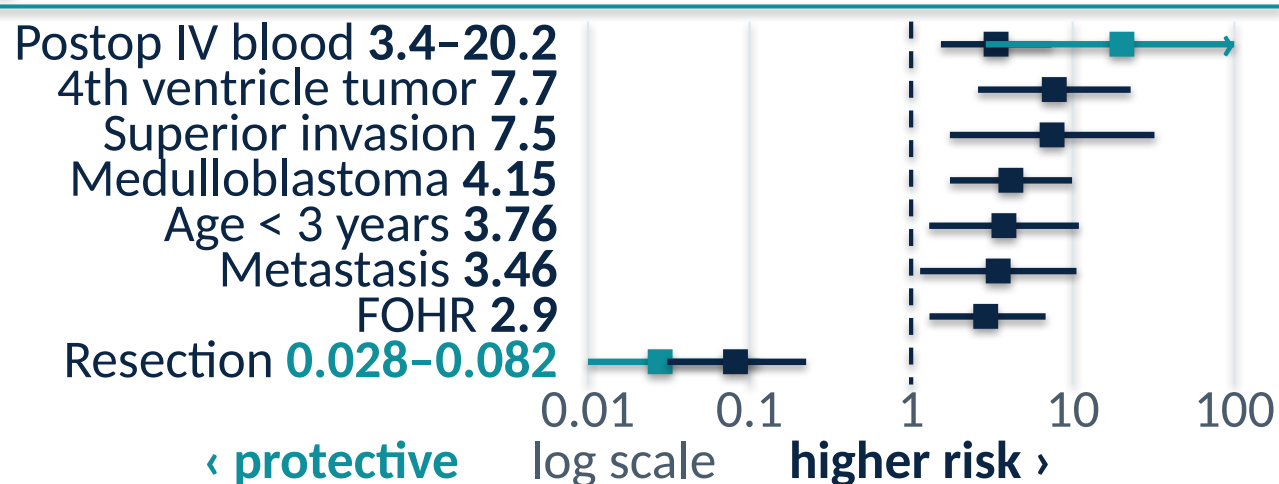
## 5 Predictive Model Performance (AUC)



**Inputs:** age, location, preop hydrocephalus (6/9 each), IV blood (5/9), resection (3/9) · LR 8/9, AI 1/9

**Quality:** PROCAST 3 low risk (incl. AI), 2 unclear, 5 high · one AI study · 2 models without AUC

## 6 Strongest Predictors OR, 95% CI



## 7 Clinical Take-Home

- 1 Assess demographic, radiological and surgical factors together.
- 2 Strongest: FOHR, midline or ventricular tumor, IVH, younger age.
- 3 Use mCPPRH in children, Frankfurt grading in adults.

## 8 The Next Generation from population-level risk to individualized precision

Conventional scores

Regression & nomograms

Multimodal imaging-integrated AI

Neurosurgery · Neuroradiology · Precision perioperative care · Biomed. eng. · Bioinformatics · Data science

## 9 Conclusion

Prediction of CSF diversion is moving from regression to AI (AUC 0.938). External validation, standardized predictors, multicenter datasets and prospective assessment are needed before routine use.

**References:** Bray 2022 (Neurooncol Adv) · Darshan 2023 (World Neurosurg) · Muthukumar 2021 (Neurol India)

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