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## Assessment of the Milan Complexity Scale for prediction of postoperative morbidity in pediatric neuro-oncological surgery

Kasper Amund Henriksen <sup>1</sup><sup>2</sup>, Gorm Von Oettingen <sup>3</sup>, Jane Skjøth-Rasmussen <sup>1</sup><sup>2</sup><sup>4</sup>, René Mathiasen <sup>1</sup><sup>2</sup>, Jon Foss-Skiftesvik <sup>5</sup><sup>6</sup>

- <sup>1</sup> Department of Pediatrics and Adolescent Medicine, Rigshospitalet University Hospital, Blegdamsvej 9, Copenhagen, 2100, Denmark.
- <sup>2</sup> Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark.
- <sup>3</sup> Department of Neurosurgery, Aarhus University Hospital, Aarhus, Denmark.
- <sup>4</sup> Department of Neurosurgery, Rigshospitalet University Hospital, Blegdamsvej 9, Copenhagen, 2100, Denmark.
- <sup>5</sup> Department of Pediatrics and Adolescent Medicine, Rigshospitalet University Hospital, Blegdamsvej 9, Copenhagen, 2100, Denmark. jon.foss-skiftesvik@regionh.dk.
- <sup>6</sup> Department of Neurosurgery, Rigshospitalet University Hospital, Blegdamsvej 9, Copenhagen, 2100, Denmark. jon.foss-skiftesvik@regionh.dk.

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## Abstract

**Purpose:** To assess the performance of the risk-predicting Milan Complexity Scale (MCS) on postoperative morbidity in pediatric neuro-oncological surgery.

**Methods:** A retrospective dual-center review of children undergoing primary brain tumor resection in Denmark over a 10-year period. MCS scoring was performed based on preoperative imaging, blinded to individual outcomes. Surgical morbidity was registered according to existing complication scales and dichotomized as significant or nonsignificant morbidity. The MCS was evaluated using logistic regression modeling.

**Results:** 208 children (50% female, mean age 7.9 y, and SD 5.2) were included. Of the original "Big Five" predictors included in the MCS, only posterior fossa (OR: 2.31, 95% CI: 1.25-4.34, p-value = 0.008) and eloquent area (OR: 3.32, 95% CI: 1.50-7.68, p-value = 0.004) locations were significantly associated with increased risk of significant morbidity in our pediatric cohort. The absolute MCS score correctly classified 63.0% of cases. Its accuracy increased to 69.2% when mutually adjusting for each of the "Big Five" predictors with corresponding positive and negative predictive values of 66.2% and 71.0%, using a predicted probability cutoff of 0.5.

**Conclusion:** The MCS is predictive of postoperative morbidity also in pediatric neuro-oncological surgery, although only two of its original five variables were significantly associated with poor outcome in children. The clinical value of the MCS is likely limited for the experienced pediatric neurosurgeon. Future clinically impactful risk-prediction tools should include a larger number of

relevant variables and be tailored to the pediatric population.

**Keywords:** Pediatric brain tumors; Pediatric neurosurgery; Surgical complications; Surgical morbidity; Surgical outcomes.

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