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Predicting Survival of Small Intestine Neuroendocrine Tumors (NETs): Experiences from a Major Referral Center

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BACKGROUND: Small intestine NETs are prevalent and account for 41.8% of all gastrointestinal malignancies. A nomogram was developed in 2010 for predicting survival of small intestine NETs and included a comprehensive list of clinically relevant prognostic factors. Validation of this nomogram was performed in Europe. However, to date, validation has not been performed in the United States. This study is the first external validation of the Modlin nomogram in US patients and describes the experiences of a tertiary referral center.

METHODS: Patients who underwent surgery for small intestine NET from 2005-2017, were screened by retrospective chart review. Clinical, surgical and biochemical factors were used to calculate nomogram scores following the methods outlined by Modlin et al. Validation was done by assessing the association between nomogram scores and survival using both Wilcoxon test and Cox regression.

RESULTS: Our analysis of 121 small intestine NET patients showed that the Modlin score significantly predicted survival both as a continuous variable ($p=0.0096$) and when dichotomized using 83 points as a cut-off value for low risk vs high risk groups ($p=0.0103$). However, the nomogram may not be universally applicable as even at our specialty center, some variables such as urinary 5-HIAA, is not routinely collected, while others such as tumor grade and stage

are not consistent with popular classification schema used in the US such as the WHO grading system and AJCC TNM stage.

CONCLUSION: The validation of the Modlin nomogram in a large patient population from a tertiary referral center showed high predictive ability. Further revision to reclassify prognostic factors according to classification schemas common in the US, in addition to eliminating outdated predictors, will improve the nomogram's usability.