Development and External Validation of a Novel TARGET-Based Prognostic Nomogram for Children with Neuroblastoma

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ABSTRACT

Background: The accuracy of the current staging systems, the INPC histology categories and COG risk group, for predicting the overall survival of patients with neuroblastoma are still unsatisfactory. We aimed at developing a nomogram to accurately predict individual survival. Furthermore, this study sought to externally validate this nomogram using the Chinese cohort.

Methods: The records of 499 patients of neuroblastoma using the TARGET database's newest database with the publication time ranging from 2007 to 2015 were retrospectively analyzed. Additionally, 155 patients of neuroblastoma, who were treated between 2011 and 2019 at Department of Pediatric Oncology, Affiliated Cancer Hospital of Tianjin Medical University, were included as an external validation set. The nomogram was established by using prognostic factors determined by LASSO regression and the predictive accuracy was verified with the concordance index and the AUCs of ROC curves.

Results: Gender, age, MYCN stage, INSS stage, diagnostic category and primary site were significant variables used to develop a nomogram for OS, which had a concordance index of 0.745 (95% CI, 0.700-0.790). The AUCs of ROC curves of 3-, and 5-year OS were 0.730 and 0.806, respectively. The calibration curved for the probability of postoperative 3-, and 5-year OS showed good agreement between the predicted and observed outcomes. The external validation showed the higher AUCs of ROC curves of 3-, 5-year OS were 0.840 and 0.824, respectively. Regard to the Chinese validation set, C-index (0.816 (95% CI, 0.747-0.885)) was also enhanced compared with the TARGET training set. Furthermore, according to the nomogram-predicted scores, the patients were respectively stratified into 3 and 2 groups with different risks to compared with the INPC histology categories and the COG risk group. The nomogram showed a better accuracy in predicting OS than the two current staging systems.

Conclusions: The nomogram that predicted the 3-, and 5-year OS of patients with NB suggesting that it exhibits satisfactory clinical utility that might improve guide further treatment in clinical practice.
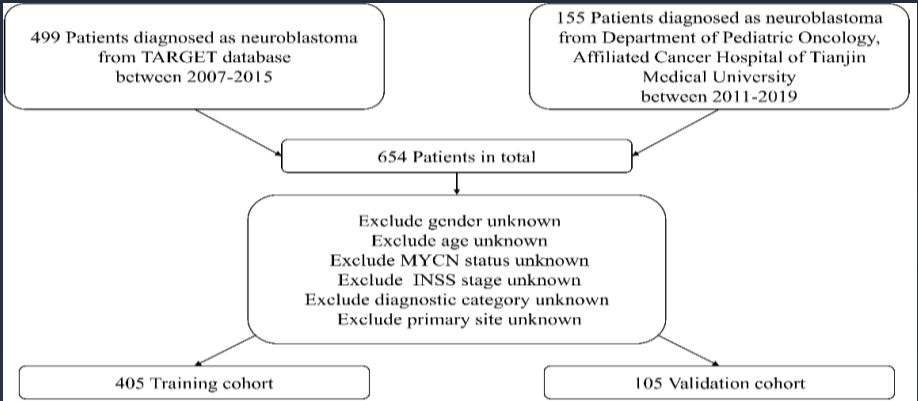

Figure 1. The process of data selection of NB patients from TARGET database and Chinese cohort
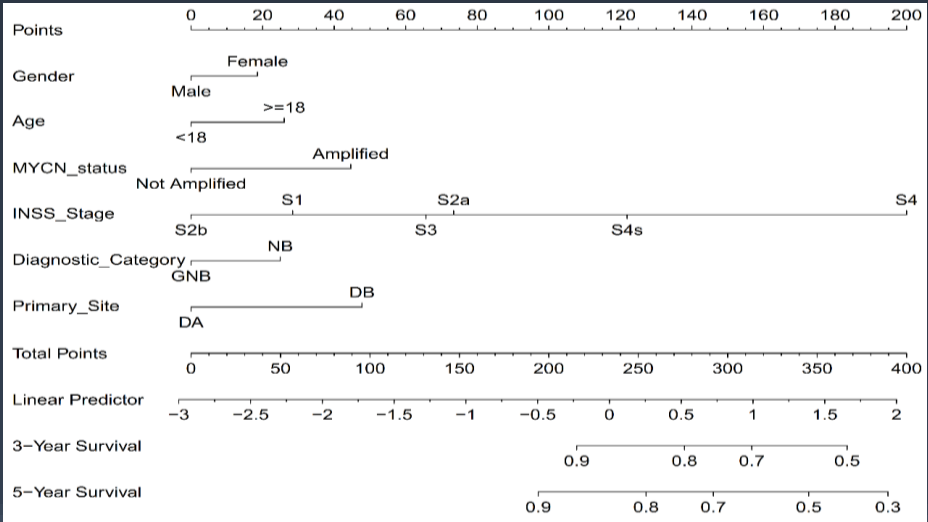

Figure 2 The nomogram of neuroblastoma. To use the nomogram, the value of an individual patient is located on each variable axis, and a line is drawn upward to determine the number of points received for each variable value. The sum of these numbers is located on the Total Points axis, and a line is drawn downward to the survival axes to determine the likelihood of 3-, 5-year survival. Abbreviation: GNB, ganglioneuroblastoma; NB, neuroblastoma; DA, diaphragmatic above; DB, diaphragmatic below.