Supplemental Online Content

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eMethods: Missing Data and Multiple Imputation

In the present study, in 88 cases (4.3%) the primary outcome 'textbook outcome' could not be defined because of a missing value in at least one of the parameters defining textbook outcome (i.e. postoperative pancreatic fistula, postpancreatectomy hemorrhage, major morbidity, readmission, in-hospital or 30-day mortality). For the secondary outcomes the number of missings were lower (for conversion to open rate 0.0%, for pancreatic fistula 0.1% and for operation time 3.0%), except for blood loss, which had 18.8% missings. Multiple imputation was used to impute missing data in order to fit generalized additive and two-piece linear models without discarding any patients.

All data was analyzed using R (R Foundation for Statistical Computing, Vienna, Austria, version 3.6.1). We used multivariate imputation by chained equations using the 'mice' package (version 3.15.0). This method assumes that data are missing at random (MAR), meaning that any systematic differences between the observed and missing values can be explained by differences in the observed data. To satisfy the assumption of data MAR, it is recommended to perform a so-called inclusive analysis strategy, incorporating a number of auxiliary variables into the analysis model or into the imputation process.[1, 2] In our study the following independent baseline parameters were incorporated as auxiliary variables for the imputed missing values to satisfy the MAR-assumption: age, sex, body mass index (BMI), ASA classification, tumor histology, splenectomy, vascular and multivisceral resection, duct diameter, and tumor size. 10 imputed datasets were created using predictive mean matching. For each imputed dataset models were fitted and the regression coefficients were pooled according to Rubin's rule. Missing data in the baseline characteristics are presented in Table 1.

eReferences.

1. Van Buuren S. Flexible imputation of missing data, second edition. Boca Raton: CRC press; 2018.
2. Enders CK. Applied missing data analysis. New York: Guilford press; 2010.

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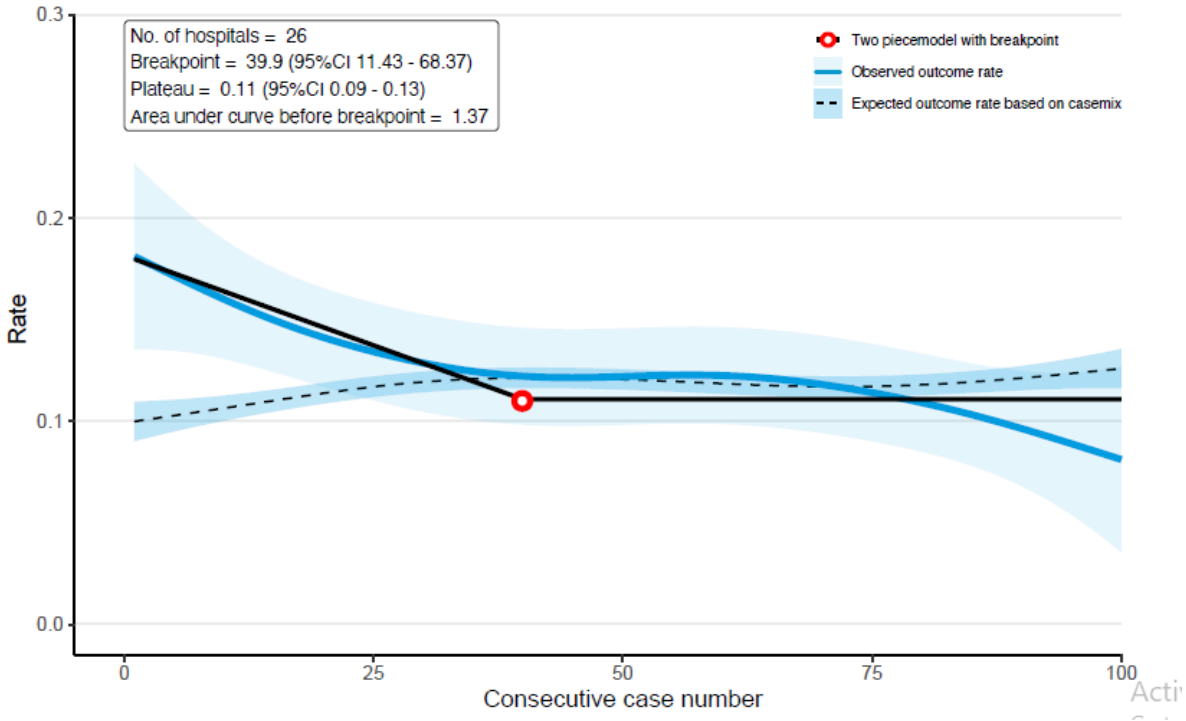
eFigure. Learning Curve for MIDP of Conversion to Open Rate



The blue line represents the generalized additive model (pooled incidence) with a 95% confidence-interval. The black dotted line represents the predicted outcomes based on casemix. The black line is the two-phase model. The first phase is the linear descending section, the second phase is the plateau phase which starts after the break point. The break point represents the length of the learning curve.

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