

FEV1 Z-Score is an Independent Predictor of Complications Following Pulmonary Lobectomy

A Retrospective Cohort Analysis

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Introduction:

- Preoperative lung function is an important indicator of outcomes in patients undergoing pulmonary lobectomy.
- Forced expiratory volume in 1 second as percent of predicted (FEV1%) is commonly used as a marker of lung function in thoracic oncology.
- However, FEV1 Z-score is proposed to provide a stronger approximation of lung function through enhanced age, sex, height, and race adjustment.

Objective:

- To characterize the discordance between FEV1% predicted and FEV1 Z-score and determine the prognostic value of FEV1 Z-score in predicting outcomes following Robotic-Assisted Pulmonary Lobectomy (RAPL) by analyzing both acute complications and long-term outcomes.

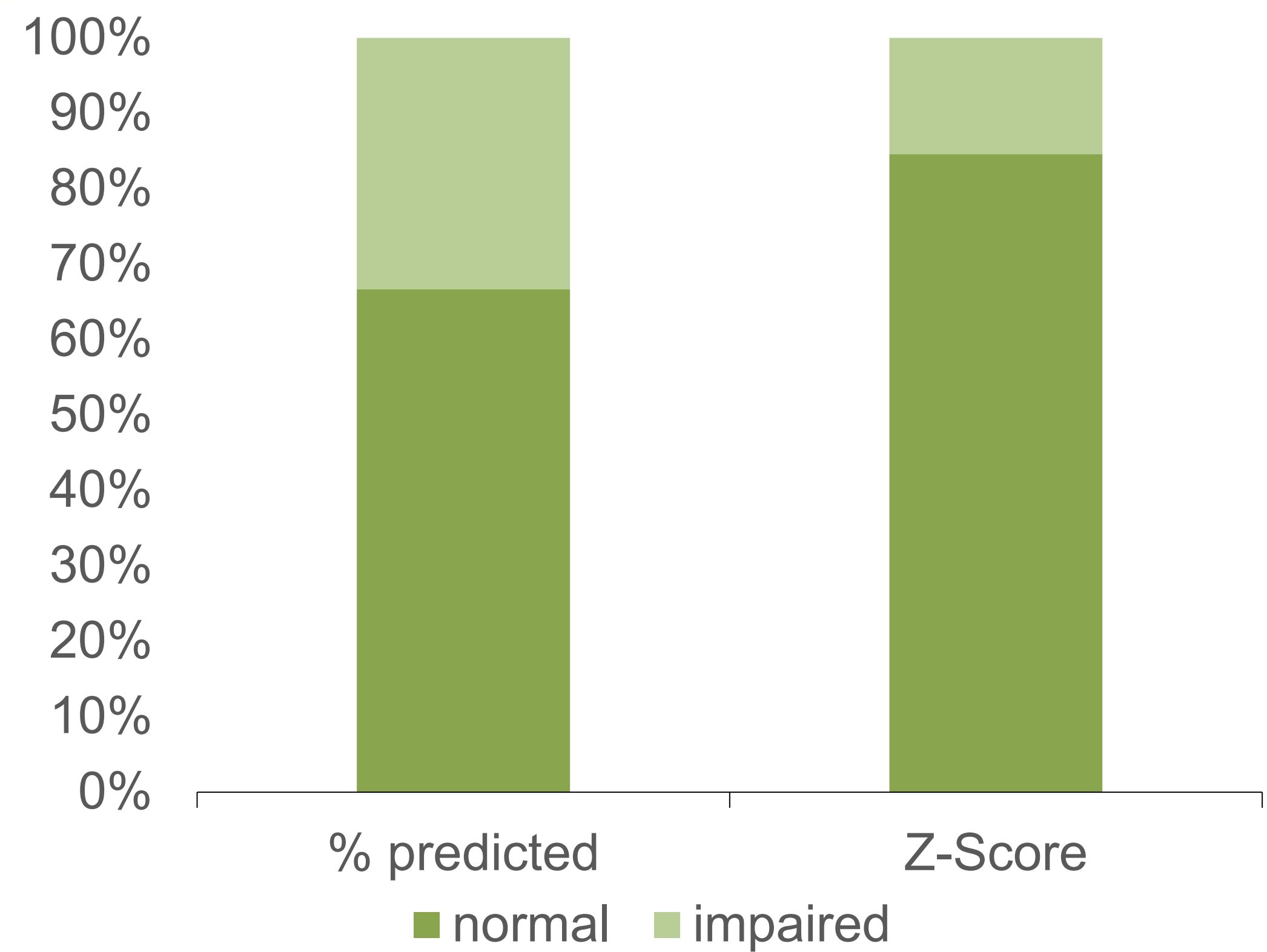


Figure 1. Distribute of Impaired lung function based on FEV1% predicted vs. Z-score

Methods:

- Study Design: Retrospective Cohort Analysis
- Population: Robotic-Assisted Pulmonary Lobectomy (RAPL) from 2010-2025.
- Inclusion Criteria: Pulmonary function testing performed prior to surgery.
- Outcomes included: prolonged air leak (>5 days), pneumonia, any respiratory complication, any post-operative complication, chest tube duration, hospital length of stay, and 90-day mortality.
- Kaplan-Meier Overall Survival Analysis was performed based on ATS/ERS-defined FEV1-based lung impairment cutoffs.
- Statistics: Chi-square, Mann Whitney U, and multivariable logistic and linear regression were performed using SPSS v30.

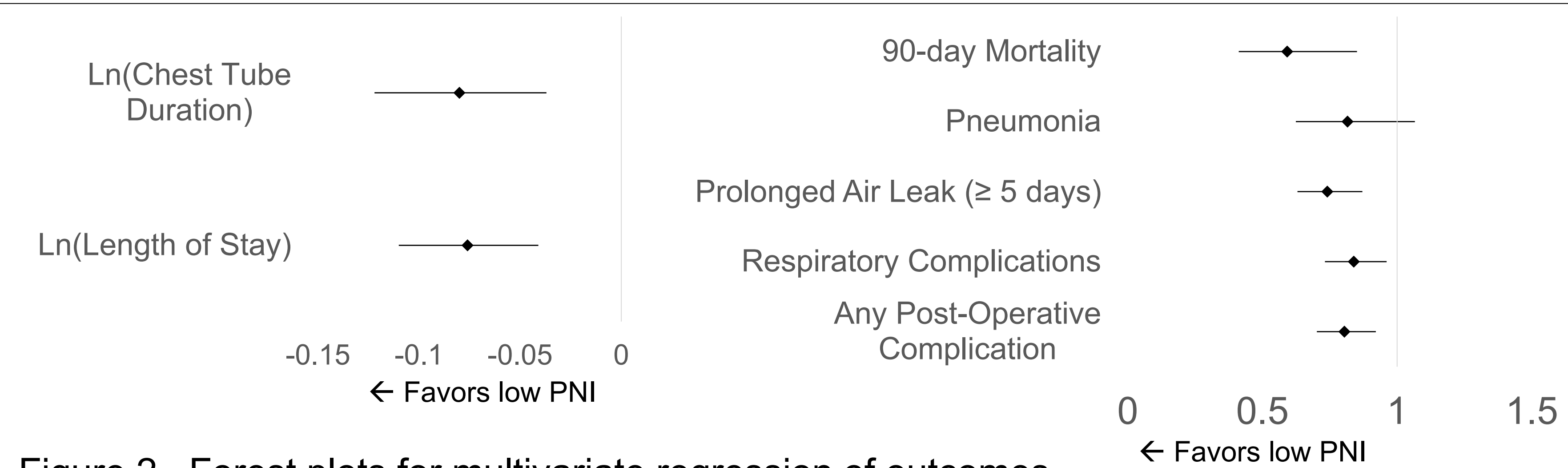


Figure 2. Forest plots for multivariate regression of outcomes.

Table 1. Preoperative Demographics

Variable	Overall (n = 843)
FEV1 Z-Score	-0.45 ± 0.04
FEV1% predicted	92.2 ± 0.7
Age (years)	68.5 ± 0.3
Sex	
Male	378 (44.8%)
Female	465 (55.2%)
Race/Ethnicity	
White	756 (89.7%)
Black	21 (2.5%)
Hispanic	43 (5.1%)
Asian	15 (1.8%)
Other	7 (0.8%)
BMI (kg/m²)	27.8 ± 5.5
Obesity	248 (29.4%)
Smoking Status	
Never	167 (19.8%)
Former	521 (61.9%)
Current	154 (18.3%)
Smoking history (pack-years)	32.0 ± 1.1

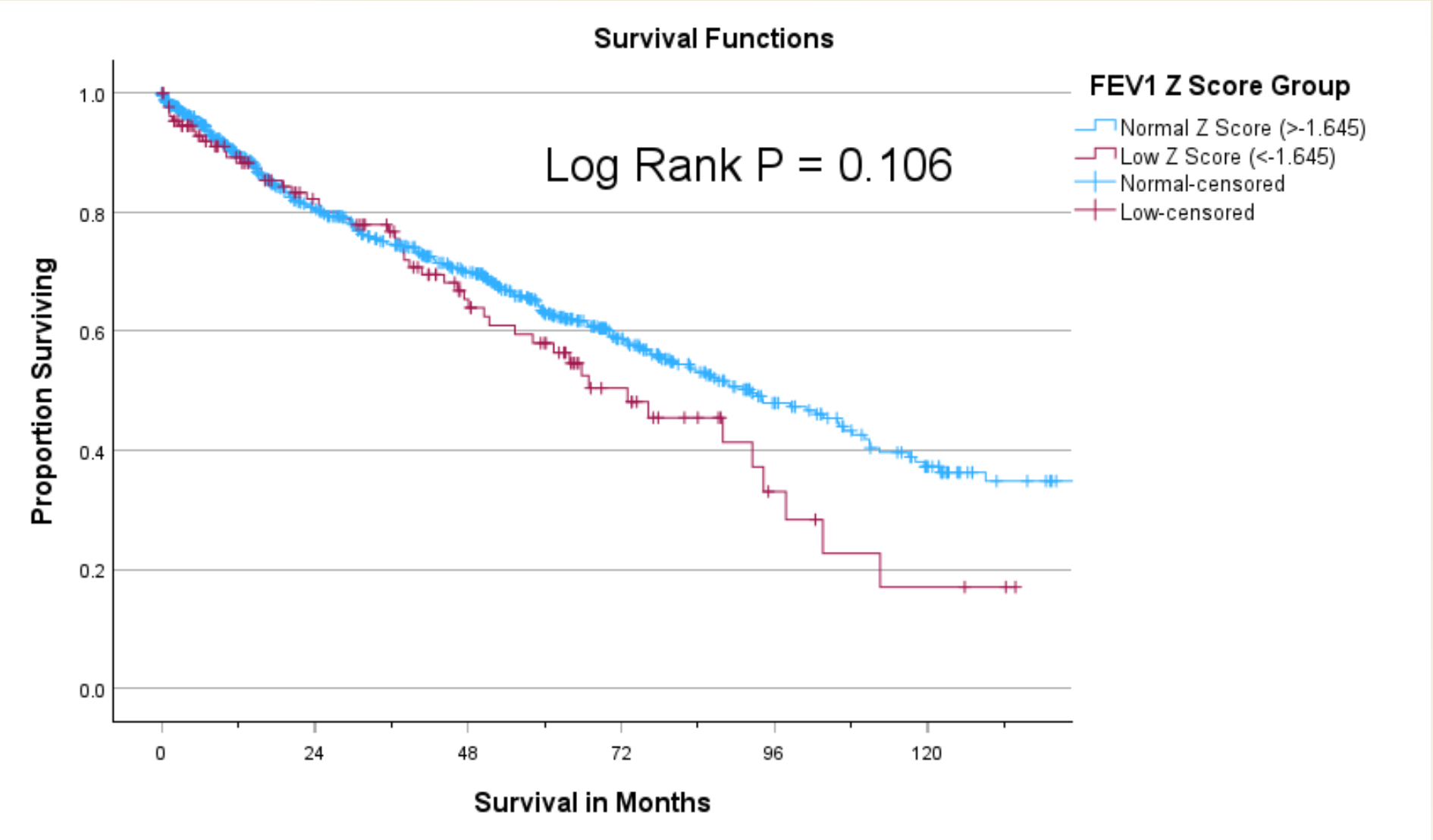


Figure 3. Kaplan Meier Overall Survival Curves for normal versus mildly-to-severely impaired lung function.

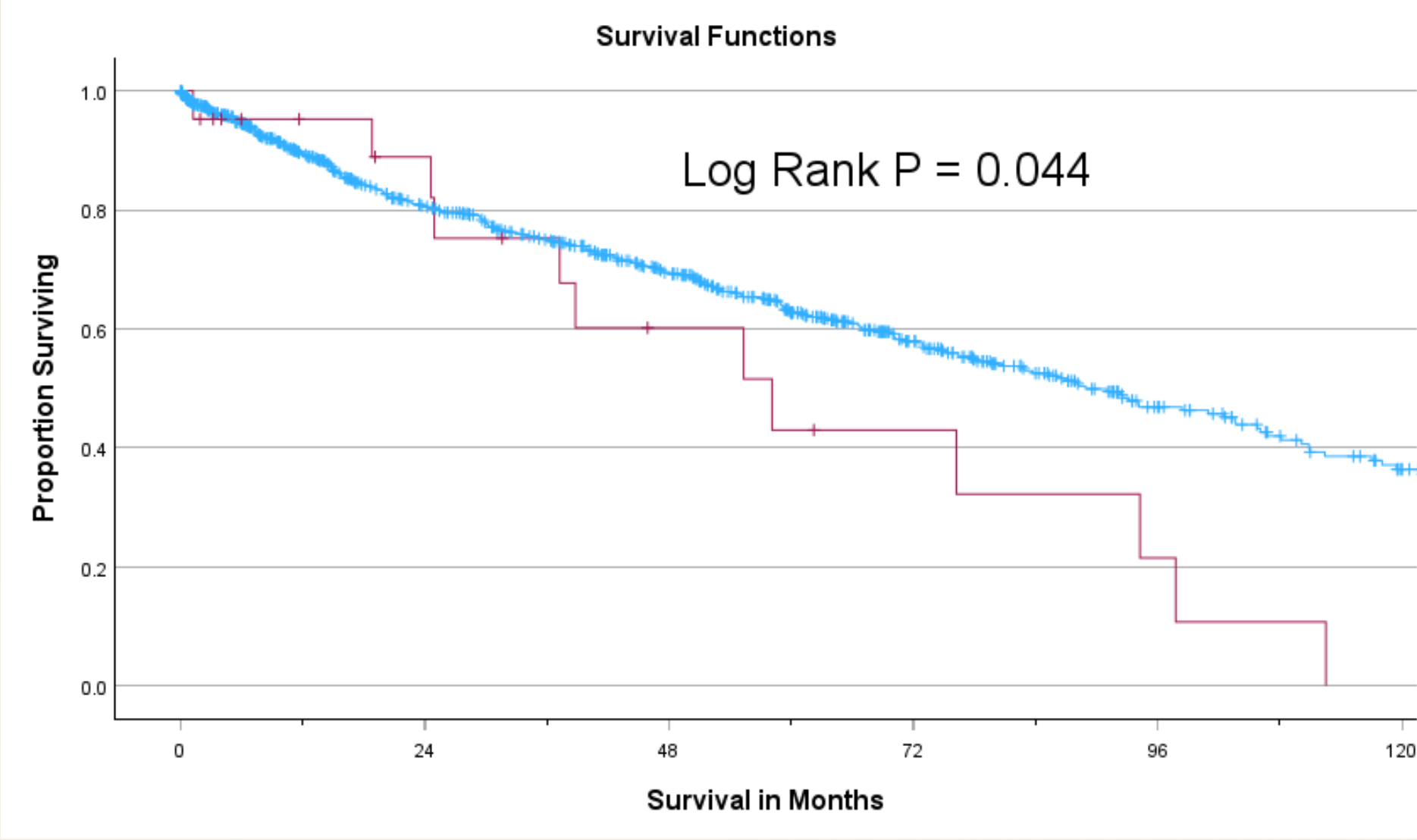


Figure 4. Kaplan Meier Overall Survival Curves for normal-to-mildly-impaired versus moderately-to-severely-impaired lung function.

Results:

- There was significant discordance between FEV1 Z-score and FEV1% predicted in this cohort (19.1%; P<0.001).
- FEV1-Z-score was an independent predictor of post-operative complications (Odds Ratio [OR]=0.804; 95% confidence interval [CI]=0.702-0.921; p=0.002), respiratory complications (OR=0.839; 95%CI=0.732-0.961; p=0.011), prolonged air leak (OR=0.741; 95%CI=0.630-0.871; p<0.001), chest tube duration (B=-0.080; 95%CI=-0.122 to -0.037; p<0.001), hospital LOS (B=-0.076; 95% CI=-0.110 to -0.041; p<0.001), and 90-day mortality (OR=0.592; 95% CI=0.412-0.851; p=0.005).
- ROC analysis showed slightly better 90-day mortality discrimination with FEV1-Z-score (Area Under the Curve [AUC]=0.65; 95%CI=0.556-0.745) than FEV1% (AUC=0.627; 95%CI=0.518-0.736).
- Using American Thoracic Society (ATS)/European Respiratory Society (ERS) guidelines, a Z-score cutoff of -2.504 for moderate-severe impaired lung function was significantly associated with median OS time (log-rank p-value=0.044).

Conclusions:

- FEV1-Z score and FEV1% predicted leads to differing classification of lung impairment.
- FEV1-Z score is a robust predictor of clinically important postoperative complications and increased healthcare burden.



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