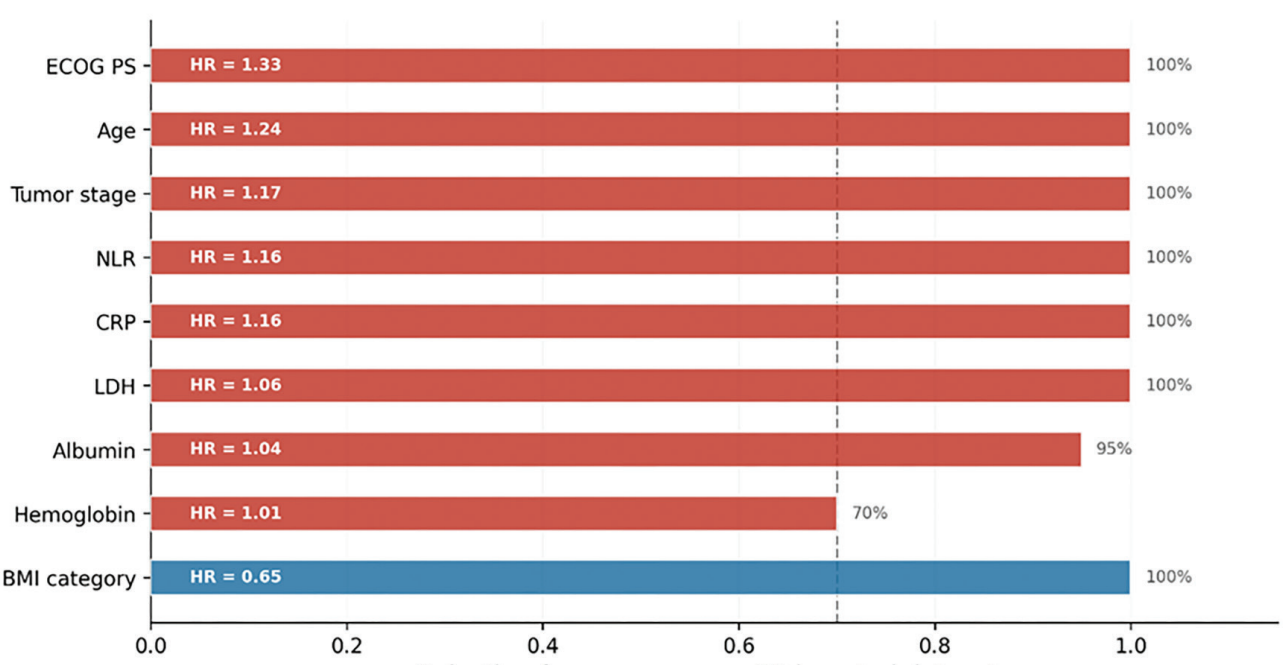
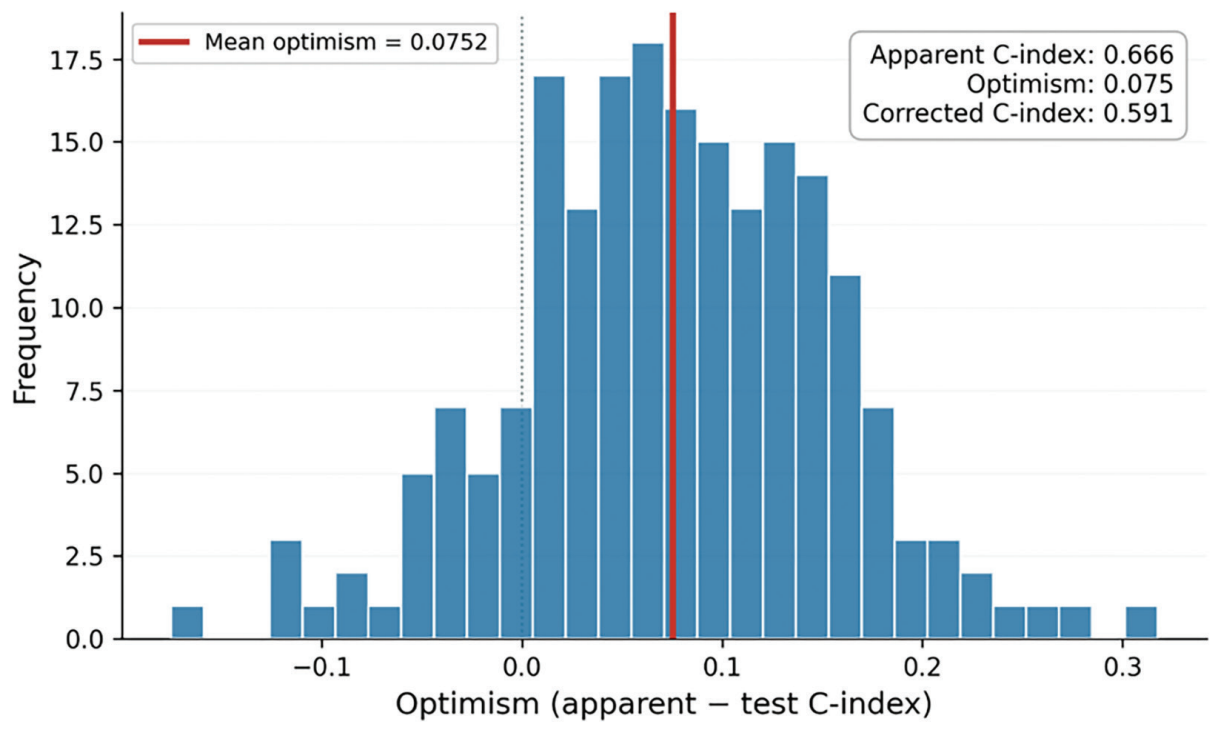
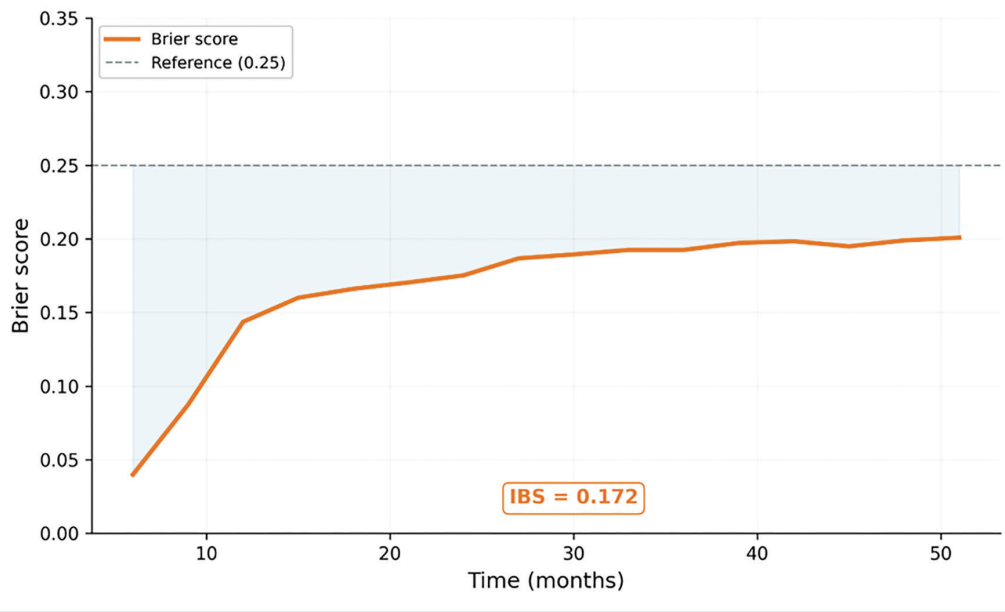


SUPPLEMENTARY FIGURE 1: LASSO Cox variable selection stability. Horizontal bars represent the proportion of multiply imputed datasets in which each predictor was selected (coefficient ≠ 0). Red bars indicate risk factors (HR>1); blue indicates protective factors (HR<1). The dashed line denotes the adaptive selection threshold (≥70%). HR values are shown inside each bar.

HR: Hazard ratio; NLR: Neutrophil-to-lymphocyte ratio; ECOG PS: Eastern Cooperative Oncology Group performance status; CRP: C-reactive protein; LDH: Lactate dehydrogenase; BMI: Body mass index

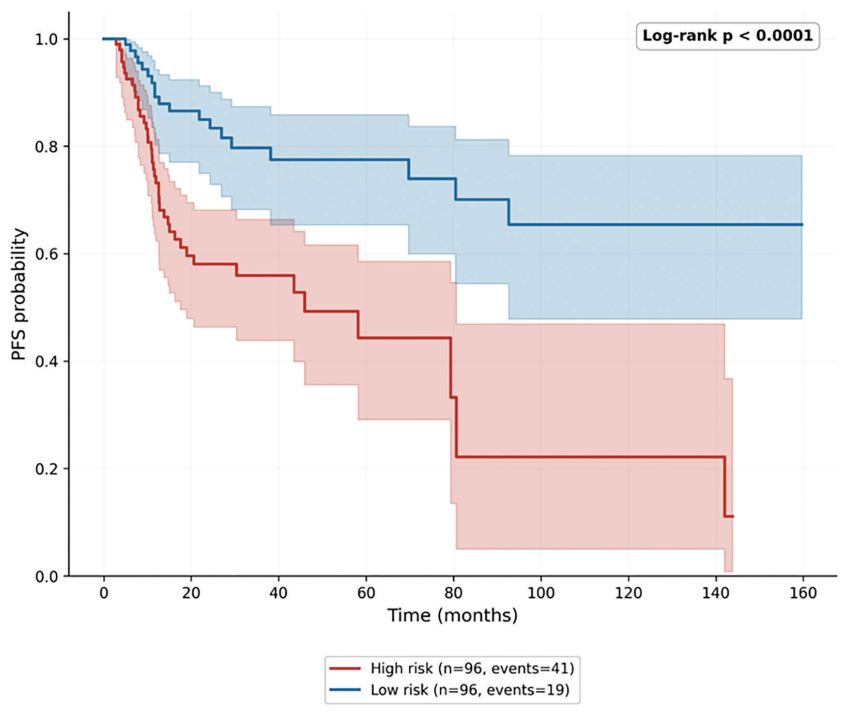


SUPPLEMENTARY FIGURE 2: Bootstrap optimism distribution (B=200). The red vertical line indicates the mean optimism. Inset box shows the apparent C-index, optimism, and optimism-corrected C-index.



SUPPLEMENTARY FIGURE 3: Brier score over time; the dashed line at 0.25 represents uninformative prediction.

IBS: Integrated Brier score



SUPPLEMENTARY FIGURE 4: Kaplan-Meier PFS curves stratified by the nomogram risk score. Median split into two equal groups.

PFS: Progression-free survival

SUPPLEMENTARY TABLE 1: Missing data.

Characteristic	Missing
Demographics	
Age, years-median [IQR]	0
Sex	0
Smoking status	3
Alcohol use	25
Comorbidities	
Diabetes mellitus	0
Hypertension	0
Coronary artery disease	0
Tumor characteristics	
Primary site (larynx, hypopharynx, etc.)	0
T classification	0
N classification	0
Clinical stage	0
ECOG performance status	2
Treatment modality	0
Prior surgery	0
Feeding gastrostomy	0
RT dose, Gy-median [IQR]	3
Mucositis (any grade)	0
Dysphagia (any grade)	1
BMI category	25
Laboratory values	
NLR-median [IQR]	0
CRP, mg/L-median [IQR]	28
Albumin, g/L-median [IQR]	1
LDH, U/L-median [IQR]	2
Hemoglobin, g/dL-median [IQR]	0
Platelet count, $\times 10^3/\mu L$-median [IQR]	0
Outcomes	
PFS events (progression or death)	0
Deaths (overall)	0

Missing column shows the number of patients with unavailable data for each variable.
IQR: Interquartile range; ECOG: Eastern Cooperative Oncology Group; RT: Radiotherapy; CRT: Chemoradiotherapy; BMI: Body mass index; NLR: Neutrophil-to-lymphocyte ratio; CRP: C-reactive protein; LDH: Lactate dehydrogenase; PFS: Progression-free survival.

SUPPLEMENTARY TABLE 2: Summary of model performance metrics for the LASSO Cox PFS prediction model.

Metric	Value
Cohort and outcomes	
Patients included	192
PFS events	60 (31.3%)
Disease progression	44 (22.9%)
Death without progression	16 (8.3%)
Median observed PFS time, months [IQR]	20.3 [10.0-43.9]
Median follow-up among censored, months	26.5
Model	
Candidate predictors	9
LASSO-stable predictors	8
Events per variable	7.5
Mean λmin	0.0021
Stability threshold	>70%
Discrimination	
Mean cross-validated C-index (λmin)	0.608
Apparent C-index	0.666
Bootstrap optimism	0.075
Optimism-corrected C-index	**0.591**
Time-dependent AUC at 12 months	0.669
Time-dependent AUC at 24 months	0.720
Time-dependent AUC at 36 months	0.696
Mean time-dependent AUC	0.695
Overall accuracy	
Integrated Brier score	0.172
Temporal split validation	
Training set-C-index (n=96, 35 events)	0.703
Test set-C-index (n=96, 25 events)	0.614
Temporal optimism (training-test)	0.089
Risk stratification (exploratory)	
KM median split-log-rank p	<0.0001
KM 67th-percentile cut-point-log-rank p	**<0.0001**
High-risk group (n=64)	29 events; median PFS 12.3 mo
Low-moderate-risk group (n=128)	31 events; median PFS 26.5 mo

Bootstrap optimism correction was performed on the first imputed dataset; values are therefore approximate. The exploratory risk-stratification cut-points were data-driven; corresponding log-rank p values are descriptive.
PFS: Progression-free survival; IQR: Interquartile range; λmin: Regularization parameter minimizing cross-validated C-index; C-index: Harrell concordance index; AUC: Area under the receiver operating characteristic curve; IBS: Integrated Brier score; KM: Kaplan-Meier.