Supplementary Online Content

Heiden BT, Eaton DB Jr, Chang SH, et al. Association between surgical quality metric adherence and overall survival among US veterans with early-stage non–small cell lung cancer. *JAMA Surg.* Published online January 18, 2023. doi:10.1001/jamasurg.2022.6826

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Multivariable Cox Proportional Hazards Model for Overall Survival

Variable	aHR, 95% CI	P-Value
Age	1.022 (1.018-1.026)	<0.001
Sex		
Male	[1 ref]	
Female	0.681 (0.575-0.807)	<0.001
Race		
White	[1 ref]	
Black	0.836 (0.773-0.904)	<0.001
Other	0.971 (0.762-1.237)	0.812
Unknown	0.961 (0.725-1.275)	0.784
Smoking status		
Current	[1 ref]	
Former	0.886 (0.838-0.937)	<0.001
Never	0.575 (0.434-0.761)	<0.001
BMI		
<18.5	1.063 (0.965-1.170)	0.2177
18.5-24.9	[1 ref]	
25-29.9	0.772 (0.724-0.824)	<0.001
30-34.9	0.705 (0.650-0.763)	<0.001
35+	0.775 (0.694-0.865)	<0.001
Charlson Comorbidity Score	1.083 (1.068-1.099)	<0.001
Number of unique prescriptions	1.017 (1.013-1.021)	<0.001
Hospital volume	1.000 (1.000-1.001)	0.683
Laterality		
Right	[1 ref]	
Left	0.988 (0.937-1.043)	0.668
Tumor location		
Upper lobe	[1 ref]	
Middle or lower lobe	0.993 (0.937-1.052)	0.803
Tumor size (mm)		
≤10	[1 ref]	
11-20	1.002 (0.906-1.107)	0.974
21-30	1.097 (0.989-1.217)	0.080
31-40	1.349 (1.144-1.436)	<0.001
>40	1.349 (1.181-1.540)	<0.001
Unknown	0.568 (0.434-0.744)	<0.001
Histology		
Adenocarcinoma	[1 ref]	
Squamous cell carcinoma	1.152 (1.087-1.222)	<0.001
Other	1.238 (1.142-1.341)	<0.001
Pathological Upstage		
No	[1 ref]	
Yes	1.602 (1.482-1.731)	<0.001
Delayed surgery		
>12 weeks	[1 ref]	
≤12 weeks	0.890 (0.842-0.941)	<0.001

Variable	aHR, 95% CI	P-Value
Surgical approach		
Open	[1 ref]	
Minimally invasive	0.918 (0.867-0.971)	0.003
Extent of resection		
Wedge	[1 ref]	
Lobectomy	0.830 (0.771-0.894)	<0.001
Segmentectomy	0.825 (0.724-0.941)	0.004
Pneumonectomy	1.080 (0.875-1.335)	0.473
Nodal sampling adequacy		
0 LN	[1 ref]	
1-4 LN	0.876 (0.894-0.965)	0.008
5-9 LN	0.816 (0.737-0.903)	<0.001
≥10 LN	0.777 (0.700-0.894)	<0.001
Surgical margin		
R1+	[1 ref]	
R0	0.584 (0.511-0.667)	<0.001
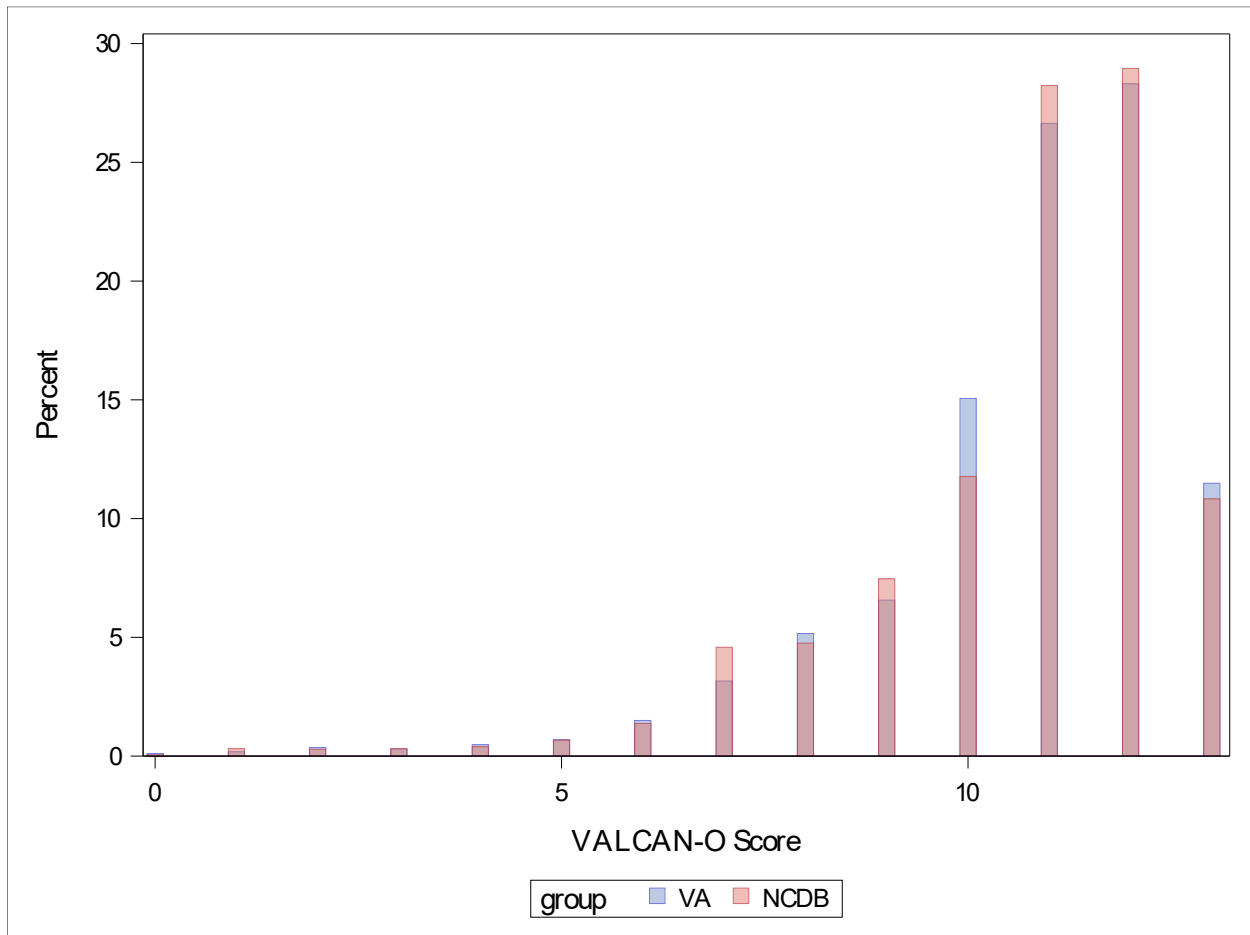
eTable 2. Multivariable Competing Risk Model for Recurrence-Free Survival

Variable	aHR, 95% CI	P-Value
VALCAN-O score		
0-5 points	[1 ref]	
6-7 points	0.630 (0.486-0.818)	<0.001
8-10 points	0.505 (0.410-0.622)	<0.001
11-12 points	0.403 (0.327-0.496)	<0.001
Age	0.994 (0.988-1.000)	0.062
Sex		
Male	[1 ref]	
Female	0.825 (0.654-1.040)	0.104
Race		
White	[1 ref]	
Black	0.946 (0.840-1.066)	0.362
Other	0.896 (0.608-1.320)	0.578
Unknown	0.706 (0.424-1.175)	0.180
Smoking status		
Current	[1 ref]	
Former	0.969 (0.887-1.059)	0.489
Never	1.103 (0.786-1.547)	0.571
BMI		
<18.5	0.929 (0.787-1.097)	0.386
18.5-24.9	[1 ref]	
25-29.9	0.926 (0.836-1.026)	0.140
30-34.9	0.897 (0.792-1.014)	0.083
≥35.0	0.911 (0.767-1.083)	0.293
Charlson Comorbidity Score	1.035 (1.011-1.059)	0.004
Number of unique prescriptions	1.004 (0.998-1.010)	0.167
Area deprivation index		
Q1 (least deprived)	[1 ref]	
Q2	1.043 (0.925-1.176)	0.493
Q3	1.106 (0.982-1.246)	0.097
Q4 (most deprived)	1.068 (0.944-1.208)	0.296
Distance from hospital		
<10	[1 ref]	
10-50	0.894 (0.803-0.996)	0.042
50+	0.733 (0.653-0.823)	<0.001
Hospital volume	1.001 (1.000-1.002)	0.063
Laterality		
Right	[1 ref]	
Left	0.991 (0.911-1.078)	0.830
Tumor location		
Upper lobe	[1 ref]	
Middle or lower lobe	1.025 (0.936-1.123)	0.591

Variable	aHR, 95% CI	P-Value
Tumor size		
≤10	[1 ref]	
11-20	1.073 (0.911-1.264)	0.400
21-30	1.361 (1.151-1.609)	<0.001
31-40	1.593 (1.329-1.909)	<0.001
>40	1.589 (1.287-1.963)	<0.001
Unknown	1.172 (0.850-1.615)	0.333
Histology		
Adenocarcinoma	[1 ref]	
Squamous cell carcinoma	0.892 (0.811-0.980)	0.018
Other	1.077 (0.949-1.222)	0.251

eFigure 2. Relationship Between VALCAN-O and Overall Survival and Recurrence-free

Survival in Subgroups Based on Pulmonary Function (A, B), Surgical Year (C, D), and Final
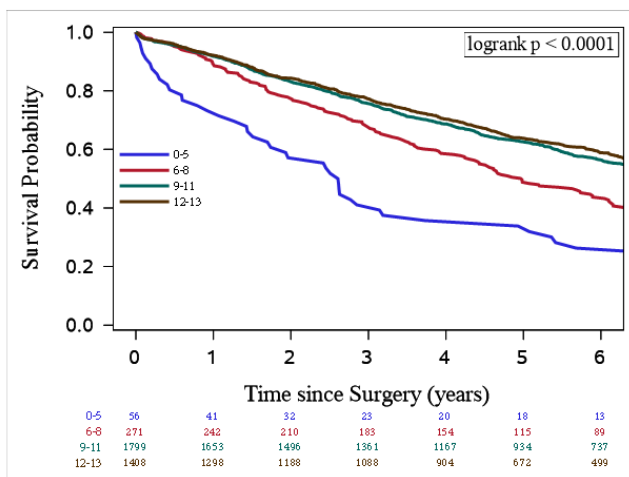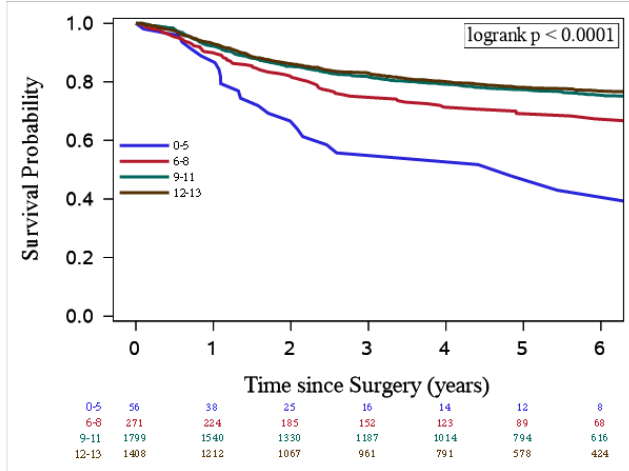
Pathologic Stage (E, F)

(A)
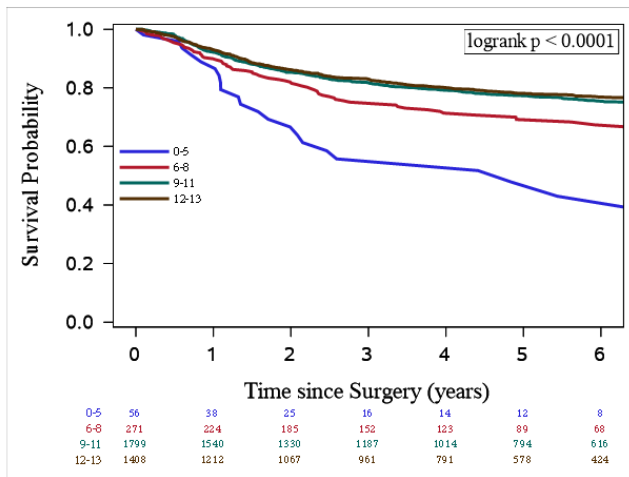
(B)

Recurrence-free Survival
FEV1 ≥ 80%

FEV1 = 50-79%

FEV1 < 50%

(C)

Overall Survival

2006-2011

2012-2016

(D)

Recurrence-free Survival

2006-2011

2012-2016

(E)

Overall Survival
Path stage I

Path stage II-III

(F)

Recurrence-free Survival
Path stage I

Path stage II-III
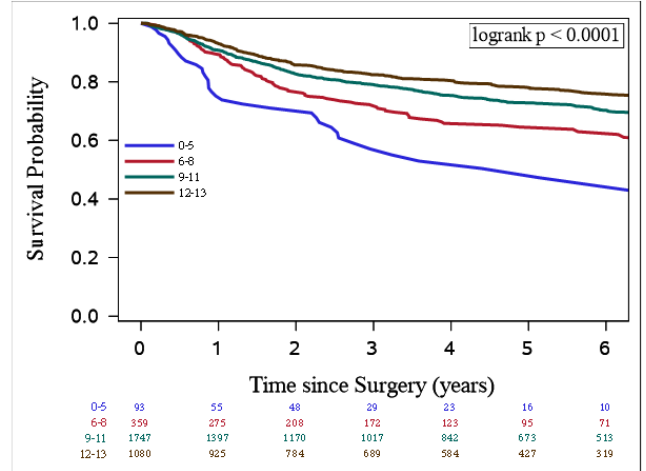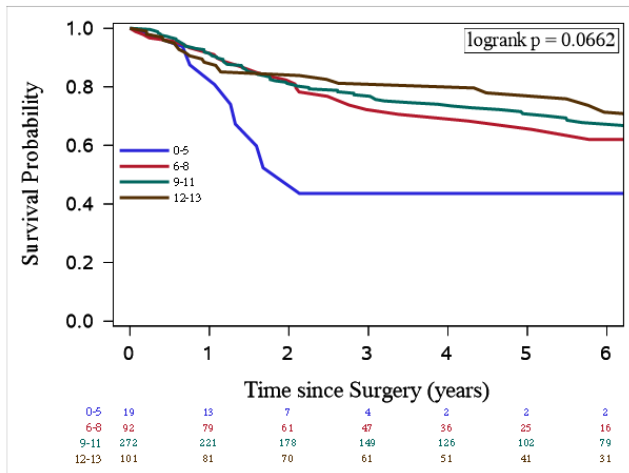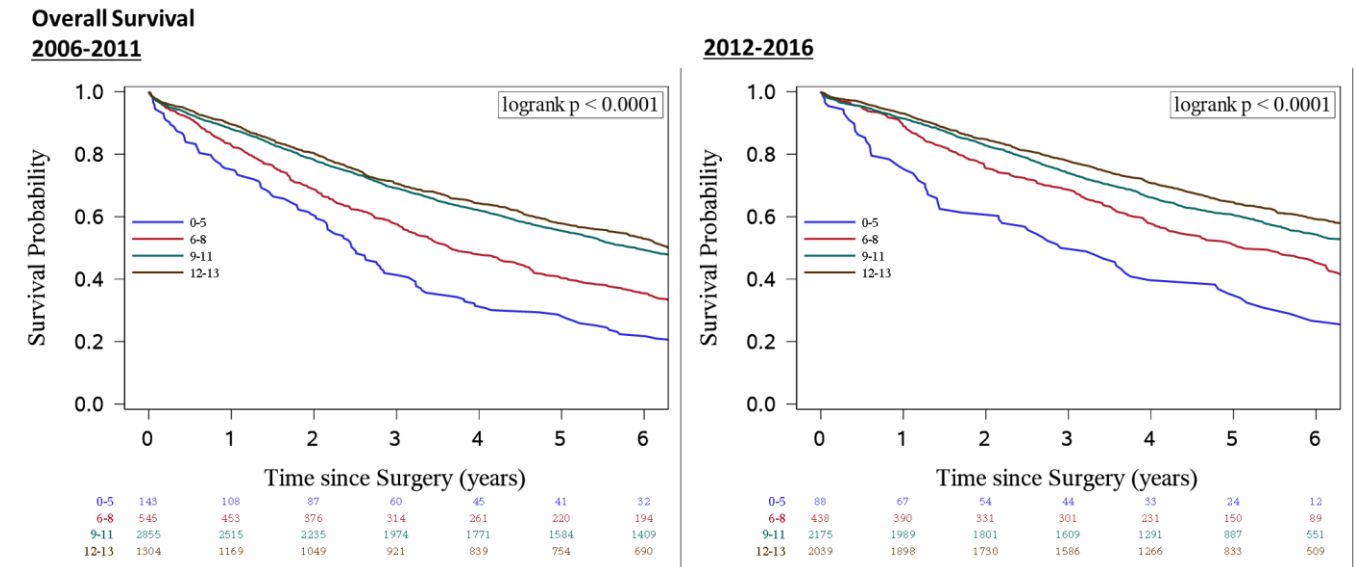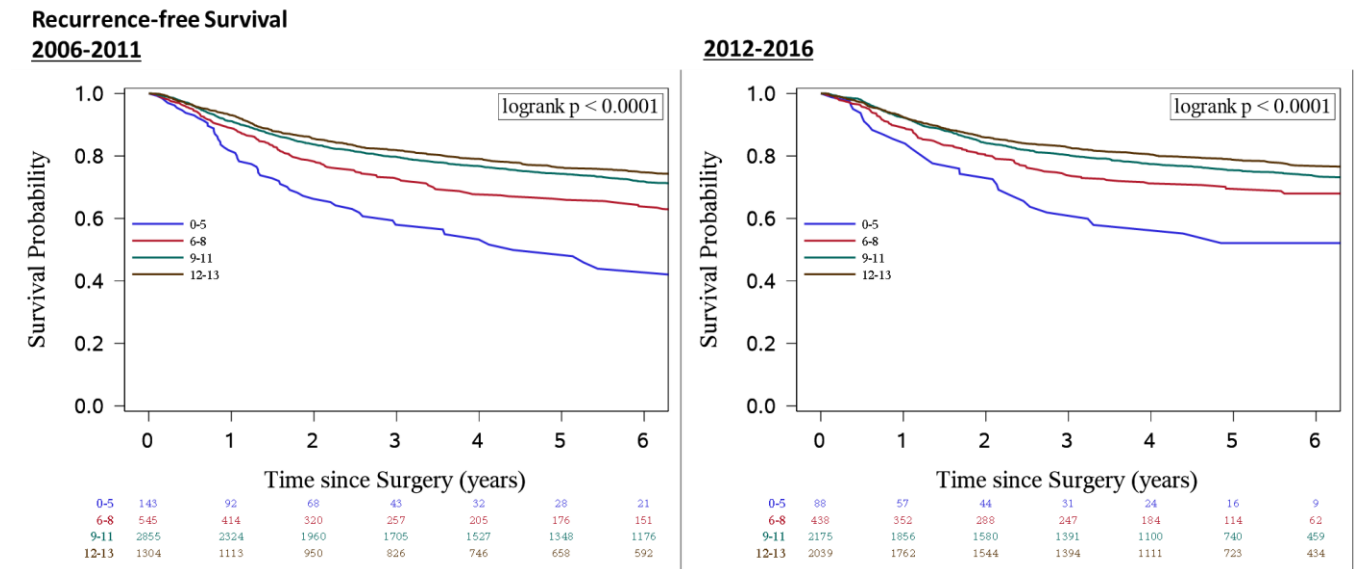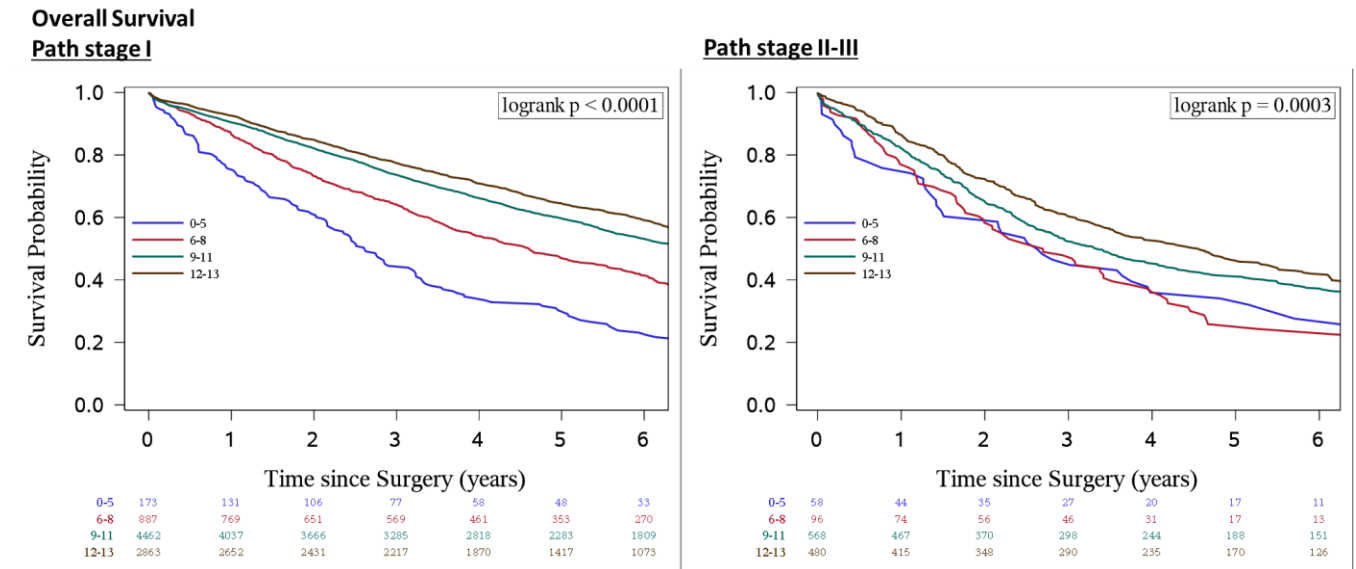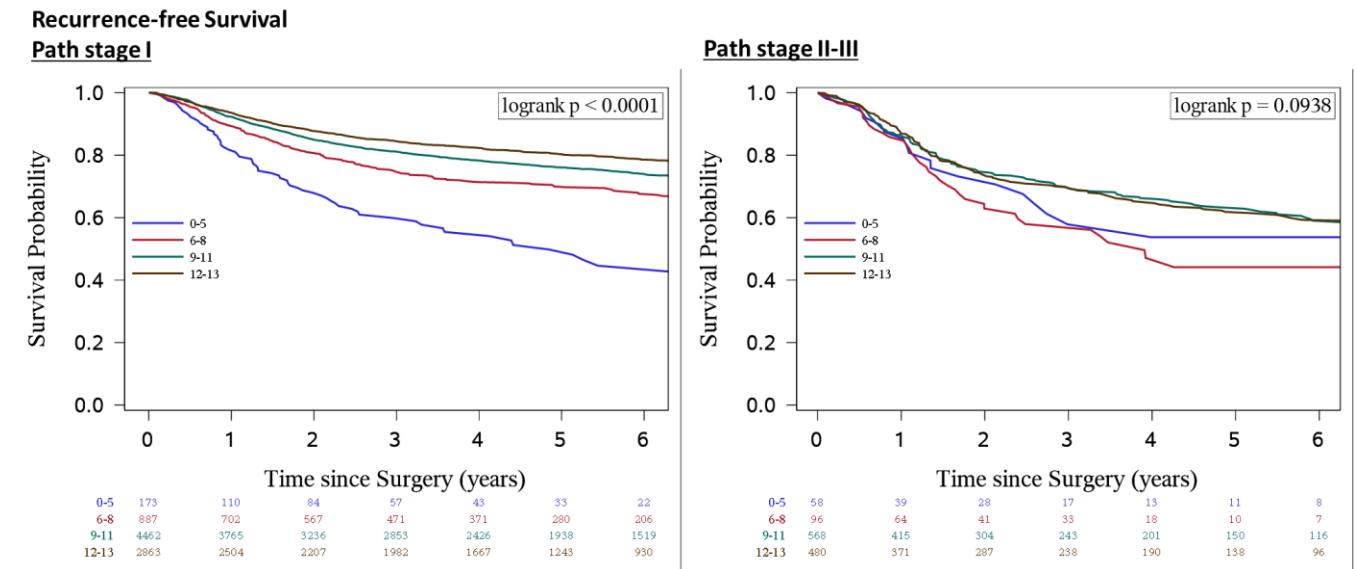
eTable 3. Validation Cohort (NCDB)

Variables	Validation cohort N=107,674
Age (SD)	67.80 (9.77)
Sex (%)	
Male	46,859 (43.52)
Female	60,815 (56.48)
Race (%)	
White	94,899 (88.14)
Black	8,841 (8.21)
Other	3,305 (3.07)
Unknown	629 (0.58)
Charlson comorbidity score (%)	
0	53,439 (49.63)
1	36,826 (34.20)
2	12,769 (11.86)
3+	4,640 (4.31)
Distance from hospital (miles, %)	
<10	46,184 (42.89)
10-50	40,163 (37.30)
50+	11,471 (10.65)
Unknown	9,856 (9.15)
Histology (%)	
Adenocarcinoma	68,396 (63.52)
Squamous cell carcinoma	25,284 (23.48)
Other	13,994 (13.00)
Tumor Size (mm, %)	
≤ 10	10,710 (9.95)
11-20	44,601 (41.42)
21-30	30,732 (28.54)
31-40	14,979 (13.91)
>40	6,652 (6.18)
Surgical Quality Metrics	
Timely surgery (%)	
≤ 8 weeks	85,142 (79.07)
>8 weeks	22,532 (20.93)
Incision (%)	
Thoracotomy	65,475 (60.81)
Minimally invasive	42,199 (39.19)
Resection (%)	
Lobectomy	78,195 (72.62)
Wedge	22,861 (21.33)
Segmentectomy	5,225 (4.85)
Pneumonectomy	1,393 (1.29)

Variables	Validation cohort N=107,674
Nodal sampling adequacy (%)	
0 LN	12,416 (11.53)
1-4 LN	25,041 (23.26)
5-9 LN	32,332 (30.03)
≥10 LN	37,885 (35.18)
Margin (%)	
R0	104,778 (97.31)
R1+	2,896 (2.69)