

Supplemental online content for:

## Impact of the Extent of Lymph Node Dissection on Precise Staging and Survival in Clinical I–II Pure-Solid Lung Cancer Undergoing Lobectomy

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**eFigure 1:** Distribution of the Number of ELNs and ENSs in the Patient Cohort

**eFigure 2:** Distribution of Involved Node Stations According to Different Primary Tumor Locations in Radiologically Pure-Solid NSCLC

**eFigure 3:** Number of Examined Lymph Nodes and Node Stations Among Different T Stages, N Stages, and Tumor Locations

**eFigure 4:** Locally Weighted Least Squares Smoothing of Percentage of Patients With at Least One Positive Lymph Node or One Involved Node Station

**eFigure 5:** LOWESS Smoother Fitting Curves of Estimated Probabilities of Undetected Positive ELNs or ENSs and Determination of Structural Break Points With Use of the Chow Test in Patients With Declared Node-Negative Disease

**eFigure 6:** Stratification of OS at Cut Point of Number of ELNs and ENSs

**eTable 1:** Baseline Characteristics of the Patient Cohort

**eTable 2:** Variants in LASSO Regression Analysis of Screening Data in Survival Analysis

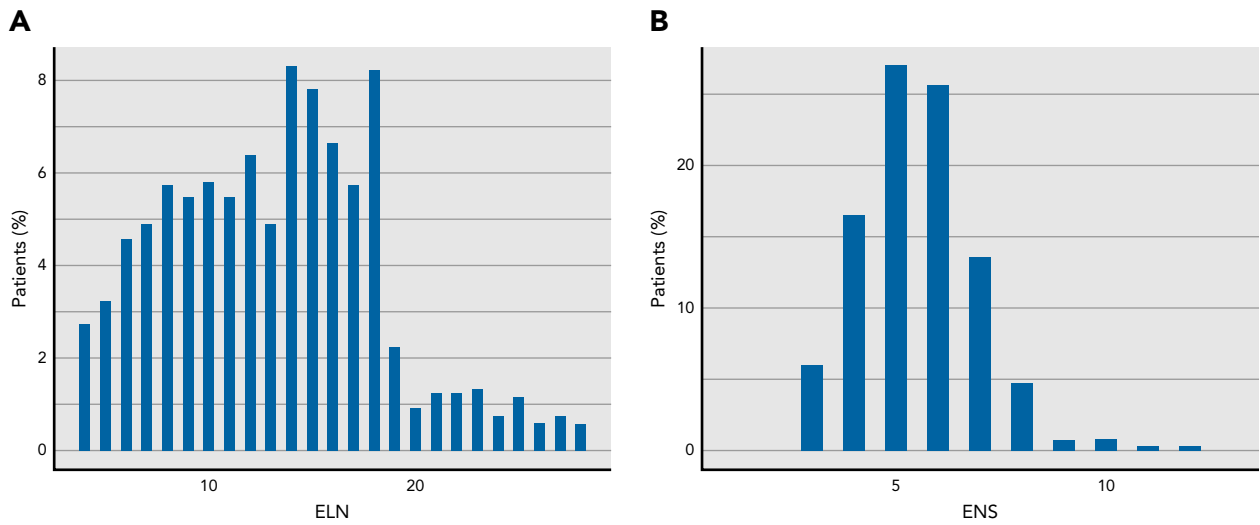
**eTable 3:** Variants in LASSO Regression Analysis of Screening Data in Multivariate Logistic Regression Analysis

**eTable 4:** Accuracy of Number of Positive Node Number

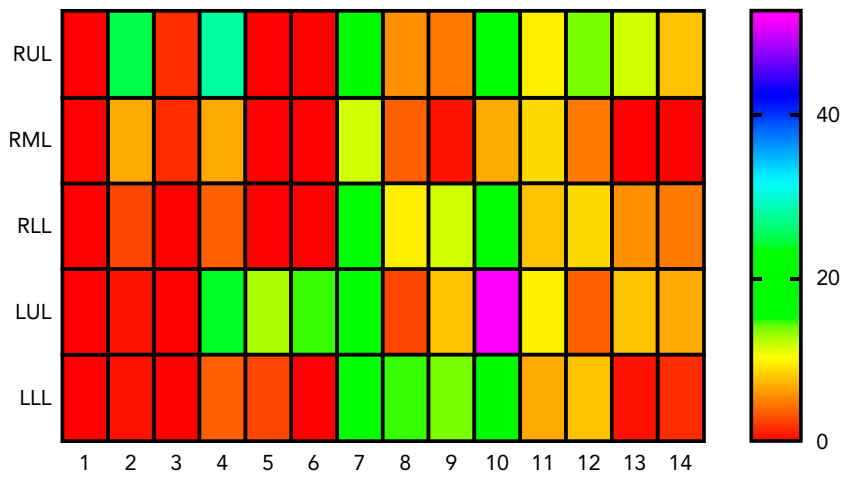
**eTable 5:** Accuracy of Number of Positive Station Number

**eTable 6:** Probability of Having M+1 or More Positive Nodes Given the Observation of M-Positive Nodes in N-Resected Nodes

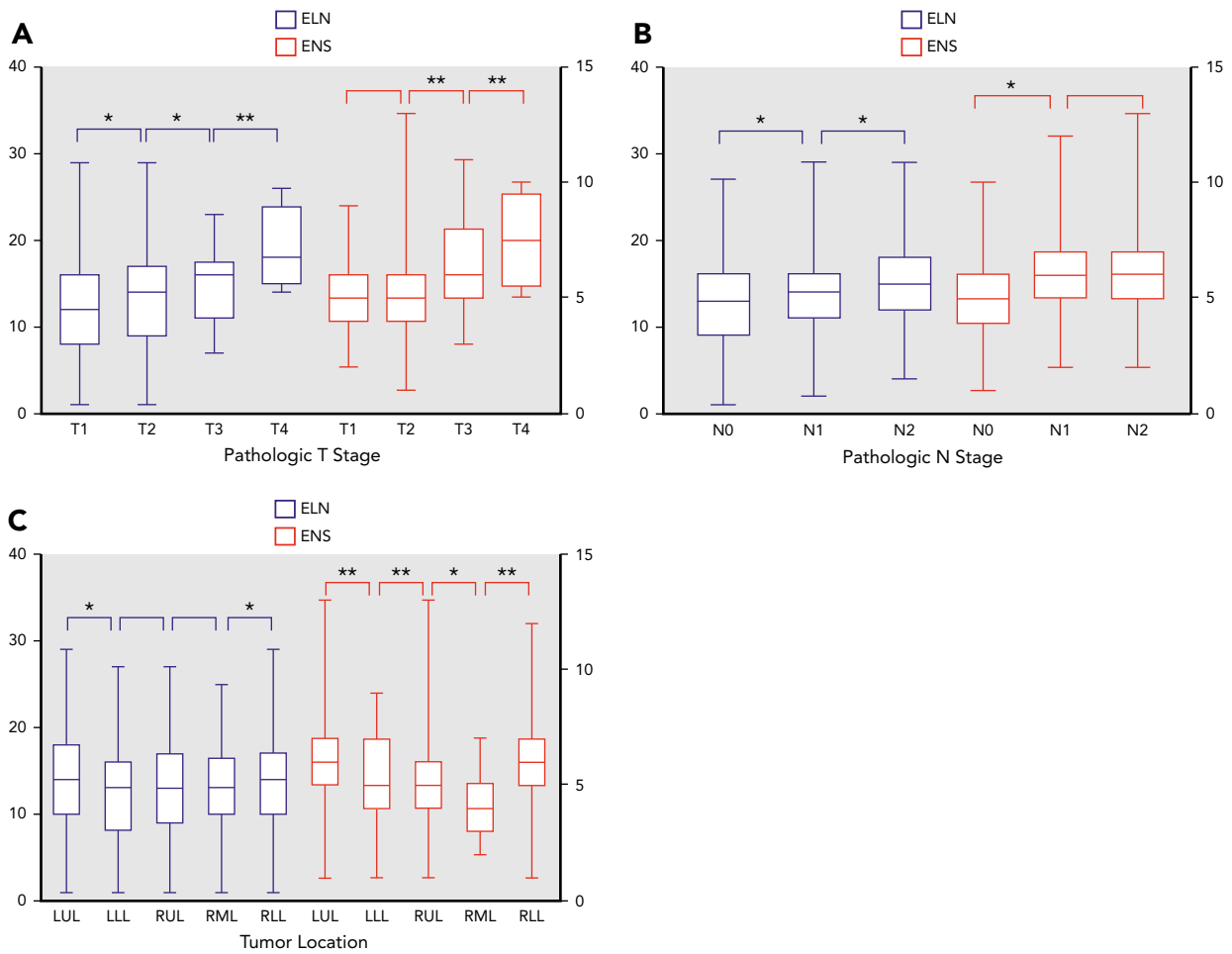
**eTable 7:** Probability of Having M+1 or More Positive Node Stations Given the Observation of M Stations With Positive Nodes in S-Examined Node Stations



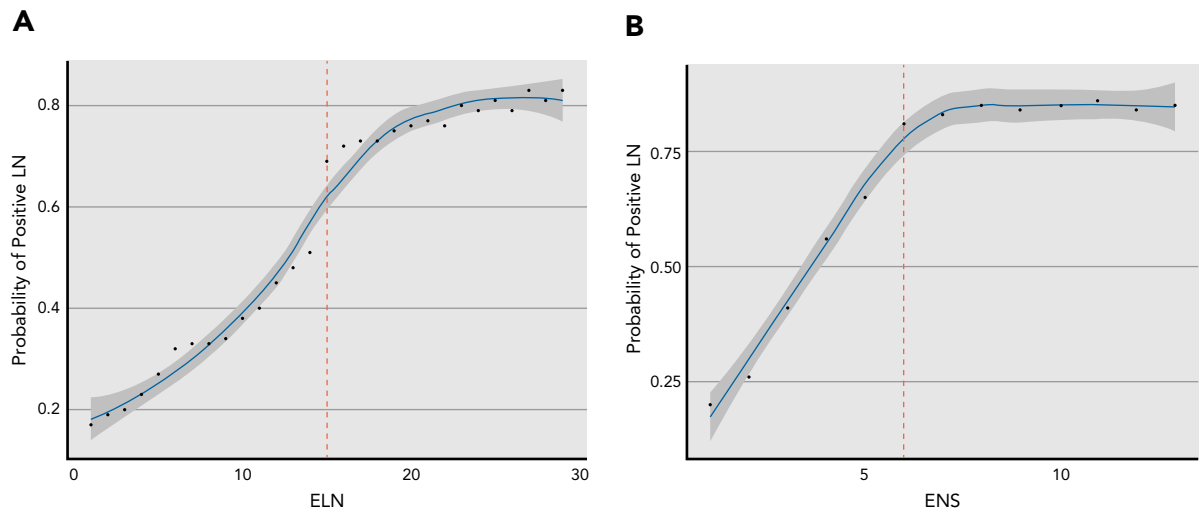
**eFigure 1.** Distribution of the number of (A) ELNs and (B) ENSs in the patient cohort. Abbreviations: ELN, examined lymph node; ENS, examined node station.



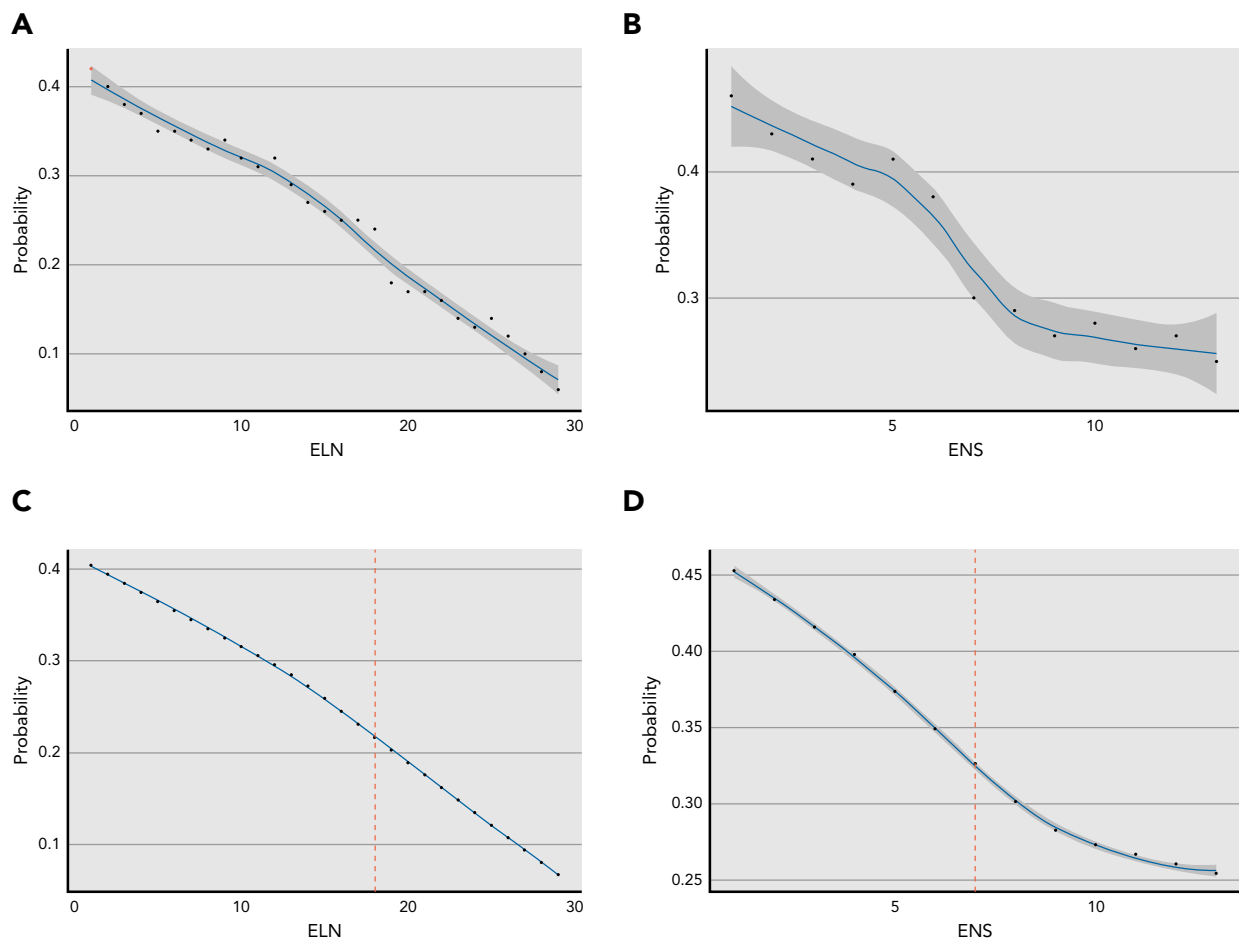
**eFigure 2.** Distribution of involved node stations according to different primary tumor locations in radiologically pure-solid NSCLC. Colors in the right bar correspond to numbers of patients with node metastasis. Abbreviations: LLL, left lower lobe; LUL, left upper lobe; NSCLC, non-small cell lung cancer; RLL, right lower lobe; RML, right middle lobe; RUL, right upper lobe.



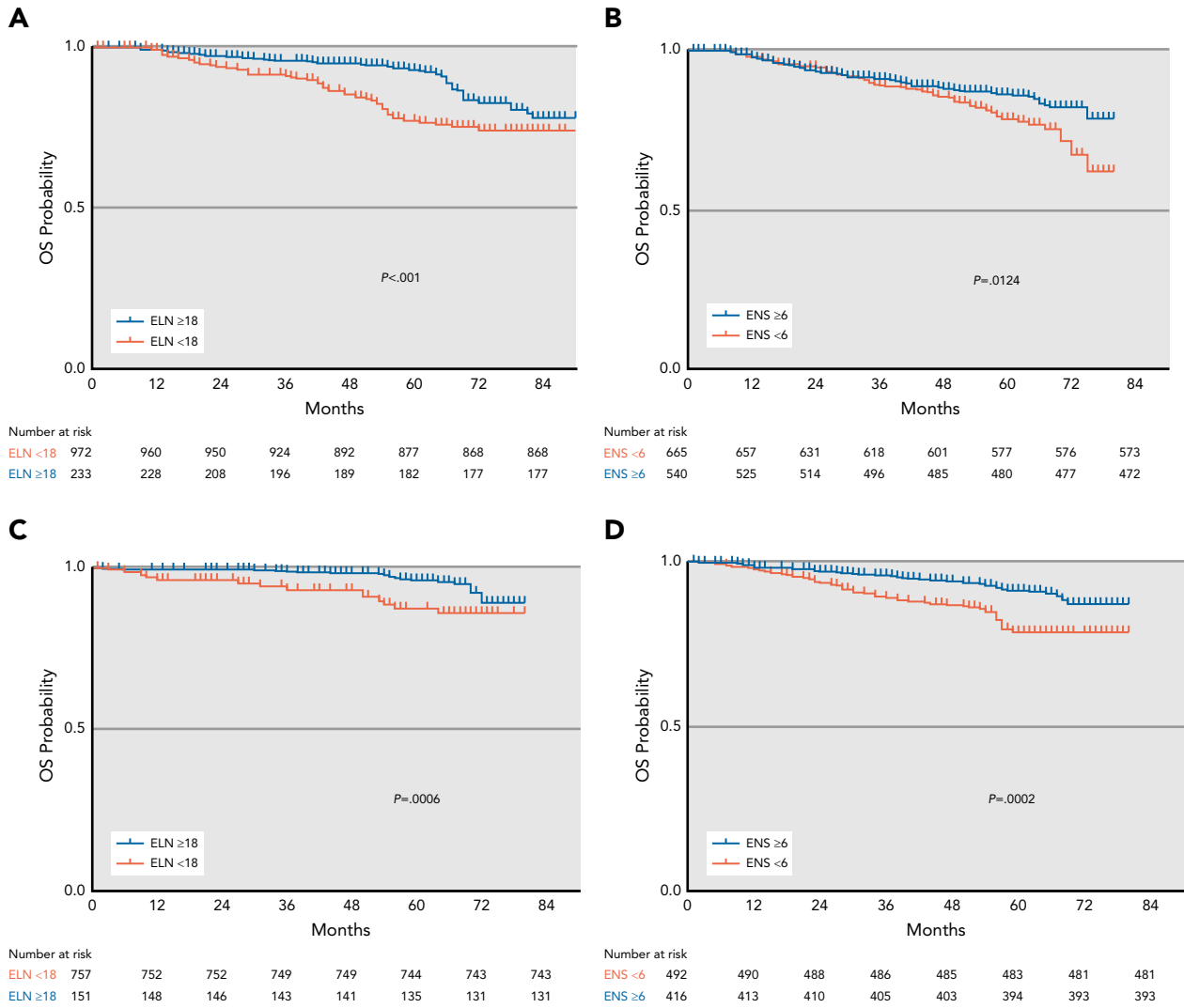
**Figure 3.** Number of ELNs and ENSs among different (A) T stages, (B) N stages, and (C) and tumor locations. Abbreviations: ELN, examined lymph node; ENS, examined node station; LLL, left lower lobe; LUL, left upper lobe; NSCLC, non-small cell lung cancer; RLL, right lower lobe; RML, right middle lobe; RUL, right upper lobe. \* $P < .05$ . \*\* $P < .01$ .



**Figure 4.** Locally weighted least squares smoothing of percentage of patients with at least one positive LN or one involved node station as a function of the number of (A) ELNs and (B) ENSs, respectively. Abbreviations: ELN, examined lymph node; ENS, examined node station; LN, lymph node.



**Figure 5.** LOWESS smoother fitting curves of estimated probabilities of (A, B) undetected positive ELNs or ENSs and (C, D) determination of structural break points using the Chow test in patients with declared node-negative (pN0) disease. Abbreviations: ELN, examined lymph node; ENS, examined node station; LOWESS, locally weighted scatterplot smoothing.



**Figure 6.** Stratification of OS at the cut point of the number of ELNs and ENSs in (A, B) the entire patient cohort and (C, D) patients with declared node-negative (pN0) disease.

Abbreviations: ELN, examined lymph node; ENS, examined node station; OS, overall survival.

eTable 1. Baseline Characteristics of the Patient Cohort (N=1,205)	
Characteristic	n (%)
Sex	
Male	701 (58.17)
Female	504 (41.83)
Age, y	
≤60	626 (51.95)
>60	579 (48.05)
Smoking history	
Yes	472 (39.17)
No	733 (60.83)
Operated side	
Left	557 (46.22)
Right	648 (53.78)
Tumor location	
Upper lobe	731 (60.66)
Middle lobe	66 (5.48)
Lower lobe	408 (33.86)
EBUS-TBNA	
Yes	726 (60.25)
No	479 (39.75)
Mediastinoscopy	
Yes	131 (10.87)
No	1,074 (89.13)
cT	
T1	438 (36.35)
T2	767 (63.65)
cN	
N0	1,078 (89.46)
N1	127 (10.54)
pT	
T1	577 (47.88)
T2	614 (50.95)
T3	10 (0.83)
T4	4 (0.33)
pN	
N0	908 (75.35)
N1	131 (10.87)
N2	166 (13.78)

(continued)

eTable 1. Baseline Characteristics of the Patient Cohort (N=1,205) (cont.)	
Characteristic	n (%)
pTNM	
Ia	460 (38.17)
Ib	408 (33.86)
IIa	74 (6.14)
IIb	87 (7.22)
IIIa	173 (14.36)
IIIb	1 (0.08)
IV	2 (0.17)
Histologic type	
Squamous cell carcinoma	226 (18.76)
Adenocarcinoma	884 (73.36)
Adenosquamous carcinoma	41 (3.40)
Large cell carcinoma	31 (2.57)
Others	23 (1.91)
Grade of differentiation	
Well differentiated	80 (6.64)
Moderately differentiated	723 (60)
Poorly differentiated	233 (19.34)
Not determined	169 (14.02)
Visceral pleural involvement	
Yes	450 (37.34)
No	755 (62.66)
Surgical approach	
VATS	1,068 (88.63)
Thoracotomy	137 (11.37)
Number of N1 nodes examined	
≤4	632 (52.45)
>4	573 (47.55)
Positive N1 nodes	
Yes	228 (18.92)
No	977 (81.08)
Number of N2 nodes examined	
≤7	605 (50.21)
>7	600 (49.79)
Positive N2 nodes	
Yes	169 (14.02)
No	1,036 (85.98)
Total number of examined nodes	
≤11	493 (40.91)
>11	712 (59.09)

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**eTable 1. Baseline Characteristics of the Patient Cohort (N=1,205) (cont.)**

Characteristic	n (%)
Positive lymph nodes	
Yes	299 (24.81)
No	906 (75.19)
Adjuvant chemotherapy	
Yes	628 (52.12)
No	577 (47.88)
Adjuvant radiotherapy	
Yes	62 (5.15)
No	1,143 (94.85)
Locoregional recurrence	
Yes	232 (19.25)
No	973 (80.75)
Distant metastasis	
Yes	184 (15.27)
No	1,021 (84.73)
cN/pN upstaging	
Yes	170 (14.11)
No	1,035 (85.89)

Abbreviations: c, clinical; EBUS-TBNA, endobronchial ultrasound-guided transbronchial needle aspiration; p, pathologic; VATS, video-assisted thoracoscopic surgery.

**eTable 2. Variants in LASSO Regression Analysis of Screening Data for Survival Analysis**

Characteristics	Variant Attributes
Sex	Categorical
Age	Continuous
Smoking history	Categorical
Operated side	Categorical
Tumor location	Categorical
pT	Categorical
pN	Categorical
pM	Categorical
Histologic type	Categorical
Grade of differentiation	Categorical
Surgical approach	Categorical
Number of N1 stations	Continuous
Number of N1 nodes examined	Continuous
Number of N2 stations	Continuous
Number of N2 nodes examined	Continuous
Adjuvant chemotherapy	Categorical
Adjuvant radiotherapy	Categorical
Total number of stations	Continuous
Total number of examined nodes	Continuous
Lymph node ratio	Continuous

Abbreviation: p, pathologic.

**eTable 3. Variants in LASSO Regression Analysis of Screening Data for Multivariate Logistic Regression Analysis**

Characteristics	Variant Attributes
Sex	Categorical
Age	Continuous
Smoking history	Categorical
Operated side	Categorical
Tumor location	Categorical
pT	Categorical
EBUS-TBNA	Categorical
Mediastinoscopy	Categorical
Histologic type	Categorical
Grade of differentiation	Categorical
Surgical approach	Categorical
Number of N1 stations	Continuous
Number of N1 nodes examined	Continuous
Number of N2 stations	Continuous
Number of N2 nodes examined	Continuous
Total number of stations	Continuous
Total number of examined nodes	Continuous

Abbreviations: EBUS-TBNA, endobronchial ultrasound-guided transbronchial needle aspiration; p, pathologic.



**eTable 4. Accuracy of Number of Positive Nodes**

No. of Harvested Lymph Nodes	No. of Positive Nodes Observed												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	12.42%												
2	14.21%	6.06%											
3	16.04%	7.66%	1.51%										
4	17.90%	9.50%	2.08%	0.64%									
5	19.79%	11.52%	2.83%	0.90%	0.26%								
6	21.72%	13.70%	3.80%	1.28%	0.36%	0.10%							
7	23.70%	15.99%	5.01%	1.81%	0.51%	0.13%	0.02%						
8	25.74%	18.36%	6.46%	2.57%	0.72%	0.18%	0.03%	0.01%					
9	27.86%	20.82%	8.14%	3.61%	1.04%	0.26%	0.03%	0.01%	<0.01%				
10	30.06%	23.36%	10.01%	5.02%	1.50%	0.36%	0.05%	0.03%	0.01%	<0.01%			
11	32.36%	26.00%	12.04%	6.85%	2.19%	0.52%	0.06%	0.03%	0.01%	<0.01%	<0.01%		
12	34.77%	28.76%	14.20%	9.15%	3.19%	0.75%	0.09%	0.05%	0.03%	0.01%	<0.01%	<0.01%	
13	37.29%	31.65%	16.47%	11.90%	4.64%	1.10%	0.12%	0.09%	0.05%	0.03%	0.01%	<0.01%	<0.01%
14	39.92%	34.70%	18.86%	15.01%	6.69%	1.63%	0.18%	0.13%	0.10%	0.07%	0.05%	0.03%	<0.01%
15	42.69%	37.92%	21.38%	18.41%	9.51%	2.43%	0.26%	0.19%	0.15%	0.11%	0.07%	0.03%	0.01%
16	45.58%	41.32%	24.08%	22.00%	13.19%	3.66%	0.38%	0.25%	0.19%	0.15%	0.11%	0.08%	0.03%
17	48.61%	44.92%	27.00%	25.72%	17.77%	5.50%	0.57%	0.32%	0.25%	0.19%	0.15%	0.11%	0.06%
18	51.79%	48.72%	30.18%	29.57%	23.12%	8.24%	0.87%	0.54%	0.32%	0.24%	0.19%	0.16%	0.10%
19	55.12%	52.71%	33.67%	33.56%	29.05%	12.17%	1.34%	0.88%	0.59%	0.36%	0.25%	0.21%	0.16%
20	58.61%	56.89%	37.54%	37.75%	35.30%	17.61%	2.07%	1.41%	0.91%	0.62%	0.38%	0.26%	0.20%
21	62.27%	61.24%	41.83%	42.22%	41.69%	24.76%	3.20%	2.12%	1.52%	0.96%	0.64%	0.41%	0.29%
22	66.12%	65.77%	46.61%	47.05%	48.09%	33.64%	4.93%	3.27%	2.35%	1.61%	1.16%	0.74%	0.43%
23	70.17%	70.43%	51.95%	52.33%	54.49%	43.99%	7.50%	5.12%	3.74%	2.69%	1.98%	1.28%	0.89%
24	74.44%	75.22%	57.91%	58.17%	60.93%	55.32%	11.26%	7.92%	5.87%	4.02%	2.81%	2.02%	1.35%
25	78.95%	80.10%	64.59%	64.69%	67.54%	66.95%	16.72%	12.56%	8.15%	6.16%	4.27%	2.98%	2.41%
26	83.72%	85.05%	72.04%	72.00%	74.46%	78.02%	24.76%	18.96%	14.87%	9.52%	7.81%	4.52%	3.82%
27	88.80%	90.03%	80.37%	80.24%	81.94%	87.63%	37.34%	26.12%	19.12%	15.72%	10.63%	8.75%	6.03%
28	94.21%	95.03%	89.66%	89.54%	90.30%	95.01%	59.14%	39.34%	28.25%	21.62%	16.77%	12.06%	8.89%
29	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	65.27%	41.28%	30.58%	22.81%	16.89%	10.02%

**eTable 5. Accuracy of Number of Positive Stations**

No. of Node Stations Examined	No. of Positive Nodes Observed					
	1	2	3	4	5	6
1	32.10%					
2	37.01%	24.17%				
3	47.10%	28.26%	16.11%			
4	48.08%	33.00%	19.03%	18.25%		
5	49.84%	38.39%	22.64%	20.75%	17.33%	
6	54.98%	44.47%	27.13%	23.83%	19.87%	15.54%
7	60.39%	51.19%	32.71%	27.65%	22.53%	20.37%
8	66.07%	58.47%	39.66%	32.69%	27.71%	26.65%
9	72.06%	66.22%	48.25%	38.76%	33.54%	31.12%
10	78.40%	74.31%	58.71%	47.10%	40.43%	38.87%
11	85.13%	82.65%	71.12%	58.56%	51.31%	46.25%
12	92.31%	91.19%	85.18%	75.00%	69.02%	63.87%
13	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**eTable 6. Probability of Having M+1 or More Positive Nodes Given the Observation of M-Positive Nodes in N-Resected Nodes**

No. of Harvested Lymph Nodes (N)	No. of Positive Nodes Observed													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
1	40.12%	47.51%												
2	38.59%	43.03%	87.76%											
3	37.26%	39.87%	83.64%	99.23%										
4	36.08%	36.32%	78.08%	97.92%	100.00%									
5	34.87%	33.44%	74.01%	97.17%	100.00%	100.00%								
6	33.25%	29.58%	69.82%	96.20%	100.00%	100.00%	100.00%							
7	32.17%	25.09%	65.61%	94.99%	100.00%	100.00%	100.00%	100.00%						
8	31.09%	22.17%	61.46%	93.54%	100.00%	100.00%	100.00%	100.00%	100.00%					
9	29.57%	19.92%	57.39%	91.86%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%				
10	28.63%	17.50%	53.41%	89.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%			
11	27.54%	15.54%	49.50%	87.96%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%		
12	26.07%	13.47%	44.95%	85.80%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	
13	24.84%	11.52%	41.48%	83.53%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
14	23.18%	9.71%	37.14%	79.53%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
15	21.76%	8.02%	33.45%	77.38%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
16	20.03%	6.52%	30.25%	75.30%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
17	18.72%	5.19%	26.70%	72.16%	97.54%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
18	17.64%	4.02%	23.16%	68.66%	92.13%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
19	16.32%	3.02%	19.62%	65.68%	86.71%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
20	15.11%	2.18%	16.28%	62.13%	78.12%	96.57%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
21	13.69%	1.48%	13.10%	58.02%	70.39%	92.36%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
22	12.25%	0.96%	10.14%	53.33%	63.44%	88.57%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
23	11.03%	0.57%	7.45%	48.04%	58.56%	81.65%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
24	9.73%	0.29%	5.10%	42.08%	52.19%	76.58%	93.59%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
25	8.11%	0.12%	3.13%	35.41%	47.54%	71.26%	89.01%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
26	7.23%	0.03%	1.60%	27.96%	39.47%	67.87%	83.16%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
27	6.16%	0.00%	0.54%	19.63%	31.58%	61.77%	75.28%	98.74%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
28	5.23%	0.00%	0.00%	10.35%	24.36%	56.21%	70.68%	96.12%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
29	3.66%	0.00%	0.00%	0.00%	12.59%	50.27%	65.13%	93.87%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**eTable 7. Probability of Having M+1 or More Positive Node Stations Given the Observation of M Stations With Positive Nodes in S-Examined Node Stations**

No. of Node Stations Examined (S)	No. of Positive Nodes Observed						
	0	1	2	3	4	5	6
1	44.55%	49.55%					
2	43.21%	47.52%	55.72%				
3	42.02%	43.52%	52.42%	87.42%			
4	40.85%	39.42%	47.89%	80.42%	100.00%		
5	39.02%	36.21%	42.42%	72.79%	100.00%	100.00%	
6	37.69%	33.15%	39.75%	63.28%	100.00%	100.00%	100.00%
7	36.14%	29.24%	35.47%	55.28%	95.01%	100.00%	100.00%
8	34.95%	26.72%	29.54%	41.32%	87.21%	92.10%	100.00%
9	33.54%	22.78%	23.45%	30.27%	79.14%	83.10%	100.00%
10	32.01%	19.12%	20.01%	14.22%	56.78%	67.20%	79.70%
11	30.87%	15.47%	12.23%	3.21%	32.17%	48.70%	68.20%
12	26.85%	8.12%	2.12%	0.00%	13.13%	24.70%	41.23%
13	22.89%	0.00%	0.00%	0.00%	0.00%	9.20%	18.57%