

Prediction of major cardiovascular events after lung resection using a modified scoring system

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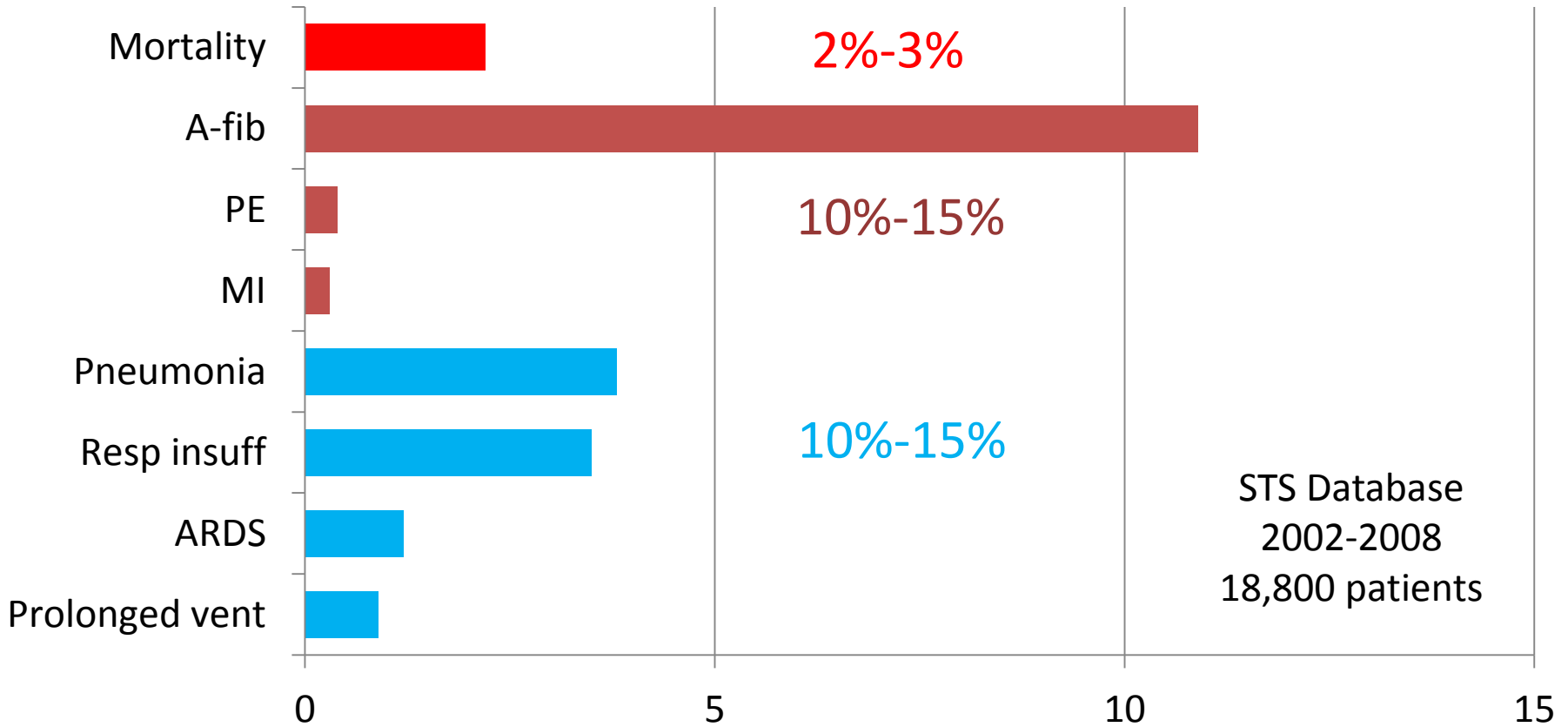
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Major lung resection morbidity



Cardiovascular Complications

- Associated with
 - Prolonged LOS
 - Greater resource utilization
 - Increased costs of care
- Identification of patients at risk
 - Preoperative evaluation
 - Patient selection for surgery
 - Informed consent
 - Resource utilization

Revised Cardiac Risk Index (RCRI)

- CRI published in 1977
- RCRI published in 1999
 - Only 12% of derivation pool “thoracic”
 - Recent review identified only 6% “thoracic”
- Brunelli and others demonstrated only moderate predictive ability
- Developed thoracic specific index: ThRCRI

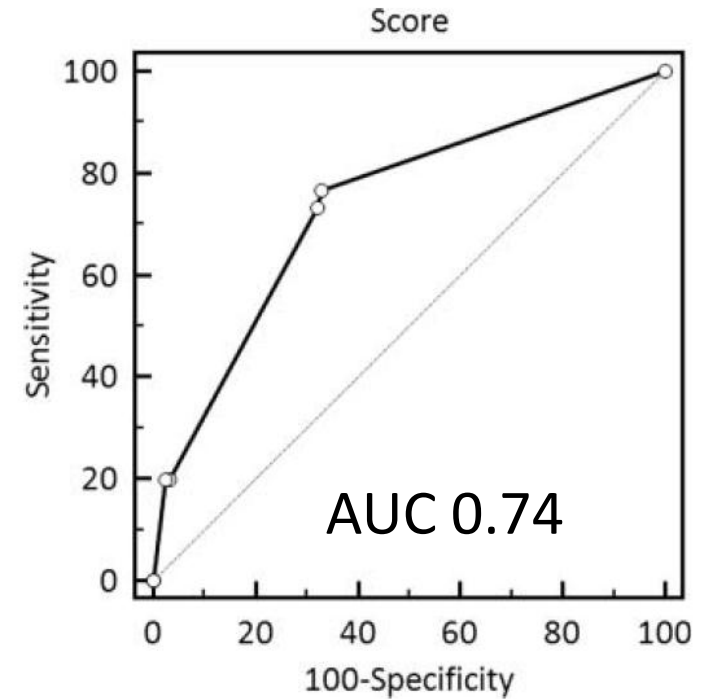
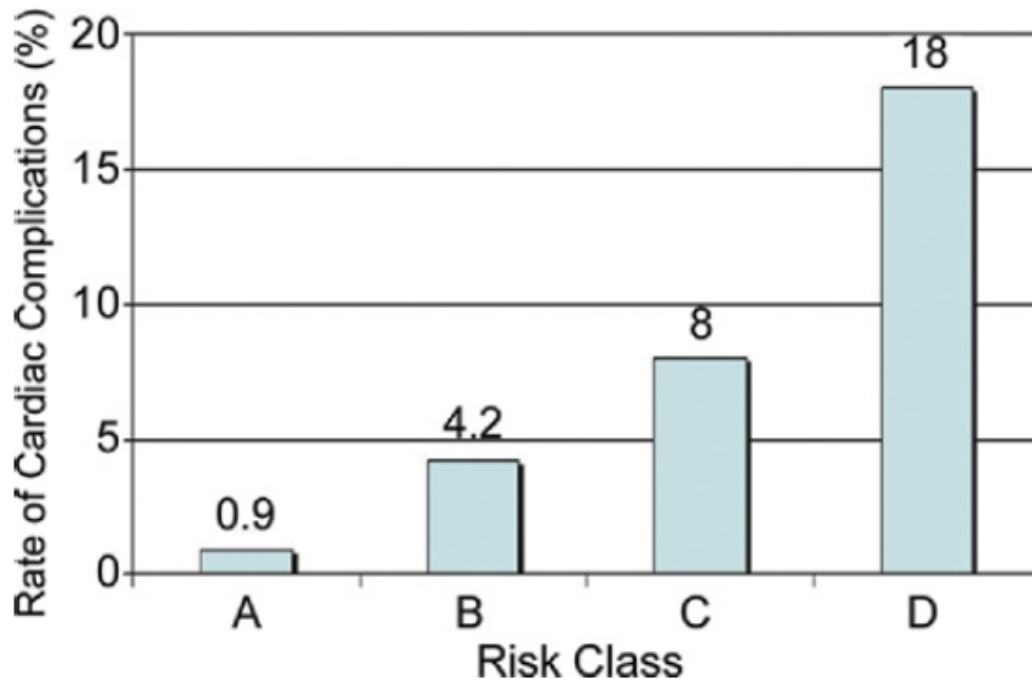
RCRI vs ThRCRI

RCRI	ThRCRI
Creatinine >2 mg/dL	Creatinine >2 mg/dL
Cerebrovascular disease	Cerebrovascular disease
Coronary artery disease	Coronary artery disease
High risk surgery	Pneumonectomy
Diabetes requiring insulin	
Congestive heart failure	

RCRI vs ThRCRI

Risk Class	RCRI	ThRCRI
A	-	1.5%
B	2.3%	5.8%
C	6%	19%
D	7.5%	23%
p value	0.001	<0.0001
c index	0.62	0.72

Validation studies



Question

- Characteristics of derivation and validation studies
 - Single institution
 - Centers of excellence
 - Relatively small numbers
- How applicable is ThRCRI to a general population of lung resection patients?

Methods

- STS General Thoracic Database 2003-2011
- Elective major lung resection
- Major cardiovascular complications
 - MI
 - ARDS
 - Ventricular arrhythmia
 - In-hospital death

ThRCRI Scoring

Category	Score
Creatinine \geq 2; dialysis	1
CAD	1.5
Cerebrovascular disease	1.5
Pneumonectomy	1

Risk Category	Score
A	0
B	1 - 1.5
C	2 - 2.5
D	>2.5

Patients

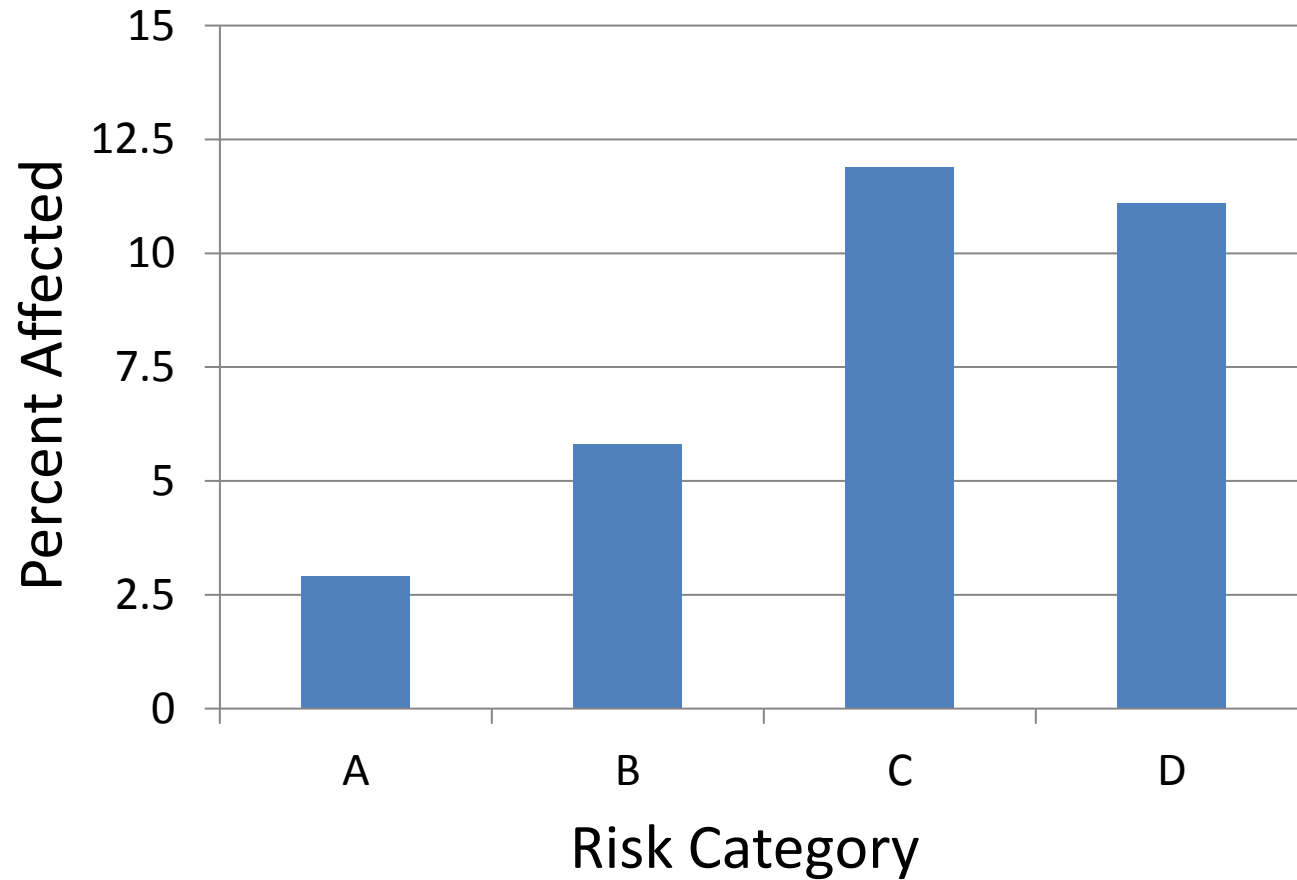
	A	B	C	D	Total
Total	16,216	8,214	261	1,394	26,085
Percent	62%	32%	1%	5%	100%

- Distribution among risk categories significantly different for:
 - Age, gender
 - BMI, ASA, DM, HTN, induction therapy

Major cardiovascular complications

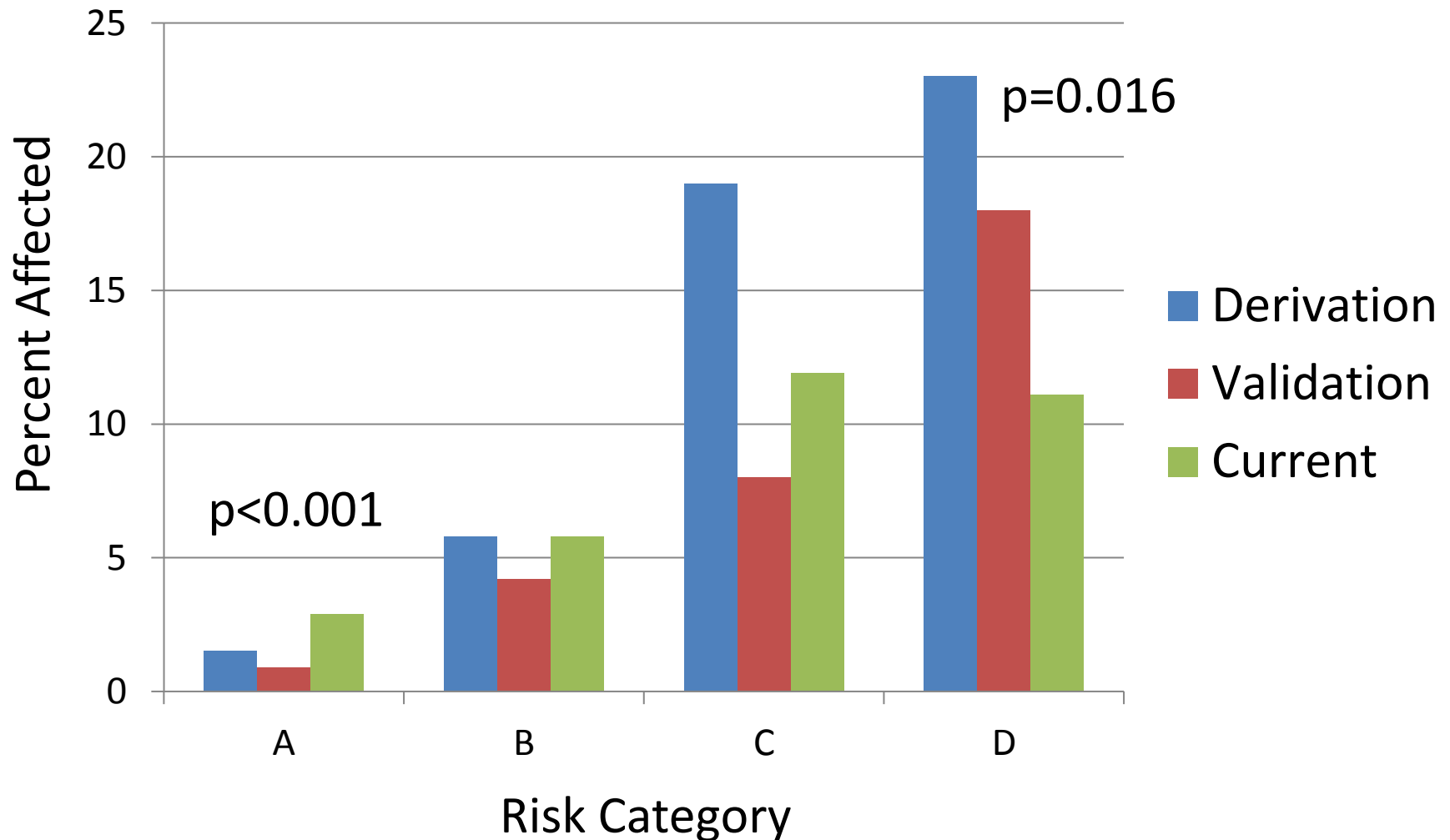
- Incidence
 - 4.3%
 - 1,125 pts
- ThRCRI score was higher in those with complications
 - 0.6 ± 0.9 with no complications
 - 1.1 ± 1.1 with complications
 - $p < 0.0001$

Incidence by risk category



p value for trend <0.001

Comparative incidence by risk category



Potential shortcomings

- STS Database not fully representative of lung resection practices in US
- Different outcomes definitions compared to derivation study
- No ability to account for concomitant procedures

Summary

- ThRCRI scores are different for patients with and without CV complications
- Risk score categories are predictive of incremental risk
- Overall incidence of complications similar to what is reported by others

Implications

- Low risk patients might be “fast-tracked”
- Higher risk patients might require closer monitoring
- Highest risk patients
 - Additional preoperative evaluation
 - Interventions to mitigate risk
- Informed decision making

Conclusions

- ThRCRI is accurate in predicting the risk of serious cardiovascular complications after major lung resection
- Use of ThRCRI might improve patient selection, resource utilization, and informed consent
- Further evaluation and refinement of the model may improve its predictive accuracy