

The Score for Prediction of Postoperative Respiratory Complications – SPORC Revisited: A Score Development and External Validation Study

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SASM

The Society of Anesthesia and Sleep Medicine

DISCLOSURES

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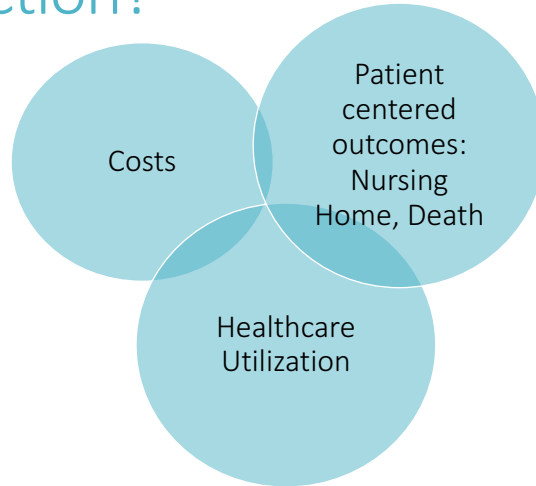
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Why focus on postoperative respiratory complication prediction?

RECOMMENDED PRACTICE BY AHRQ:

Assess risk factors:

“Determine which patients are at increased risk for postoperative respiratory failure to better prepare clinicians to anticipate adverse events postoperatively, as well as improve allocation of resources after surgery.” Agency for Healthcare Research and Quality (2015); Selected Best Practices and Suggestions for Improvement https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/systems/hospital/qitoolkit/combined/d4h_combo_psi11-postoprespfailure-bestpractices.pdf



Ramachandran SK et al. (2011) Anesthesiology 115: 44–53
 Johnson RG et al. (2007) JAm Coll Surg 204:1188-1198
 Bailey JG et al. (2016) Can J Surg; 59:172-179
 Sonny A et al. (2016) ASA Abstr 2016; A5016

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From SPORC to SPORC II



SPORC

Prediction score for preoperative risk assessment (Brueckmann et al. 2013)



Intraoperative factors?

Duration of surgery?
 Complexity of case? Drugs?
 Vital signs?
 Ventilator settings?



SPORC II

AIM:
 To incorporate preoperative + intraoperative predictors

To test whether the addition of intraoperative predictors improves predictive ability.

Brueckmann B et al. (2013) Anesthesiology 118:1276-12855

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Methodology

Design: Hospital registry study analysing data from two independent healthcare networks in Massachusetts.



Development cohort n= 90,893



Validation cohort n= 50,389

Primary Outcome: 3-day reintubation after primary post-procedural extubation.

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Predictors considered for development:

Pre- op (all SPORC variables):

- ASA physical status >3
- emergency status
- “high risk” surgical service
- chronic pulmonary disease
- heart failure

Intraoperative:

- Mean FiO_2
- Vasopressor dose
- NMBA dose
- Fluids
- Opioid dose
- Fentanyl dose
- Packed red blood cells
- Volatile anesthetics
- Protective ventilation patterns (driving pressure >15mmHG)
- Post- intubational desaturation ≤ 90 percent within five minutes

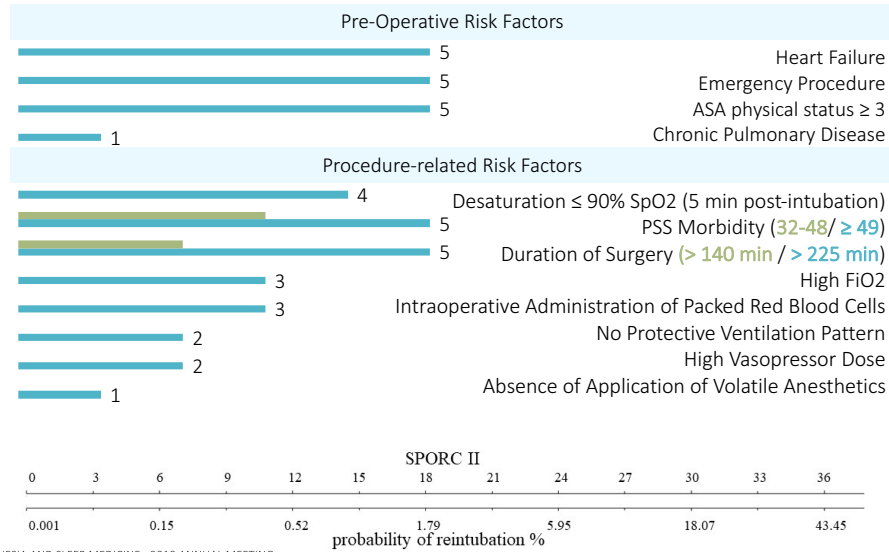
Procedure-related :

- duration of surgery
- surgical complexity (Procedure Severity Index)



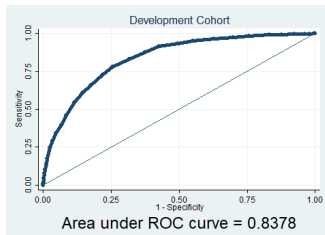
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SPORC II



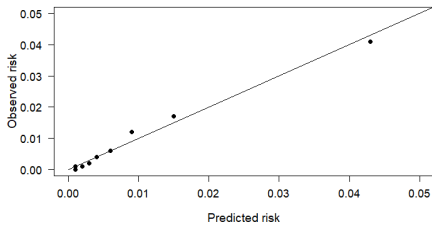
Model Performance

DEVELOPMENT COHORT

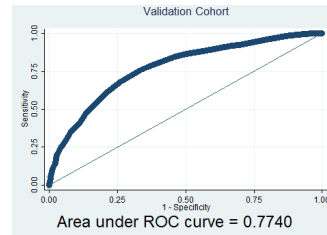


Hosmer-Lemeshow-Test: not significant (0.06), indicating good calibration of the model

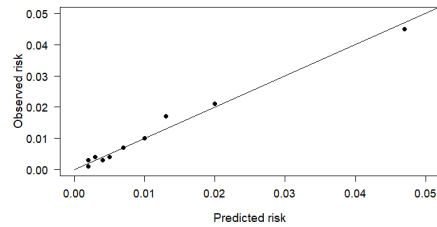
Calibration plot in Development Cohort



EXTERNAL VALIDATION COHORT

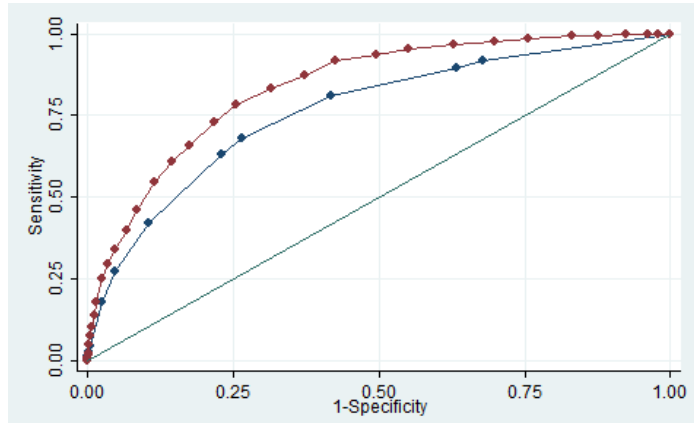


Calibration plot in Validation Cohort



Model Comparison SPORC vs SPORC II

Score for Prediction of Post-Op Mechanical Ventilation



Compare AUC 0.84 (SPORC II) at AUC 0.76 (SPORC) (95% CI 0.75-0.78), p-value <0.001).

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Net Reclassification index

- NRI: 0.25
- In the event group 213 (30.4%) were adequately classified in higher risk categories when using the novel prediction score (SPORCII)

SPORC II (New Prediction Tool for Postoperative Reintubation)

Risk Categories for Postoperative Reintubation

SPORC - Risk Categories for Postoperative Reintubation	< 1% Risk	1-5% Risk	5-10% Risk	>10% Risk	Total Number
In 699 patients who were reintubated within 3 days after surgery					
<1% Risk	161	80	1		242
1-5% Risk	66	240	88	29	423
5-10% Risk		2	9	15	26
>10%			3	5	8
Total Number	227	322	101	49	699
In 90194 patients who were not reintubated within 3 days after surgery					
<1% Risk	63583	3987	45	1	67616
1-5% Risk	9609	11125	1200	223	22157
5-10% Risk	1	106	154	104	365
>10%		5	26	25	56
Total Number	73193	15223	1425	353	90194

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Conclusion

SPORC II is an improved tool for the prediction of early postoperative reintubation.

- Utilizes preexisting comorbidity, surgery, and anesthesia-related risk factors
- Improved c-statistics performance compared with previous SPORC instrument
- Well calibrated and externally validated
- Improved net reclassification



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Thank you!

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