Kalp Cerrahisinde Postoperatif Değerlendirme Risk Tayini Skorlama Sistemleri

Dr. Bilge ÇELEBİOĞLU

Skorlama sistemleri

- Hasta tanımlanması
- Mortalite ve Morbidite hızı
- Prognoz tahmini
- Hasta seçimi
- Karşılaştırılabilir
- Tedavi planı

Performans

- Uygulanabilir
- Doğru
- Genellenebilir
  - Kalibrasyon (mortalite)
  - Diskriminasyon (sağ kalım)

Fizyolojik Değişikliklere dayalı SS

- **APACHE**
  (Acute Physiology and Chronic Health Evaluation) (0-299)
- **SAPS (0-252)**
  (Simplified Acute Physiology Score)
- **MPM (sağkalım olasılığı)**
  (Mortality Probability Model)

Organ Disfonksiyon Skorları

- **MODS (Multiple Organ Dysfunction Score)**
- **SOFA (Sequential Organ Failure Assessment)**
- **LODS (Logistic Organ Dysfunction System)**

Diğer Skorlama Sistemleri

- **Glaskow Koma Skalası**
- **TISS 28 (Therapeutic Intervention Score System)**

Literatür

- OMMI
- Euro Score
- Ontorio
- Bayesian
- POSSUM
- ASA
- Goldman
- Zubrod
- Syntax
- MACCE
- Aristotle Basic Complex
- CASUS scoring
- RACHS – I
- AKICS
- E – PASS
- TSCHS Database
- CRS
- EVAD
- CPRI
- P – POSSUM
- LOS
- PCI
- Spivack SS
- Parsonnet SS

clinical investigations in critical care

Validity of Scoring Systems to Predict Risk of Prolonged Mechanical Ventilation After Coronary Artery Bypass Graft Surgery*

Sachin Yende, MD; Richard Wunderink, MD FCCP

Study objective: Two scoring systems, (the Spivack scoring system [SSS] and the cardiac risk score [CRS]), have been proposed to predict the risk of prolonged mechanical ventilation (PMV) after coronary artery bypass graft surgery (CABG). The primary objective of this study was to validate the efficacy of these scoring systems to predict the risk of PMV.
Design: Prospective observational study.
Setting: Cardiovascular surgical ICU.
Patients: Three hundred forty-eight patients underwent CABG. Following surgery, patients were extubated by a standardized respiratory weaning protocol.
Measurements and results: Forty-nine percent of patients had SSS > 0 and had significantly longer duration of mechanical ventilation. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the SSS for failure to extubate at 48 h are 80, 49, 9%, and 98%, respectively. Two hundred thirty-two patients (67.5%), 101 patients (29%), and 12 patients (3.5%) had a CRS of 0 to 4, 5 to 8, and > 8, respectively. Patients with lower scores had shorter duration of mechanical ventilation. The sensitivity, specificity, PPV, and NPV of the CRS for failure to extubate at 10 h are 42, 73, 47% and 69%, respectively.
Conclusion: The SSS may be used as a preoperative screening tool. A simple questionnaire that includes history of unstable angina, diabetes, congestive heart failure, and smoking prior to hospital admission can be used to calculate the SSS. Patients with SSS ≤ 0 are at low risk for PMV and can proceed to surgery without further evaluation. *(CHEST 2002; 122:239–244)*

Key words: coronary artery bypass grafting; failure to wean; prolonged mechanical ventilation; scoring system

Abbreviations: CABG = coronary artery bypass graft surgery; CHF = congestive heart failure; CI = confidence interval; COMFAC = comorbid risk factor score; CRS = cardiac risk score; EF = ejection fraction; NPV = negative predictive value; NS = not significant; OPCAB = off-pump coronary artery bypass surgery; PFT = pulmonary function test; PMV = prolonged mechanical ventilation; PPV = positive predictive value; ROC = receiver operating curve; SSS = Spivack scoring system

Chest 2002;122:239-244

PMV (> 24 saat)

- 1. op. % 5.6 Redo % 10.7
- Preop değerlendirme
- Spivack SS - CRS (kardiyak risk)

Spivack SD, Chest 1996;109:1222-1230
Wong DT, Anesthesiology 1999;91:936-944

- FiO_2 1 - 0.4 SaO_2 > %93
- FVC>1L , (-) basınç>20 cm H_2O
- Asist/kontrol – CPAP
- pH>7.3 PCO_2<50mmHg PO_2>70mmHg
- İnotrop MAP≥100mmHg CI>2L/dk/m^2

SSS

- Komorbit risk faktörleri
  - Sigara
  - Diabet
  - UnstablAngina
  - CHF

X 0.25 puan

- SSS= 5.409(COMFAC) – 0.437(EF) – 1.821
- SSS> 0   Yüksek risk
- SSS< 0   Düşük risk

CRS

- Yaş >75   3 puan
- 61 – 75   2 puan
- Kadın   2 puan
- Postop kanama   6 puan
- IABP   6 puan
- İnotrop   2 puan
- Atriyal aritmi   2 puan

0-4   5-8   >8

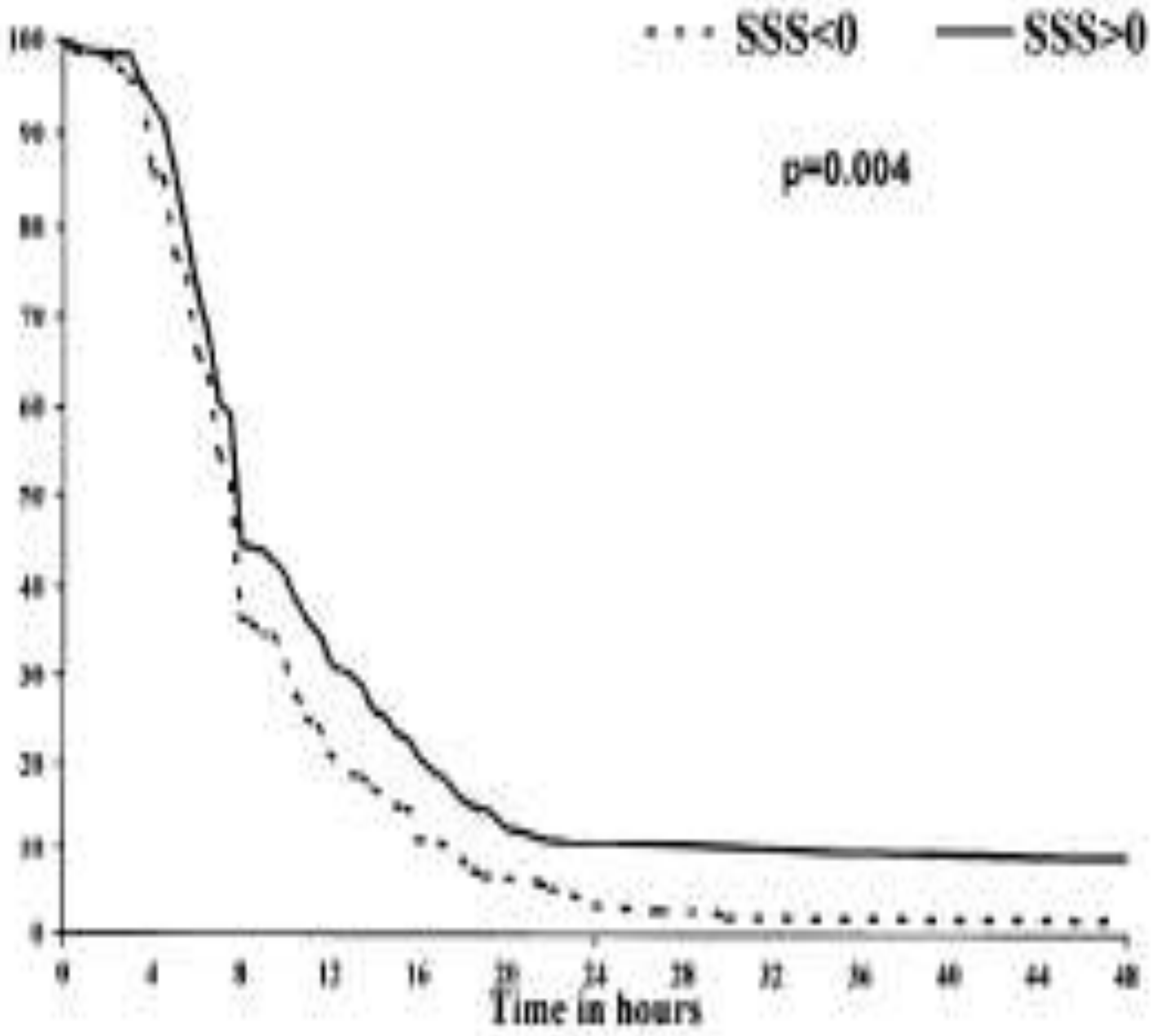


FIGURE 1. Effect of the SSS on duration of mechanical ventilation.

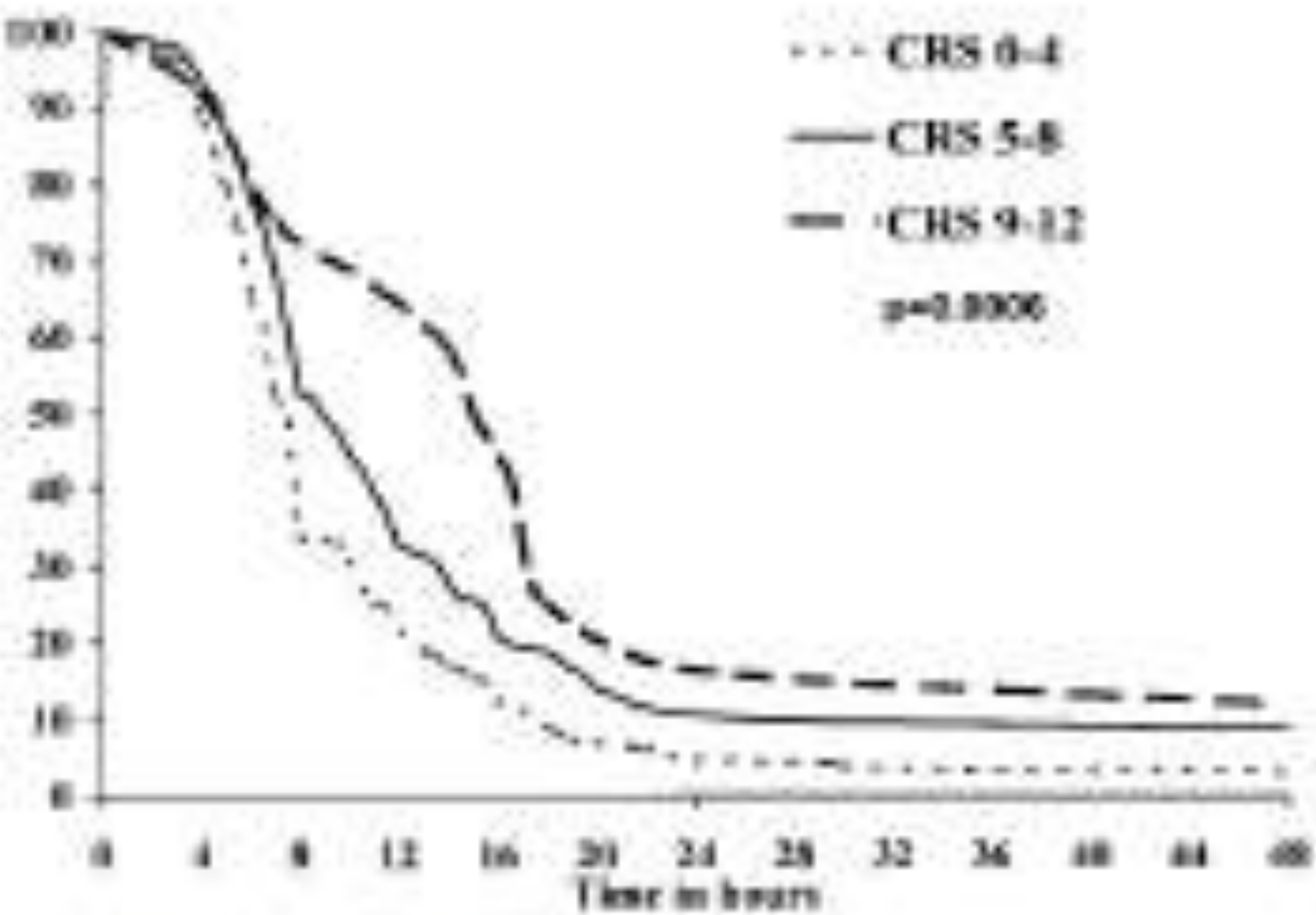


FIGURE 2. Effect of the CRS on duration of mechanical ventilation.

Table 2—Association of the SSS and Duration of Mechanical Ventilation, Length of Stay, and Mortality*

Variables	SSS < 0 (n = 168)	SSS > 0 (n = 177)	p Value
Time to wean, h	11.7 ± 1.8	31.6 ± 6.9	0.004
Unsuccessful extubation at 48 h	1.8	8.9	0.004
Length of ICU stay, d	3.2 ± 0.3	4.1 ± 0.4	0.003
Length of hospital stay, d	11.8 ± 0.6	12.6 ± 0.5	NS
Mortality	3.5	4.8	NS

*Data are presented as mean ± SEM or %.

Değişkenler	SSS<0 (n=168)	SSS>0 (n=177)	p
Estb/saat	11.7 1.8	31.6 6.9	0.004
Estb>48saat	1.8	8.9	0.004
ICU kalış/gün	3.2 0.3	4.1 0.4	0.003
Hastanede kalış/gün	11.8 0.6	12.6 0.5	NS
Mortalite	3.5	4.8	NS

Table 5—Association of the CRS and Duration of Mechanical Ventilation, Length of Stay, and Mortality*

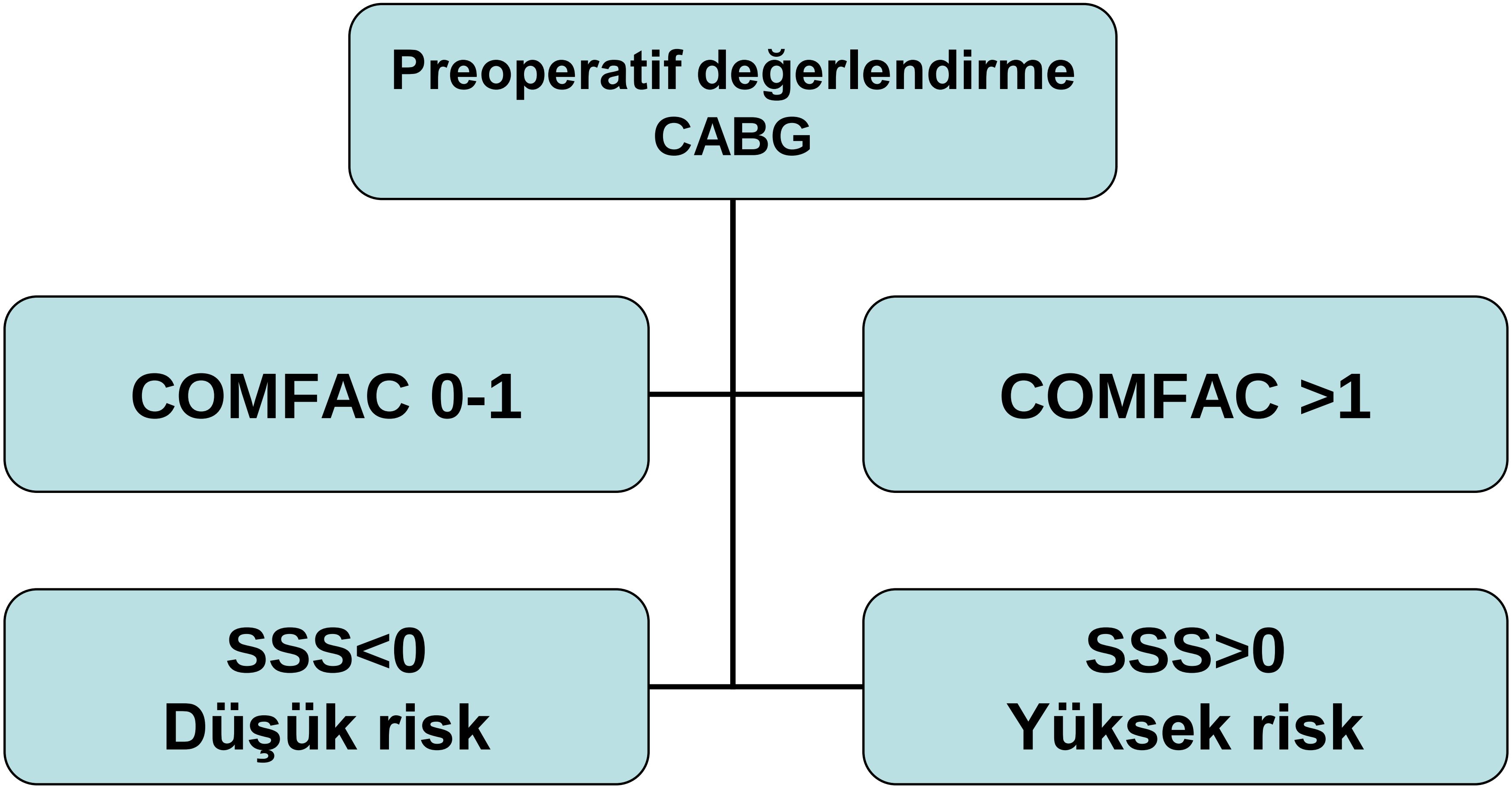
Variables	0–4 (n = 232)	5–8 (n = 101)	> 8 (n = 12)	p Value
Time to wean, h	14.7 ± 40.3	36.3 ± 106.2	42.1 ± 75.5	0.0006
Unsuccessful extubation at 10 h	34	52.5	75	0.0003
Length of ICU stay, d	3.1 ± 0.2	4.8 ± 0.6	5.7 ± 2.1	0.0003
Length of hospital stay, d	11.1 ± 0.5	14.7 ± 0.9	11.4 ± 2.1	0.0003
Mortality	2.5	6.5	16.7	0.02

*Data are presented as mean ± SEM or %.

Değişkenler	0-4 (n=232)	5-8 (n=101)	>8 (n=12)	p
Ekstb /saat	14.7 40.3	36.3 106.2	42.1 75.5	0.0006
Ekstb >10saat	34	52.5	75	0.0003
ICU kalış/gün	3.1 0.2	4.8 0.6	5.7 2.1	0.0003
Hastanede kalış/gün	11.1 0.5	14.7 0.9	11.4 2.1	0.0003
Mortalite	2.5	6.5	16.7	0.02

PPV (positive predictive value) ↓

NPV (negative predictive value) ↑



Intensive Care Med (2001) 27: 407–415
DOI 10.1007/s001340000802

ORIGINAL

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Risk factors for prolonged ventilation after cardiac surgery using APACHE II, SAPS II, and TISS: comparison of three different models

Table 1 Analysis of the days on the ventilator and outcome. Values are shown as mean/median. Patients ventilated for less than 6 h were assessed as days ventilated = 0. (*SMR* standardized mortality ratio, *APACHE II* acute physiology and chronic health evaluation, *ROD* risk of death, *ICU* intensive care unit)

Variable	Days on ventilator		
	< 2 days	2–4 days	> 4 days
Number of patients	625	40	22
Died	3	4	3
Hospital mortality %	0.48	10.00[b]	13.60[d,e]
SMR	0.07	0.67	0.59
APACHE II score	10.0/9.3	16.1/16.6[b]	19.8/19.8[d,e]
APACHE II ROD	6.5/4.7	15.0/11.9[b]	23.2/19.9[d,e]
APACHE II score: survivors	10.0/9.3	15.3/16.2[b]	20.2/20.0[d,f]
APACHE II score: non-survivors	9.3/9.0	22.3/23.5[a]	17.7/13.0
APACHE II ROD: survivors	6.5/4.7	13.2/10.9[b]	23.7/20.5[c,f]
APACHE II ROD: non-survivors	4.0/3.0	31.3/31.8[a]	20.1/8.2
Days ventilated: survivors	0/0	3/2[b]	13/9[d,f]
Days ventilated: non-survivors	0/0	3/3[a]	13/13[c,e]
ICU Length of stay: survivors	2/1	5/5[b]	18/13[d,f]
ICU Length of stay: non-survivors	5/5	3/3	17/15[e]

[a] $P < 0.05$ (Mann-Whitney U-test) < 2 days versus 2–4 days
[b] $P < 0.01$ < 2 days versus 2–4 days
[c] $P < 0.05$ (Mann-Whitney U-test) < 2 days versus > 4 days
[d] $P < 0.01$ < 2 days versus > 4 days
[e] $P < 0.05$ (Mann-Whitney U-test) 2–4 days versus > 4 days
[f] $P < 0.01$ 2–4 days versus > 4 days

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Table 3 Univariate analysis of preoperative risk factors significantly influencing duration of mechanical ventilation. Median values (range) were used for continuous variables and absolute and relative frequency for categorical variables. (*APACHE* acute physiology and chronic health evaluation, *CABG* coronary artery bypass grafting, *LVEF* left ventricular ejection fraction, *LVEDP* left ventricular end-diastolic pressure, *NYHA* New York Heart Association; *SAPS* simplified acute physiology score, *TISS* therapeutic intervention scoring system)

Preoperative categorical variable	< 48 h ventilated *n* = 625 Occurrence (%)	> 48 h ventilated *n* = 62 Occurrence (%)	*P*
Age > 65 years	235 (37.5)	33 (53.2)	< 0.05
Female gender	173 (27.7)	22 (35.5)	n.s.
Emergency operation	11 (1.8)	1 (1.6)	n.s.
Admission criteria			
Coronary artery disease	497 (76.6)	48 (77.4)	n.s.
Valvular disease	137 (21.9)	22 (35.5)	< 0.05
Others	23 (3.7)	0	n.s.
History of			
Myocardial infarction	315 (50.4)	32 (51.6)	n.s.
Cardiogenic shock	112 (17.9)	17 (27.0)	n.s.
Hyperlipoproteinemia	342 (54.7)	27 (43.5)	n.s.
Arterial hypertension	346 (55.4)	26 (41.9)	< 0.05
Diabetes mellitus	136 (21.8)	25 (40.3)	< 0.01
Platelet aggregation inhibitors	280 (44.8)	32 (51.6)	n.s.
Continuous anticoagulation	72 (11.5)	8 (12.9)	n.s.
Previous cardiac surgery	63 (10.1)	12 (19.4)	= 0.05
Chronic peripheral vascular disease	84 (13.4)	15 (24.2)	< 0.05
APACHE II: chronic disease	106 (17.0)	(37.1)	< 0.001
Preoperative status			
NYHA class IV	93 (14.9)	15 (24.2)	n.s.
LVEDP > 15 mmHg	162 (25.9)	21 (30.9)	n.s.
LVEF < 40 %	450 (72.0)	43 (69.4)	n.s.
Three- or more vessel disease	101 (16.2)	21 (30.9)	< 0.001
Atrial fibrillation	42 (6.7)	8 (12.9)	n.s.

Table 4 Univariate analysis of intraoperative risk factors significantly influencing duration of mechanical ventilation: continuous variables

Variable	< 48 h ventilated ($n = 625$)	> 48 h ventilated ($n = 62$)	P
Operation time (min)	181 (80–500)	213 (115–480)	< 0.0001
Cardiopulmonary bypass time (min)	75 (0–360)	100 (0–212)	< 0.0001
Aortic cross-clamping time (min)	45 (0–175)	58 (0–158)	< 0.0001

Table 5 Univariate analysis of intraoperative risk factors significantly influencing duration of mechanical ventilation: categorical variables

Variable	Occurrence (%)	Occurrence (%)	P
Complications	37 (5.9)	18 (29.0)	< 0.0001
Surgical procedure			
CABG	458 (73.3)	37 (59.1)	< 0.05
Valve repair	114 (18.2)	17 (27.4)	n.s.
Combined CABG + valve repair	24 (3.8)	6 (9.7)	< 0.05
Others	29 (4.6)	2 (3.2)	n.s.

Table 6 Univariate analysis of postoperative risk factors significantly influencing duration of mechanical ventilation: continuous variables

Variable	< 48 h ventilated ($n = 625$)	> 48 h ventilated ($n = 62$)	P
APACHE II score	10 (0–30)	20 (3–35)	< 0.0001
SAPS II	27 (6–70)	48 (23–82)	< 0.0001
TISS points	50 (27–76)	64 (43–99)	< 0.0001

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- **Postoperatif SS APACHE II, SAPS II, TISS kuvvetle önerilir**
- **Hastalık şiddeti, Tedavi kesinliği, IABP, Parenteral beslenme, Acil operasyon, Transfüzyon, Reoperasyon PMV da etkendir**
- **Farklı modeller yaratılmalıdır**

ELSEVIER

European Journal of Cardio-thoracic Surgery 23 (2003) 678–683

EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY

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Fast track recovery of high risk coronary bypass surgery patients☆

Cem Alhan*, Fevzi Toraman, Esref Hasan Karabulut, Sümer Tarcan, Sinan Dağdelen, Nevnihal Eren, Nuri Çağlar

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- **Euro SCORE <6 Düşük risk**

  Euro SCORE >6 Yüksek risk

Table 3

Factors leading to delayed extubation (>6 h) on univariable analysis[a]

	Low risk group	High risk group
Age >70	0.0001	
Hypertension	0.06	
COPD	0.09	
Peripheral vascular disease	0.07	
Chronic renal failure	0.0001	
Myocardial infarction < 90 days	0.04	
Bypass time > 90 min	0.001	
Cross clamp time >60 min	0.003	0.01
Any red blood cell transfusion	0.0001	0.004
Postoperative blood loss >1000 ml	0.0001	0.02
Preoperative use of IV inotropes		0.004
Operative priority (non-elective)		0.08

[a] COPD, chronic obstructive pulmonary disease.

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Table 4

Factors leading to increased intensive care unit stay (>24 h) on univariable analysis[a]

	Low risk group	High risk group
COPD	0.09	
Post operative blood loss >1000 ml	0.001	
Cross clamp time >60 min	0.007	
Bypass time >90 min	0.001	0.05
Any red blood cell transfusion	0.0001	0.0001
Preoperative use of IV inotropes		0.09
NYHA Class 3 or 4		0.01

[a] NYHA = New York Heart Association; COPD = chronic obstructive pulmonary disease.

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PMID: 15874885

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Clinical Research

Assessing the validity of cardiac surgery risk stratification systems for CABG patients in a single center

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[2] Kaunas University of Medicine Institute of Biomedical Research, Kaunas, Lithuania
[3] Kaunas University of Medicine, Department of Preventive Medicine, Kaunas, Lithuania

- **Postoperatif morbidite**
- **Tahmin edilebilir mortalite**
- **1021 hasta   66.5 9.2 yaş   CABG**
- **Euro SCORE**
- **Ontario**
- **QMMI**

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Assessing the validity of cardiac stratification systems for CABG center

Giedrius Vanagas[1,3], Šarūnas Kinduris[1,2]

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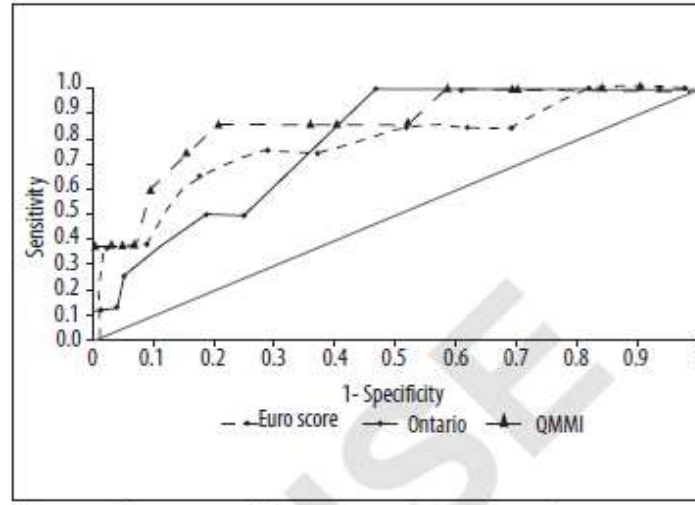

Figure 1. Comparison of the cardiac surgery risk stratification system validity by Receiver Operating Characteristics curves.

- **Mortalite hızı % 4.1**

EuroSCORE	**7.49**	**3.1**	**10.84**	**3.1**	**p<0.005**
Ontario	**3.32**	**2.6**	**6.34**	**3.3**	**p<0.005**
QMMI	**9.44**	**6.9**	**20.31**	**8.6**	**p<0.0001**

- **EuroSCORE % 20.7 %96.7**
- **Ontario % 21.1 %94.4**
- **QMMI % 33.3 %97.2**

QMMI SS yüksek duyarlılık ve özgünlük gösterir

Complexity of Coronary Vasculature Predicts Outcome of Surgery for Left Main Disease

Özcan Birim, MD, PhD, Menno van Gameren, MD, Ad J.J.C. Bogers, MD, PhD, Patrick W. Serruys, MD, PhD, Friedrich W. Mohr, MD, PhD, and A. Pieter Kappetein, MD, PhD

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Background. The SYNTAX score, a comprehensive angiographic scoring system, was recently developed as a tool for risk stratification during the SYNTAX trial (randomized trial comparing coronary artery bypass grafting with percutaneous coronary intervention). We applied the SYNTAX score in patients with left main coronary artery disease who underwent coronary artery bypass grafting to examine its role in predicting incidences of major adverse cardiac and cerebrovascular events (MACCE) within 30 days and 1 year.

Methods. One hundred forty-eight patients were studied. Their angiograms were scored according to the SYNTAX score. The MACCE-free survival curves were estimated by the Kaplan–Meier method. Univariate and multivariate analyses determined risk factors for MACCE. Performance of the SYNTAX score was studied with respect to discrimination by receiver-operating characteristic curves with their area under the curve (c-index). Classification and regression tree analysis was performed to identify the best outcome predictors and develop a risk stratification model.

Results. Overall SYNTAX score ranged from 11 to 53 (mean, 24 ± 9). At 30 days and 1 year, 15 (10%) and 19 (13%) patients experienced MACCE. Patients with a higher SYNTAX score had a significantly ($p < 0.0001$) poorer MACCE-free survival. In multivariate analysis, SYNTAX score, female sex, and incomplete revascularization were associated with a higher rate of MACCE in 30 days. The SYNTAX score was the single predictor for MACCE in 1 year. The c-index of the SYNTAX score was 0.88 for 30 days and 0.90 for 1 year, respectively. The SYNTAX score was the best single discriminator between patients with and those without MACCE, with a discrimination level of 36.5.

Conclusions. The SYNTAX score is the first coronary vasculature complexity score predictive for postoperative outcome in patients with left main coronary artery disease undergoing coronary artery bypass grafting. The outcomes of the ongoing SYNTAX trial will definitively define the role of the SYNTAX score in predicting short-term and long-term incidence of MACCE.

(Ann Thorac Surg 2009;87:1097–105)

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- **SYNTAX SS**
  - **Genişletilmiş Anjiografik SS**
- **MACCE SS**
  - **Kardiyak ve Serebrovasküler sonuç SS**
- **148 hasta KAH – anjio**

Table 2. Angiographic and Procedural Characteristics of the Study Population

Characteristic	SYNTAX Score ≤19 (n = 49)	SYNTAX Score >19–25 (n = 48)	SYNTAX Score >25 (n = 51)	p Value
Left main stenosis (%)	75 ± 13	74 ± 14	73 ± 11	0.775
Isolated left main disease	14 (29%)	0	0	<0.001
Left main + one-vessel disease	24 (49%)	20 (42%)	2 (4%)	<0.001
Left main + two-vessel disease	11 (22%)	16 (33%)	13 (26%)	0.461
Left main + three-vessel disease	0	12 (25%)	36 (71%)	<0.001
Type of graft				
Total arterial	9 (18%)	9 (19%)	2 (4%)	0.032
Arterial and venous	37 (76%)	37 (77%)	44 (86%)	0.350
Total venous	3 (6%)	2 (4%)	5 (10%)	0.607
Complete revascularization	44 (90%)	44 (92%)	40 (78%)	0.142

Complexity of Coronary Vasculature Predicts Outcome of Surgery for Left Main Disease

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- **SYNTAX skor kısa ve uzun dönem kardiyak ve serebrovasküler olayların tahmininde kesin sonuçlar vermektedir**

Table 3. Thirty-Day and One-Year Outcome

Characteristic	SYNTAX Score ≤19 (n = 49)	>19–25 (n = 48)	>25 (n = 51)	p Value
30 days				
MACCE	0	3 (6%)	12 (24%)	0.0001
Death	0	1 (2%)	6 (12%)	0.014
Myocardial infarction	0	3 (6%)	6 (12%)	0.038
Cerebrovascular accident	0	0	2 (4%)	0.329
Revascularization	0	1 (2%)	0	0.324
1 year				
MACCE	0	3 (6%)	16 (31%)	<0.0001
Death	0	1 (2%)	8 (16%)	0.002
Myocardial infarction	0	3 (6%)	6 (12%)	0.038
Cerebrovascular accident	0	0	3 (6%)	0.106
Revascularization	0	1 (2%)	1 (2%)	0.770

MACCE = major adverse cardiac and cerebrovascular events.

Clinical Predictors of Major Infections After Cardiac Surgery

Vance G. Fowler, Jr, MD, MHS; Sean M. O'Brien, PhD; Lawrence H. Muhlbaier, PhD;
G. Ralph Corey, MD; T. Bruce Ferguson, MD; Eric D. Peterson, MD, MPH

***Background*—**Major infections are infrequent but important complications of cardiac surgery. Predicting their occurrence is essential for future prevention. The objective of the current investigation was to create and validate a bedside scoring system to estimate patient risk for major infection (mediastinitis, thoracotomy or vein harvest site infection, or septicemia) after coronary artery bypass grafting.

***Methods and Results*—**Using the Society of Thoracic Surgeons National Cardiac Database, we analyzed 331 429 coronary artery bypass grafting cases from January 1, 2002, to December 31, 2003, to identify risk factors for major infection. Using logistic regression, 2 models were generated and validated using split-sample validation: (1) One limited to preoperative characteristics (preop model) and (2) one model including both preoperative and intraoperative characteristics (combined model). Major infection occurred in 11 636 patients (3.51%) (25.1% mediastinitis, 32.6% saphenous harvest site, 35.0% septicemia, 0.5% thoracotomy, 6.8% multiple sites). Patients with major infection had significantly higher mortality (17.3% versus 3.0%, $P<0.0001$) and postoperative length of stay >14 days (47.0% versus 5.9%, $P<0.0001$) than patients without major infection. Both the preop model (c-index 0.697) and combined model (c-index: 0.708) successfully discriminated between high- and low-risk patients. A simplified risk scoring system of 12 variables accurately predicted risk for major infection.

***Conclusions*—**We identified and validated a model that can identify patients undergoing cardiac surgery who are at high risk for major infection. These high-risk patients may be targeted for perioperative intervention strategies to reduce rates of major infection. (*Circulation*. 2005;112[suppl I]:I-358–I-365.)

Key Words: infection ■ diagnosis ■ bypass ■ surgery

Clinical Predictors of Major Infections After Cardiac Surgery

Vance G. Fowler, Jr, MD, MHS; Sean M. O'Brien, PhD; Lawrence H. Muhlbaier, PhD;
G. Ralph Corey, MD; T. Bruce Ferguson, MD; Eric D. Peterson, MD, MPH

STS National Cardiac Database

http://www.sts.org

TABLE 3. Infection Risk Scores for Major Infection After CABG

	Preop Only	Combined
Preoperative variables		
Age (for each 5 years over 55)	1 point	1 Point
BMI 30 to 40 kg/m^2	4 points	3 points
BMI 40+ kg/m^2	9 points	8 points
Diabetes	3 points	3 points
Renal failure	4 points	4 points
Congestive heart failure	3 points	3 points
Peripheral vascular disease	2 points	2 points
Female gender	2 points	2 points
Chronic lung disease	2 points	3 points
Cardiogenic shock	6 points	N/A
Myocardial infarction	2 points	N/A
Concomitant surgery	4 points	N/A
Intraoperative variables		
Perfusion time 100 to 200 minutes	N/A	3 points
Perfusion time 200 to 300 minutes	N/A	7 points
Intra-aortic balloon pump	N/A	5 points

A patient's total risk score is calculated by adding the total points for all risk factors present.

Clinical Predictors of Major Infections After Cardiac Surgery

Vance G. Fowler, Jr, MD, MHS; Sean M. O'Brien, PhD; Lawrence H. Muhlbaier, PhD; G. Ralph Corey, MD; T. Bruce Ferguson, MD; Eric D. Peterson, MD, MPH

- **Postoperatif major enfeksiyonlar**

  Yüksek mortalite (% 17.3 - %3.0 $p<0.0001$)

  ICU süresi>14 gün (%47.0 - %5.9 $p<0.0001$)

- **Glikoz düzeyi < 150 mg/dL**

  Sternal yara enfeksiyonu % 66 ↓

- **Kilo kaybı, sigara bırakma, nasal dekolonizasyon, aşı**

Staphylococcus aureus

Major Infection After Pediatric Cardiac Surgery: A Risk Estimation Model

Gregory M. Barker, MD, Sean M. O'Brien, PhD, Karl F. Welke, MD, Marshall L. Jacobs, MD, Jeffrey P. Jacobs, MD, Daniel K. Benjamin, Jr, MD, PhD, Eric D. Peterson, MD, James Jaggers, MD, and Jennifer S. Li, MD

Duke University Medical Center, Durham, North Carolina; Oregon Health and Science University, Portland, Oregon; Cleveland Clinic, Cleveland, Ohio; and The Congenital Heart Institute of Florida, Saint Petersburg and Tampa, Florida

Background. In pediatric cardiac surgery, infection is a leading cause of morbidity and mortality. We created a model to predict risk of major infection in this population.

Methods. Using the Society of Thoracic Surgeons Congenital Heart Surgery Database, we created a multivariable model in which the primary outcome was major infection (septicemia, mediastinitis, or endocarditis). Candidate-independent variables included demographic characteristics, comorbid conditions, preoperative factors, and cardiac surgical procedures. We created a reduced model by backward selection and then created an integer scoring system using a scaling factor with scores corresponding to percent risk of infection.

Results. Of 30,078 children from 48 centers, 2.8% had major infection (2.6% septicemia, 0.3% mediastinitis, and 0.09% endocarditis). Mortality and postoperative length of stay were greater in those with major infection (mortality, 22.2% versus 3.0%; length of stay >21 days, 69.9% versus 10.7%). Young age, high complexity, previous cardiothoracic operation, preoperative length of stay more than 1 day, preoperative ventilator support, and presence of a genetic abnormality were associated with major infection after backward selection ($p < 0.001$). Estimated infection risk ranged from less than 0.1% to 13.3%; the model discrimination was good (c index, 0.79).

Conclusions. We created a simple bedside tool to identify children at high risk for major infection after cardiac surgery. These patients may be targeted for interventions to reduce the risk of infection and for inclusion in future clinical trials.

(Ann Thorac Surg 2010;89:843–50)

RACHS-1 (Risk Adjustment for Congenital Heart Surgery)
ABC (Aristotle Basic Complexity)

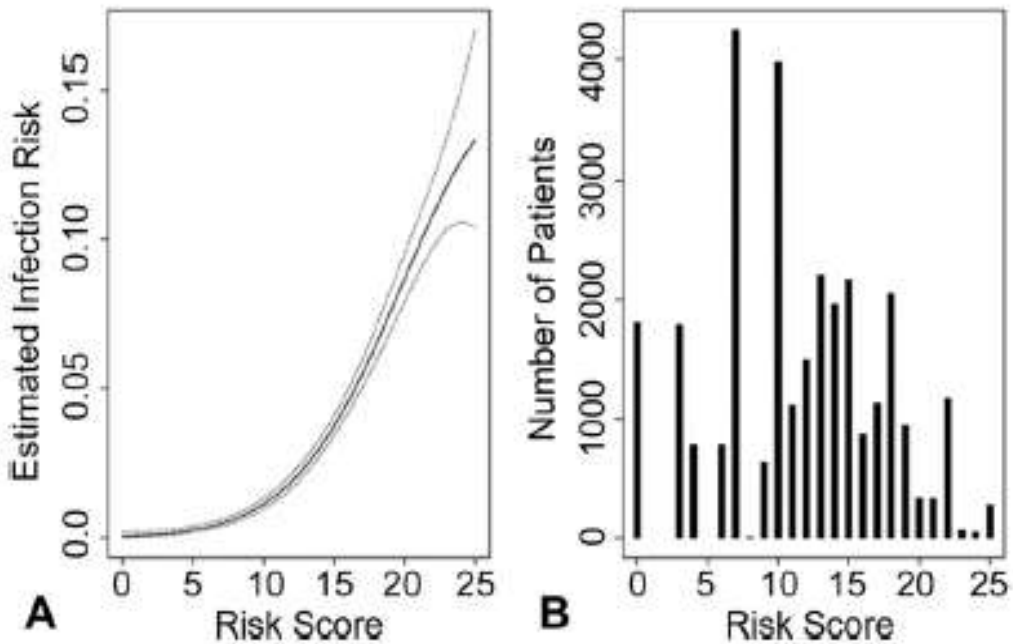

Fig 1. (A) Bedside tool model of predicted risk in relation to risk score. Solid line represents model estimate. Dotted line represents 95% confidence interval. The x axis denotes risk score, and the y axis denotes estimated infection risk. (B) Distribution of study population by risk score category. The x axis denotes risk score, and the y axis represents total number of patients.

- **El yıkama**
- **Santral kateter bakımı**
- **Preoperatif antibiyotik protokolleri**

ORIGINAL ARTICLE

Rev Bras Cir Cardiovasc 2007; 22(4): 425-431

Is the RACHS-1 (Risk adjustment in congenital heart surgery) a useful tool in our scenario?

O escore de risco ajustado para cirurgia em cardiopatias congênitas (RACHS-1) pode ser aplicado em nosso meio?

Rachel Vilela de Abreu Haickel NINA[1], Mônica Elinor Alves GAMA[2], Alcione Miranda dos SANTOS[3], Vinícius José da Silva NINA[4], José Albuquerque de FIGUEIREDO NETO[5], Vinícius Giuliano Gonçalves MENDES[6], Zeni Carvalho LAMY[7], Luciane Maria de Oliveira BRITO[8]

Intensive Care Med (2005) 31:98–104
DOI 10.1007/s00134-004-2504-1

NEONATAL AND PEDIATRIC INTENSIVE CARE

Anthony F. Rossi
Danyal M. Khan
Robert Hannan
Juan Bolivar
Michel Zaidenweber
Redmond Burke

Goal-directed medical therapy and point-of-care testing improve outcomes after congenital heart surgery

- **Malnütrisyon**
- **Tekrarlayan üst solunum yolu enfeksiyonları – kronik enfeksiyonlar**
- **Prematürite**
- **Laktat düzeyleri**
- **Geç tanı ve tedavi**

ELSEVIER
European Journal of Cardio-thoracic Surgery xxx (2010) xxx–xxx
EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY
www.elsevier.com/locate/ejcts

Prediction of mortality in intensive care unit cardiac surgical patients☆,☆☆

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Received 6 October 2009; received in revised form 24 January 2010; accepted 26 January 2010

Abstract

Objectives: The purpose of this study was to develop a specific postoperative score in intensive care unit (ICU) cardiac surgical patients for the assessment of organ dysfunction and survival. To prove the reliability of the new scoring system, we compared its performance to existing ICU scores. **Methods:** This prospective study consisted of all consecutive adult patients admitted after cardiac surgery to our ICU over a period of 5.5 years. Variables were evaluated using the patients of the first year who stayed in ICU for at least 24 h. The reproducibility was then tested in two validation sets using all patients. Performance was assessed with the Hosmer–Lemeshow (HL) goodness-of-fit test and receiver operating characteristic (ROC) curves and compared with the Acute Physiology and Chronic Health Evaluation (APACHE II) and Multiple Organ Dysfunction Score (MODS). The outcome measure was defined as 30-day mortality. **Results:** A total of 6007 patients were admitted to the ICU after cardiac surgery. Mean HL values for the new score were 5.8 (APACHE II, 11.3; MODS, 9.7) for the construction set, 7.2 (APACHE II, 8.0; MODS, 4.5) for the validation set I and 4.9 for the validation set II. The mean area under the ROC curve was 0.91 (APACHE II, 0.86; MODS, 0.84) for the new score in the construction set, 0.88 (APACHE II, 0.84; MODS, 0.84) in the validation set I and 0.92 in the validation set II. **Conclusions:** Most of general ICU scoring systems use extensive data collection and focus on the first day of ICU stay. Despite this fact, general scores do not perform well in the prediction of outcome in cardiac surgical patients. Our new 10-variable risk index performs very well, with calibration and discrimination very high, better than general severity systems, and it is an appropriate tool for daily risk stratification in ICU cardiac surgery patients. Thus, it may serve as an expert system for diagnosing organ failure and predicting mortality in ICU cardiac surgical patients.

Keywords: Severity-of-disease scoring system; Heart surgery; Intensive care; Mortality; Outcome; Length of ICU stay

APACHE II
MODS
CASUS (Cardiac Surgical Score)

- **13 yataklı ICU**
- **>18 yaş** **68 ay / 6007 hasta**
- **1. yılda** **APACHE II+MODS** (109 değişken)
- **2. yılda** **APACHE II+MODS** (57 değişken)
- **3. yılda** **CASUS** (10 değişken)

Table 1
The CASUS.

Descriptor	0 points	1 point	2 points	3 points	4 points
PO_2/FiO_2	Extubated	>250	151–250	75–150	<75
Serum creatinine (mg dl^{-1})	<1.2	1.2–2.2	2.3–4.0	4.1–5.5	>5.5
Serum bilirubin (mg dl^{-1})	<1.2	1.2–3.5	3.6–7.0	7.1–14.0	>14.0
PAR = HR × CVP/MAD	<10.1	10.1–15.0	15.1–20.0	20.1–30.0	>30.0
Lactic acid (mmol l^{-1})	<2.1	2.1–4.0	4.1–8.0	8.1–12.0	>12.0
Platelets (ml × 10^{-3})	>120	81 – 120	51 – 80	21 – 50	<21
Neurologic state	Normal status	–	Confused conversation	Sedated	Diffuse neuropathy
Intra-aortic balloon pump	No	–	–	–	Yes
Ventricular assist device	No	–	–	–	Yes
CVVH/dialysis	No	–	–	–	Yes

30 günlük MORTALİTE

Table 2
Hosmer–Lemeshow (χ^2) goodness-of-fit test, overall correct classification (OCC) and area under the receiver operating characteristic curve (AUC) for the construction set.

Construction set	APACHE II χ^2	OCC	AUC	MODS χ^2	OCC	AUC	CASUS χ^2	OCC	AUC
Operative day (n = 384)	4.1	93.8%	0.75	2.9	93.5%	0.63	8.5	93.8%	0.85
Postoperative day 1 (n = 384)	**16.7**	94.5%	0.82	9.9	93.5%	0.81	7.8	95.6%	0.87
Postoperative day 2 (n = 378)	**17.3**	95.0%	0.87	10.7	95.5%	0.89	10.3	95.5%	0.90
Postoperative day 3 (n = 266)	11.7	94.7%	0.92	**19.1**	94.0%	0.91	3.0	93.2%	0.95
Postoperative day 4 (n = 183)	9.8	89.6%	0.89	3.2	92.3%	0.92	2.8	92.3%	0.92
Postoperative day 5 (n = 130)	7.9	90.8%	0.93	12.1	90.8%	0.88	2.1	90.8%	0.94

χ^2: Hosmer–Lemeshow chi²-statistic; OCC: overall correct classification; AUC: area under the curve. Best values are underlined. Bold values show a significant difference between predicted and observed number of deaths ($p < 0.05$).

Table 3
Hosmer–Lemeshow goodness-of-fit test, overall correct classification and area under the receiver operating characteristic curve for the validation set I.

Validation set I	APACHE II			MODS			CASUS		
	χ^2	OCC	AUC	χ^2	OCC	AUC	χ^2	OCC	AUC
Operative day (n = 1057)	13.0	97.5%	0.70	4.4	97.0%	0.69	6.9	97.5%	0.86
Postoperative day 1 (n = 467)	7.8	93.6%	0.85	8.7	94.0%	0.81	7.2	94.4%	0.85
Postoperative day 2 (n = 462)	6.6	94.8%	0.89	5.7	94.2%	0.90	6.7	95.0%	0.91
Postoperative day 3 (n = 303)	5.5	90.8%	0.88	2.9	92.1%	0.88	7.7	94.1%	0.88
Postoperative day 4 (n = 184)	6.6	89.7%	0.87	2.9	88.0%	0.87	9.1	91.8%	0.90
Postoperative day 5 (n = 137)	8.4	89.1%	0.85	2.6	89.8%	0.89	5.6	92.0%	0.90

χ^2: Hosmer–Lemeshow chi²-statistic; OCC: overall correct classification; AUC: area under the curve. Best values are underlined.

Table 4
Hosmer–Lemeshow goodness-of-fit test, overall correct classification and area under the receiver operating characteristic curve for the validation set II.

CASUS			
Validation set II	χ^2	OCC	AUC
Operative day (n = 3801)	6.6	96.6%	0.92
Postoperative day 1 (n = 3724)	7.0	97.4%	0.95
Postoperative day 2 (n = 1539)	2.8	95.4%	0.94
Postoperative day 3 (n = 1011)	4.7	94.3%	0.91
Postoperative day 4 (n = 669)	3.6	93.6%	0.89
Postoperative day 5 (n = 483)	3.6	92.0%	0.88

χ^2: Hosmer–Lemeshow chi²-statistic; OCC: overall correct classification; AUC: area under the curve.

*** Hosmer-Lemeshow X^2 değerleri**
*** ROC eğrisi değerleri**

• CASUS	$X^2 =$ 5.8	
APACHEII	$X^2 =$ 11.3	
MODS	$X^2 =$ 9.7	
• CASUS	$X^2 =$ 7.2	
APACHEII	$X^2 =$ 8.0	
MODS	$X^2 =$ 4.5	
• CASUS	$X^2 =$ 4.9	

• CASUS	0.91
APACHEII	0.86
MODS	0.84
• CASUS	0.88
APACHEII	0.84
MODS	0.84
• CASUS	0.92

Prediction of mortality in intensive care unit cardiac surgical patients

Khosro Hekmat [a,*], Fabian Doerr [a], Axel Kroener [b], Matthias Heldwein [a], Torsten Bossert [a], Akmal M.A. Badreldin [a], Artur Lichtenberg [c]

- **CASUS duyarlı ve özgün sonuç verir**
- **<1 dakika hasta/gün**

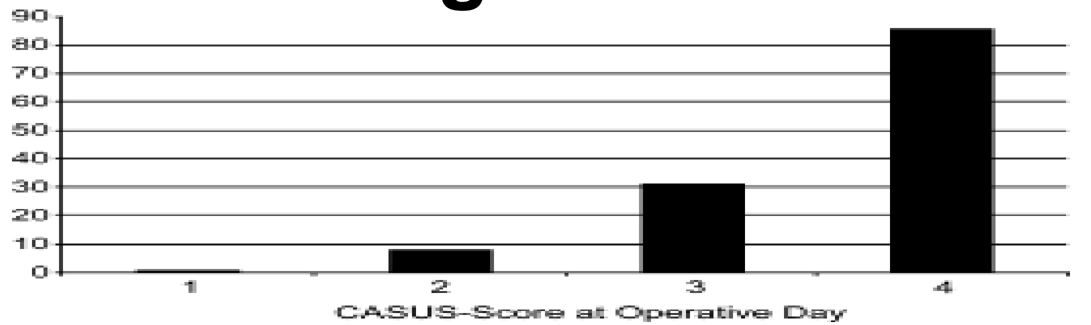

Fig. 1. Percentage of mortality in four different categories of the CASUS-Admission Score. Category 1: CASUS < 10 points: $n = 2953$, mortality rate 0.91% ($n = 27$). Category 2: CASUS 10—15 points: $n = 673$, mortality rate 8.17% ($n = 55$). Category 3: CASUS 16—20 points: $n = 140$, mortality rate 31.43% ($n = 44$). Category 4: CASUS > 20 points: $n = 35$, mortality rate 85.71% ($n = 30$).

- **Hastalar ve aileleri açısından günlük skorlama risk-iyileşme-tedavi değerlendirmesi gereklidir**

A Scoring System Predicting the Risk for Intensive Care Unit Admission for Complications After Major Lung Resection: A Multicenter Analysis

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Background. We aimed to develop and validate a scoring system to predict intensive care unit (ICU) admission for complications after major lung resection for purposes of optimizing planning of resources for patient care.

Methods. Patients undergoing major lung resections performed between 2000 and 2006 at three thoracic surgery units were analyzed for unplanned admission to the ICU for complications. Variables were initially screened by univariate analysis. Selected variables were used in a stepwise logistic regression analysis that was validated by bootstrap analysis. The scoring system was developed by proportional weighting of the significant and reliable predictors estimates and validated on patients operated on in a different center.

Results. In the derivation set of 1297 patients, 82 (6.3%) had ICU admission for complications, and 30 died (associated mortality rate, 36.5%). Predictive variables and their scores were pneumonectomy, 2 points; and 1 point each for age older than 65, predicted postoperative forced expiratory volume in 1 second below 65%, predicted postoperative carbon monoxide lung diffusion capacity below 50%, and cardiac comorbidity. Patients were grouped into three risk classes by their scores, which were significantly associated with incremental risk of ICU admission in the validation set of 349 patients.

Conclusions. This scoring system predicts incremental risk of ICU admission for complications after major lung resection. This system may help in assessing the need for additional postoperative resources and in modifying indicators used to determine the appropriateness of initial transfer of postoperative patients from ICU or step-down status and in developing criteria for future cost-effectiveness trials.

(Ann Thorac Surg 2008;86:213–9)

Table 4. Results of the Regression Analysis[a]

Variables[b]	Estimates	SE	*p* Value	Boot, %[c]	Weighed Score
Intercept	−0.07	0.01			
Age > 65	0.04	0.01	0.007	79	1
$PpoFEV_1$ < 65	0.04	0.01	0.01	72	1
PpoDLco < 50	0.04	0.02	0.02	65	1
Cardiac comorbidity	0.03	0.01	0.04	52	1
Pneumonectomy	0.09	0.02	<0.001	95	2

[a] Dependent variable: intensive care unit admission for complications; 1297 patients, derivation set (parsimonious model). [b] All variables were coded as 1 for presence and 0 for absence. [c] Percentage of significancy in 1000 bootstrap samples.

DLco = diffusion capacity of the lung for carbon monoxide; Ppo = predicted postoperative; SE = standard error.

- **1297 hasta Major AC operasyonu sonrası ICU risk tayini**

Table 5. Frequency of Emergency Intensive Care Unit Admissions for Complications in 1000 Bootstrap Samples Drawn From Unit D (Validation Set) and Grouped by Class of Risk

ICU Admission Rate	Class A (score 0)	Class B (score 1–3)	Class C (score ≥ 4)
<1%	36%	0	0
<2%	73%	1%	0
<5%	93%	6%	0
>10%	0	13%	100%
>20%	0	0	73%

ICU = intensive care unit.

- **Postoperatif plan açısından etkindir**

Journal of Cardiothoracic Surgery BioMed Central

Research article

Open Access

UK pneumonectomy outcome study (UKPOS): a prospective observational study of pneumonectomy outcome

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* Corresponding author

- **28 merkez 312 AC kanser- Pnömonektomi**

Table 3: Risk factors associated with major complications in univariate analysis

Risk factors	Numbers	Odds ratio (95%CI)
Age	312	1.07 (1.03, 1.10; P < 0.001)
ASA: ≥ P3 vs < P3	137, 173	1.9 (1.1, 3.0; P = 0.01)
DLCO mmol/min/kPa	153	0.76 (0.62, 0.92; P = 0.006)
Epidural vs paravertebral	187,90	1.8 (1.0,3.2; P = 0.05)
FEV_1 L	309	0.67 (0.45, 1.00; P = 0.05)
FEV_1 % predicted	308	1.00 (0.98,1.01; P = 0.7)
ppo FEV_1 % predicted	306	0.99 (0.96,1.01; P = 0.4)
DLCO % predicted	154	0.99 (0.97,1.01; P = 0.13)
ppo DLCO % predicted	162	0.97 (0.93,1.01; P = 0.11)
Preop. O2 saturation on air: ≤ 94 vs > 94%	26, 235	2.3 (1.0, 5.2; P = 0.04)
One lung ventilation: (hours)	294	1.09 (0.99, 1.20; P = 0.1)
Plateau pressure during one lung ventilation: ≥ 25 vs < 25 cmH_2O	254	1.5 (0.8, 2.7; P = 0.2)
Right vs left operations	110, 199	1.5 (0.9, 2.5; P = 0.08)
Fluid positive balance	272,19	0.9 (0.3, 2.5; P = 0.9)
Planned vs Converted	208,102	1.3 (0.8,2.2; P = 0.3)
Gender: Male vs Female	209,101	1.2 (0.7,2.0; P = 0.4)
Stump closure: staples vs sutures	249,36	1.1 (0.5,2.3; P = 0.9)
Smoking history: yes vs no	286,25	1.2 (0.5,3.0; P = 0.7)
Neo-adjuvant therapy: yes vs no	33,270	0.5 (0.2,1.1; P = 0.1)

Table 4: Risk factors associated with major complications in multivariate analysis

Risk factors	Multivariate (n = 275) Odds ratio (95%CI)	DLCO included (n = 141) Odds ratio (95%CI)
Age	1.07 (1.04, 1.11; P = 0.001)	1.07 (1.02, 1.11; P = 0.004)
ASA: ≥ P3 vs < P3	1.7 (1.0, 2.9; P = 0.05)	
DLCO mmol/min/kPa		0.78 (0.64, 0.95; P = 0.02)
Epidural vs paravertebral	2.2 (1.1, 3.8; P = 0.02)	

- **AC kanserlerinde**
  - **Yaş**
  - **ASA**
  - **DLCO**
  - **Epidural analjezi – Paravertebral blok**
- **Postoperatif risk faktörlerini tayinde önemlidir**

Sonuç

- **Skorlama sistemleri yalnız bir grup hastanın sonuçlarına göre hazırlanmıştır**
- **ICU kararları her hasta için değişebilir**

Yüksek risk skor değerlerine sahip hastaların tedavisi ertelenmemelidir