

KAN VE KAN ÜRÜNLERİNİN ERKEN VE GEÇ DÖNEM MORBİDİTE VE MORTALİTE ÜZERİNE ETKİLERİ

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Acıbadem Mehmet Ali Aydınlar Üniversitesi Tıp Fakültesi
Anesteziyoloji Anabilim Dalı

ACIBADEM
MEHMET ALI AYDINLAR
UNIVERSITY

Sunum Akışı

- Kardiyak Cerrahide Kan Kullanımı
- Kan transfüzyonuna bağlı Morbidite/Mortalite
- Neler yapılabilir?
 - Preoperatif Risk Faktörleri
 - Kılavuzlar
 - Preoperatif Anemi
 - Hasta Kan Yönetimi

Kardiyak Cerrahide Kan Kullanımı

- 1-1.25 milyon kardiyak cerrahi vakası /yıl
Dixon B, Santamaria JD, Reid D, et al. The association of blood transfusion with mortality after cardiac surgery: cause or confounding Transfusion 2013;53:19–27
- %20-60 kan transfüzyon gereksinimi
Goudie R, Sterne JA, Verheyden V, et al. Risk scores to facilitate preoperative prediction of transfusion and large volume blood transfusion associated with adult cardiac surgery. Br J Anaesth 2015;114:757-66.

Kardiyak Cerrahide Kan Kullanımı

Morbidite

- Kanama ile reoperasyon
- Postoperatif cerrahi enfeksiyon
- Multiorgan disfonksiyonu
- Mekanik ventilasyon süresinde uzama
- Yoğun bakımda kalış süresinde uzama
- Hastanede kalış süresinde uzama

Mortalite

- Hastane mortalitesi
- İleri dönem mortalitesi:
 - 30 gün
 - 6 ay

Maliyet artışı

Impact of Blood Product Transfusion on Short and Long-Term Survival After Cardiac Surgery: More Evidence

Ann Thorac Surg 2012;94:460-7

Table 3. Unadjusted Postoperative Complications in the Transfusion Group Compared With the Non-Transfusion Group

Complication	No Transfusion	Any Transfusion	P Value
Reopening	11 (0.4)	206 (8.9)	<0.0001
Myocardial infarction	5 (0.2)	33 (1.4)	<0.0001
Arrhythmias	657 (21.7)	693 (30)	<0.0001
Cardiac arrest	18 (0.6)	73 (3.2)	<0.0001
Respiratory failure	9 (0.3)	109 (4.7)	<0.0001
Stroke	16 (0.5)	48 (2.1)	<0.0001
Pneumonia	6 (0.2)	57 (2.5)	<0.0001
Sternal infection	4 (0.1)	30 (1.3)	<0.0001
Septicemia	1 (0.001)	16 (0.7)	<0.0001
Leg wound infection	20 (0.7)	75 (3.2)	<0.0001
Multiorgan failure	1 (0.002)	22 (1.0)	<0.0001

Blood transfusion and risk of atrial fibrillation after coronary artery bypass graft surgery
A meta-analysis of cohort studies
Medicine(2018)97:10

- 8 kohort çalışmanın metaanalizi
- Kan transfüzyonu yapılan hastalarda overall 1.45 kat AF riski artışı

Study or Subgroup	log(Odds Ratio)	SE	Weight	Odds Ratio	Odds Ratio
				IV, Random, 95% CI	IV, Random, 95% CI
Koch 2006	0.2231	0.0381	19.3%	1.25 [1.16, 1.35]	2006
Whitson 2007	0.5423	0.0978	14.8%	1.72 [1.42, 2.08]	2007
Choi 2009	1.6715	0.3275	3.9%	5.32 [2.80, 10.1]	2009
Dorrelles 2011	0.3001	0.0908	15.4%	1.35 [1.13, 1.61]	2011
Topal 2011	0.4637	0.1228	12.8%	1.59 [1.25, 2.02]	2011
Alameddine 2014	0.3075	0.1036	14.3%	1.36 [1.11, 1.67]	2014
Pacne 2014	0.1906	0.0486	18.6%	1.21 [1.10, 1.33]	2014
Vlahou 2016	-0.462	0.7674	0.8%	0.63 [0.14, 2.84]	2016
Total (95% CI)			100.0%	1.45 [1.26, 1.67]	

Heterogeneity: Tau² = 0.03; Chi² = 33.87, df = 7 (P < 0.0001); I² = 79%
Test for overall effect: Z = 5.13 (P < 0.00001)

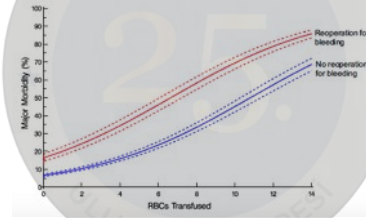
Morbidity of Bleeding After Cardiac Surgery: Is It Blood Transfusion, Reoperation for Bleeding, or Both?

Ann Thorac Surg 2011;91:1780-90

- Kanamaya bağlı reoperasyon % 2-8
- Risk faktörleri:
 - İleri yaş
 - Düşük BMI
 - Komorbidite
 - Aort kapak cerrahisi
 - KPB ve KK sürelerinin uzaması
- Hastane mortalitesi %8.5 vs %1

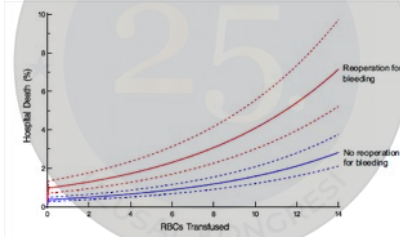
Morbidity of Bleeding After Cardiac Surgery: Is It Blood Transfusion, Reoperation for Bleeding, or Both?

Ann Thorac Surg 2011;91:1780-90



Morbidity of Bleeding After Cardiac Surgery: Is It Blood Transfusion, Reoperation for Bleeding, or Both?

Ann Thorac Surg 2011;91:1780-90



Morbidity of Bleeding After Cardiac Surgery: Is It Blood Transfusion, Reoperation for Bleeding, or Both?

Ann Thorac Surg 2011;91:1780-90

Table 3. Morbidity and Mortality Associated With Reoperation for Bleeding in Matched Patients

Variable	Reoperation for Bleeding (n = 566) No. (%) 68% CI	No Reoperation for Bleeding (n = 566) No. (%) 68% CI	p Value
Operative mortality	48 (8.5) 7.3-9.8	10 (1.8) 1.2-2.5	<-0.0001
Mortality			
Perioperative myocardial infarction	4 (0.7) 0.37-1.3	1 (0.18) 0.03-0.58	0.18
Stroke	11 (1.9) 1.4-2.7	11 (1.9) 1.4-2.7	>0.9
Renal failure	79 (14) 12-16	31 (5.5) 4.5-6.6	<-0.0001
Renal failure requiring hemodialysis	38 (6.7) 5.7-7.9	11 (1.9) 1.4-2.7	<-0.0001
Prolonged ventilation (>24 hours)	186 (42) 40-45	55 (12) 11-14	<-0.0001
Deep sternal wound infection	9 (1.6) 1.1-2.3	4 (0.7) 0.37-1.3	0.16
Reoperation for valve dysfunction	7 (1.2) 0.78-1.9	1 (0.18) 0.03-0.58	0.03
Reoperation for exclusion of valve dysfunction/graft occlusion	57 (10) 8.8-11	2 (0.35) 0.13-0.82	<-0.0001
Other noncardiac reoperation	45 (7.9) 7.1-8.8	6 (1.0) 0.62-1.5	<-0.0001
Length of stay >14 days	145 (26) 24-27	47 (7.2) 6.3-8.1	<-0.0001
Transfusion			
Any intraoperative blood use	234 (45) 42-47	241 (46) 44-48	0.6
RBC	204 (36) 34-38	215 (38) 36-40	0.5
FFP	47 (9.2) 7.9-11	46 (9.0) 7.8-10	0.9
Platelets	108 (19) 17-21	113 (20) 18-22	0.7
Cryoprecipitate	7 (1.4) 0.85-2.1	7 (1.4) 0.85-2.1	>0.9
Any postoperative blood use	495 (87) 86-89	236 (40) 38-42	<-0.0001
RBC	476 (84) 82-86	215 (38) 36-40	<-0.0001
FFP	90 (16)	25 (4)	
1	33 (5.8)	73 (13)	
2	37 (6.5)	80 (14)	
3	65 (11)	15 (2.6)	
>4	291 (51)	47 (8.3)	
Platelets	271 (48) 46-50	54 (9.5) 8.3-11	<-0.0001
Cryoprecipitate	317 (56) 54-58	64 (11) 10-13	<-0.0001
Cryoprecipitate	102 (18) 16-20	8 (1.4) 0.95-2.1	<-0.0001

ORIGINAL ARTICLE

Braz J Cardiovasc Surg 2019;34(1):70-5

Risk Factors and Outcome of Acute Kidney Injury after Isolated CABG Surgery: a Prospective Cohort Study

- AKI insidansı %6.7- %39
- 1737 hastada %15.8 AKI.
- Perioperatif risk faktörleri

Rosner MH, Okusa MD. Acute kidney injury associated with cardiac surgery. Clin J Am Soc Nephrol. 2006; 1:19-32

- İleri yaş
- Diabet
- KPB
- >1U RBC transfüzyonu
- Uzamış mekanik ventilasyon

Original Article

Predictive risk factors of acute kidney injury after on-pump coronary artery bypass grafting

Ann Transl Med 2019;7(3):44

- Preoperatif proteinüri bağımsız prediktif faktör olarak anlamlı bulunmuştur.

Impact of Peri-Operative Acute Kidney Injury as a Severity Index for 30-day Readmission After Cardiac Surgery

Ann Thorac Surg. 2014 January; 97(1): 111-117.

- AKI' de 30 günlük tekrar başvuru %9.3-%28,6

European Journal of Cardio-Thoracic Surgery 42 (2012) 114–120
doi:10.1093/ejcts/etj242 Advance Access publication 12 January 2012 ORIGINAL ARTICLE

Transfusion of blood during cardiac surgery is associated with higher long-term mortality in low-risk patients

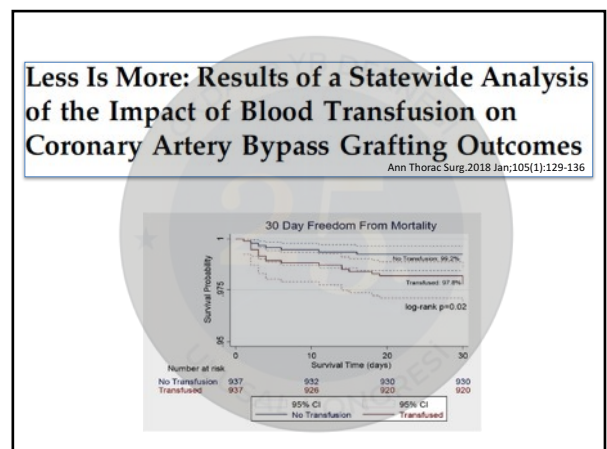
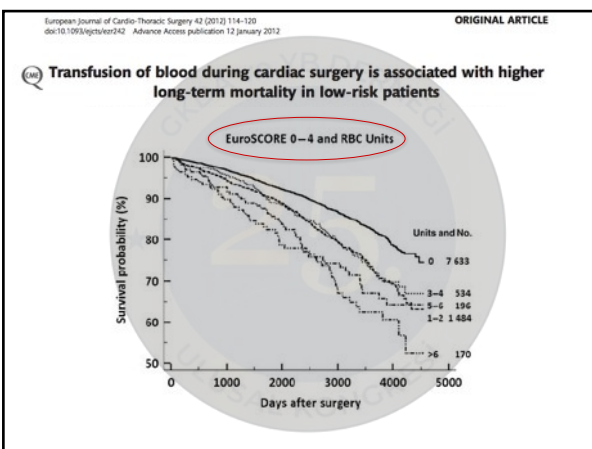
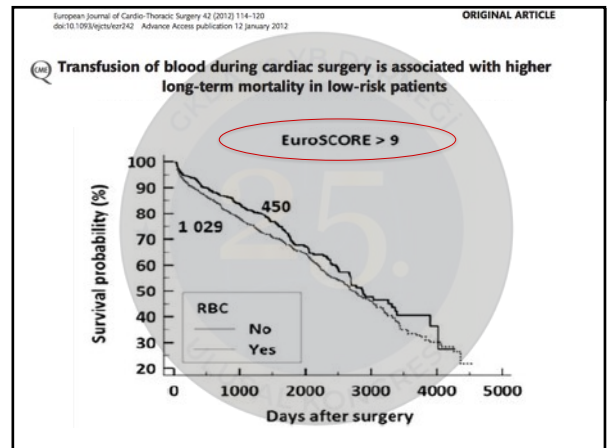
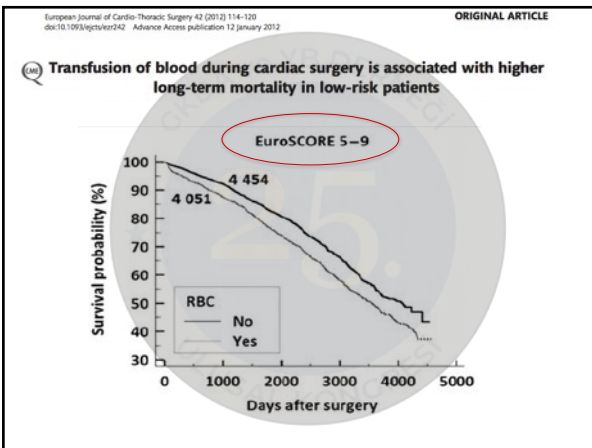
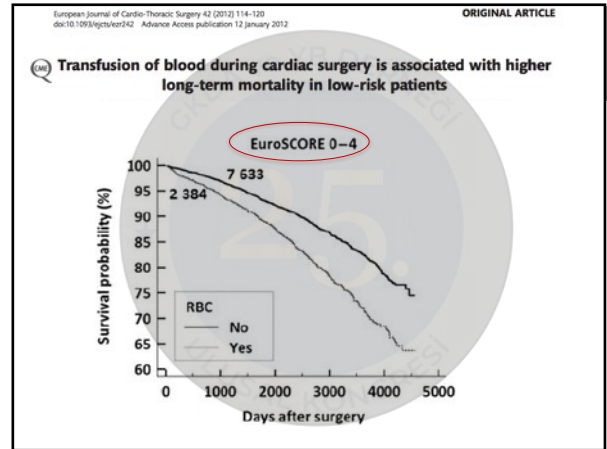
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Received 15 August 2011; received in revised form 7 November 2011; accepted 14 November 2011

Abstract
OBJECTIVE: Numerous reports have emphasized the need for reduction in transfusions of allogeneic red blood cells (RBC) due to increased morbidity and mortality. Nevertheless, transfusion rates are still high in several cardiac surgery institutions. Reports on long-term survival after cardiac surgery and RBC transfusion are few.
METHODS: Data from the Western Denmark Heart Registry (WDHR) were used to identify all (25 117) adult cardiac surgery performed in four centres during 1999–2010. Patients with multiple entries (1049), re-do cardiac surgery (983), special/complex procedures (2329), dying within 30 days (668) and not eligible for follow-up (85) were excluded leaving a cohort of 20 001. Registration in the WDHR is mandatory. WDHR and the unique Danish Civil Registration System with continuous sequential updates of the Danish population ensure that all patients and outcomes are accounted for.
RESULTS: Kaplan–Meier survival plot for low-risk patients (EuroSCORE 0–4), undergoing simple cardiac surgery showed a significantly lower estimated survival after >500 days (0.637 vs. 0.743) when receiving perioperative RBC transfusion ($P < 0.0001$). The difference was less evident in patients with EuroSCORE 5–9 (0.373 vs. 0.436, $P = 0.0001$), while high-risk patients showed no difference. Adjusted risk ratio, after RBC transfusion, containing among others age, sex, EuroSCORE and diabetes, was 1.83 (95% CI (confidence interval) 1.67–2.01). The survival rate was independent of up till six units of RBC.
CONCLUSION: Long-term follow-up of low-risk patients undergoing simple cardiac surgery demonstrates a more than 10% higher mortality when receiving perioperative RBC transfusion. Even transfusion of 1–2 units seems to carry a risk of that magnitude.



**The NEW ENGLAND
JOURNAL of MEDICINE**

ESTABLISHED IN 1812 MARCH 12, 2015 VOL. 372 NO. 11

Liberal or Restrictive Transfusion after Cardiac Surgery

Gavin J. Murphy, F.R.C.S., Katie Pike, M.Sc., Chris A. Rogers, Ph.D., Sarah Wordsworth, Ph.D., Elizabeth A. Stokes, M.Sc., Gianni D. Angelini, F.R.C.S., and Barnaby C. Reeves, D.Phil., for the TRRe2 Investigators*

- **Primer & Sekonder çıktı:**
 - Enfeksiyon
 - İnme
 - Miyokard infarktüsü
 - Akut Böbrek hasarı

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Restrictive or Liberal Red-Cell Transfusion for Cardiac Surgery

Mazer CD, et al 2017

- **Primer çıktı:**
 - Ölüm
 - İnme
 - Myokard infarktüsü
 - Yeni başlangıç böbrek yetmezliği
- **Sekonder çıktı:**
 - Kan transfüzyonu
 - Enfeksiyon
 - MV süresi
 - Yoğun bakımda kalış
 - Hastanede kalış

Table 3. Primary and Secondary Outcomes in the Per-Protocol Population.

Characteristic	Restrictive Threshold (N=2430)	Liberal Threshold (N=2430)	Odds Ratio or Hazard Ratio (95% CI)
Primary outcome			
Composite outcome event — no./total no. (%)	276/2428 (11.4)	303/2429 (12.5)	0.90 (0.76–1.07)
Death — no./total no. (%)	74/2427 (3.0)	87/2429 (3.6)	0.85 (0.62–1.16)
Stroke — no./total no. (%)	45/2428 (1.9)	49/2429 (2.0)	0.92 (0.61–1.38)
Myocardial infarction — no./total no. (%)	144/2428 (5.9)	144/2429 (5.9)	1.00 (0.79–1.27)
New-onset renal failure with dialysis — no./total no. (%)	61/2428 (2.5)	72/2429 (3.0)	0.84 (0.60–1.19)
Secondary outcomes			
Length of stay in ICU			
No. of patients with data	2422	2418	
Median — days	2.1	1.9	0.89 (0.84–0.94)*
Interquartile range — days	1.0–4.0	1.0–3.9	
Length of stay in hospital			
No. of patients with data	2419	2419	
Median — days	8.0	8.0	0.93 (0.88–0.99)*
Interquartile range — days	7.0–13.0	7.0–12.0	
Duration of mechanical ventilation			
No. of patients with data	2416	2421	
Median — days	0.38	0.36	0.94 (0.89–1.00)*
Interquartile range — days	0.22–0.75	0.22–0.71	
Prolonged low-output state — no./total no. (%)			
994/2429 (40.9)	987/2430 (40.6)	1.01 (0.90–1.14)	
Infection — no./total no. (%)	121/2428 (5.0)	101/2429 (4.2)	1.21 (0.92–1.58)
Bowel infarction — no./total no. (%)	6/2428 (0.2)	5/2429 (0.2)	1.20 (0.37–3.94)
Acute kidney injury — no./total no. (%)	792/2332 (34.0)	797/2348 (34.0)	1.00 (0.89–1.13)
Seizure — no./total no. (%)	50/2428 (2.1)	40/2429 (1.7)	1.20 (0.79–1.81)
Delirium — no./total no. (%)	306/2428 (12.6)	264/2429 (10.9)	1.18 (0.99–1.41)
Encephalopathy — no./total no. (%)	26/2428 (1.1)	22/2429 (0.9)	1.18 (0.67–2.10)

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Six-Month Outcomes after Restrictive or Liberal Transfusion for Cardiac Surgery


Mazer CD et al 2018

- **Primer / Sekonder çıktılar**
- **6ay sonraki çıktıların değerlendirilmesi**
 - Hastaneye tekrar başvuru
 - Koroner revaskülarizasyon

Table 2. Outcomes at 6 Months in the Per-Protocol Population.*

Outcome	Restrictive Threshold (N=2430)	Liberal Threshold (N=2430)	Odds Ratio (95% CI)
Primary outcome			
Composite outcome event — no./total no. (%)	402/2317 (17.4)	402/2347 (17.1)	1.02 (0.87–1.18)
Secondary outcomes			
Death from any cause — no./total no. (%)	141/2291 (6.2)	149/2318 (6.4)	0.95 (0.75–1.21)
Myocardial infarction — no./total no. (%)	162/2226 (7.3)	164/2237 (7.3)	0.99 (0.79–1.24)
Stroke — no./total no. (%)	88/2199 (4.0)	74/2232 (3.3)	1.21 (0.88–1.66)
New-onset renal failure with dialysis — no./total no. (%)	87/2222 (3.9)	94/2237 (4.2)	0.93 (0.69–1.25)
Expanded secondary composite outcome event — no./total no. (%)	1015/2318 (43.8)	1006/2348 (42.8)	1.04 (0.93–1.17)
Coronary revascularization — no./total no. (%)	15/2199 (0.7)	19/2234 (0.9)	0.79 (0.40–1.57)
Hospital readmission or emergency department visit — no./total no. (%)	786/2216 (35.5)	746/2223 (33.6)	1.09 (0.96–1.23)
Hospital readmission — no./total no. (%)	577/2204 (26.2)	523/2216 (23.6)	1.12 (1.01–1.32)
No. of hospital readmissions per patient	0.38±0.76	0.34±0.74	
Emergency department visit — no./total no. (%)	579/2201 (26.3)	562/2211 (25.4)	1.07 (0.94–1.22)
No. of emergency department visits per patient	0.44±1.18	0.40±0.95	

Neler yapılabilir?



Transfüzyon kılavuzları

Anesthesiology 2006; 105:198-208

© 2006 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

Practice Guidelines for Perioperative Blood Transfusion and Adjuvant Therapies

2011 Update to The Society of Thoracic Surgeons and the Society of Cardiovascular Anesthesiologists Blood Conservation Clinical Practice Guidelines*

The Society of Thoracic Surgeons Blood Conservation Guideline Task Force:

2017 EACTS/EACTA Guidelines on patient blood management for adult cardiac surgery

The Task Force on Patient Blood Management for Adult Cardiac Surgery of the European Association for Cardio-Thoracic Surgery (EACTS) and the European Association of Cardiothoracic Anaesthesiology (EACTA)

Transfüzyon kılavuzları

- Güncellenmiş transfüzyon kılavuzlarının varlığına rağmen

- Alışkanlıklar
- Mezuniyet sonrası eğitim eksikliği
- Transfüzyon kararı alabilme yetki-sorumluluk ve ücretlendirme zincirindeki eksiklikler nedeni ile

– Klinik pratik uygulamada güncellenme, kılavuzlara paralel olamamaktadır.

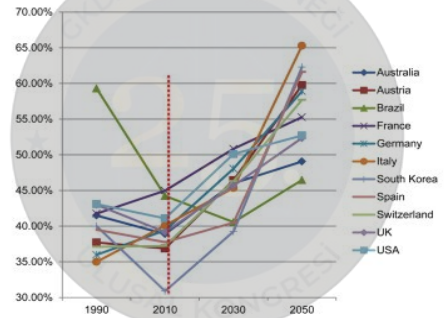
– **Endikasyonsuz kan kullanımı giderek artmaktadır. (ABD’de %60)**

Kardiyak Cerrahide Kan Kullanımı

- ✓ Kaynak bulma zorluğu



Transfüzyona Bağımlılık Oranı



Best Practice & Research Clinical Anaesthesiology Volume 27, Issue 1 2013 43 - 58

Kardiyak Cerrahide Kan Kullanımı

- ✓ Transfüzyonun maliyeti artırması



Kan Kullanımı Maliyeti

- Bir Eritrosit Süspansiyon (ES) transfüzyonu uygulanması toplam maliyeti, ürünün kendi maliyetinin 2-5 katıdır.
- 1 Ünite ES;
Kızılay'a maliyeti: **280 TL**
Ülkeye maliyeti: **420-1100 TL**
- Tüm ilgili maliyetler hesaplanırsa, toplam transfüzyon maliyeti, –Sağlık hizmetleri bütçesinin % 4,5'inden fazlasına ulaşmaktadır.

Leahy MF. Int. Med. J. 2012;42:332-38
Shander A. Best Pract Res Clin Anaesthesiol 2007;21:271-89

Kardiyak Cerrahide Kan Kullanımı

- ✓ Hasta güvenliği



Hasta Güvenliği



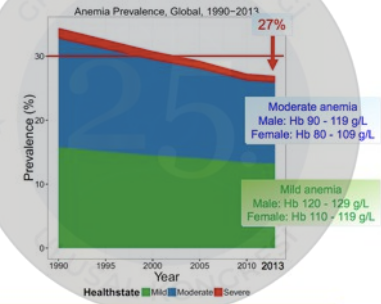
- Bulaş riski
 - Tarama testlerindeki güvenlik: 0,9999
- Transfüzyon reaksiyonları
 - Akut / Kronik reaksiyonlar

Risk Faktörlerinin Azaltılması

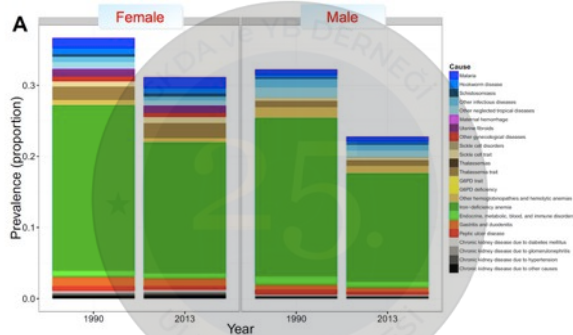
- İleri yaş
- Kadın cinsiyet
- Düşük BMI
- Preoperatif Hb değeri
- Preoperatif komorbidite faktörleri
- Acil cerrahi ve/ Reoperasyon
- Uzamış KPB süresi , Kros klemp süresi
- STS - mortalite riski
- Cerrahi öncesi kullanılan ilaçlar

Niv Ad, et al. Cardiovasc Revasc Med. 2015 Oct-Nov;16(7):397-400
Salvatore De Santo Lu, et al. J Thorac Dis 2017;9(10):3719-3727
Likosky DS, et al. Ann Thorac Surg. 2017 March; 103 (3):764-772
Stammers AH, et al. Perfusion 2018;1-10
Huang D, et al. Medicine 2019;98.5

Preoperatif Anemi



Kassebaum N. J. et al., Blood (2014) 123: 615
Kassebaum N. J. et al., Hematol Oncol Clin North Am (2016) 30: 247



Kassebaum N. J. et al., Hematol Oncol Clin North Am (2016) 30: 247

Preoperative Anemia versus Blood Transfusion: Which is the Culprit for Worse Outcomes in Cardiac Surgery?

The Journal of Thoracic and Cardiovascular Surgery (2018), doi:10.1016/j.jtcvs.2018.03.109

- Preoperatif anemi postoperatif morbidite ve mortaliteyi arttıran bağımsız risk faktörüdür.
- Eritrosit transfüzyonu x4 ↑
- Böbrek yetmezliği x3 ↑
- Mortalite x2 ↑

Anemi varlığında;

- Hb %30 ↓ ;
 - Morbidite %40 ↑
 - Mortalite %30 ↑
- İntraoperatif major kan kaybı olduğu durumda;
 - Morbidite x3 ↑
 - Mortalite x3 ↑

Musallam K. M. et al. Lancet (2011) 378: 1396
 Ranucci M. et al. Ann Thorac Surg (2013) 96: 478
 Spahn D. R. et al. Lancet (2013) 381: 1855

Blood Management

Section Editor: Susan Goobie

Discharge Hemoglobin Level and 30-Day Readmission Rates After Coronary Artery Bypass Surgery

February 2019 • Volume 128 • Number 2

- Primer çıktı;
 - 30 günlük hastaneye tekrar başvuru
- Sekonder çıktı;
 - Hastanede kalma süresi
 - Postoperatif morbidite
 - enfeksiyon
 - Trombotik sonuçlar
 - Akut böbrek hasarı
 - Solunumsal problemler
 - Major iskemik sonuçlar

Table 3. Multivariable Logistic Regression: 30-d Readmission Rates

Parameter	Odds Ratio (95% CI)	P Value
Age ≥65 y	0.84 (0.61-1.16)	.30
Male sex	0.97 (0.67-1.43)	.88
CCI (per unit increase)	1.11 (1.01-1.21)	.02
Pre (compared to post) PBM	1.36 (0.97-1.90)	.07
Race (reference)	0.38 (0.08-1.17)	.09
Renal disease	2.35 (1.61-3.40)	<.0001
Pulmonary disease	1.17 (0.77-1.76)	.47
Diabetes mellitus	1.10 (0.77-1.55)	.60
Low (compared to high) Hb cohort ^a	1.16 (0.84-1.61)	.36

Hasta Kan Yönetimi

- Hemogloblin konsantrasyonunu korumak,
- Hemostazı optimize etmek,
- Kan kaybını en aza indirmek için;

Kanıtla dayalı tıbbi ve cerrahi olanakların zamanında uygulanmasıdır.

The Impact of Blood Conservation on Outcomes in Cardiac Surgery: Is It Safe and Effective?

Ann Thorac Surg 2010;90:451-9

Outcome	Non-PBMP cohort (n=586)	PBMP cohort (n=586)	P value
Transfüzyon	%42.5	%10.6	<0.0001
Mortalite	%2.5	%0.8	0.02
Ciddi Komplikasyon	%18.75	%11.1	0.0002

BLOOD MANAGEMENT

Patient blood management in cardiac surgery results in fewer transfusions and better outcome

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- PBM programının transfüzyon insidansı ve çıktılar üzerine etkisi araştırılmış.
- Hedefe yönelik koagülasyon algoritmi
- Restriktif transfüzyon

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TABLE 2. Blood loss and transfusion outcome*

	Pre-PBM epoch	PBM epoch	p value
RBC loss (mL)	810 ± 426 721 [538-993]	605 ± 369 552 [370-756]	<0.001
Hb (g/dL)			
Before transfusion	7.2 ± 1.4	6.6 ± 1.2	<0.001
After transfusion	8.3 ± 1.3	7.7 ± 1.1	<0.001
% of patients transfused			
RBCs	39.3	20.8	<0.001
FFP	18.3	6.5	<0.001
PLTs	17.8	9.8	<0.001
RBCs (units/patient)	1.28 ± 2.34 0 [0-2]	0.61 ± 1.57 0 [0-0]	<0.001
FFP (units/patient)	0.78 ± 1.98 0 [0-0]	0.23 ± 1.05 0 [0-0]	<0.001
PLTs (units/patient)	0.39 ± 1.03 0 [0-0]	0.17 ± 0.65 0 [0-0]	<0.001
Discharge Hb (g/dL)	9.1 ± 1.2	9.4 ± 1.5	<0.001

* Data are mean ± SD and median [interquartile range] for nonnormally distributed data.

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TABLE 3. Clinical and economic outcomes

	Pre-PBM epoch	PBM epoch	p value
Mortality (%)	3.9	4.4	0.642
CVA (%)	3.40	2.10	0.130
Kidney injury (%)	7.60	5.00	0.039
ICU LOS (days)	5.0 ± 7.1	5.0 ± 7.1	0.970
	3 [1-6]	3 [1-6]	
Hospital LOS (days)	12.2 ± 9.6	10.4 ± 8.0	<0.001
	10 [7-15]	8 [6-12]	
30-day readmission rate (%)	0.3	0.1	0.467
Total direct costs (\$)	48,375 ± 28,053	44,300 ± 25,915	<0.001
	39,709 [32,470-54,994]	36,906 [29,510-49,967]	

Review Article

Anemia and Patient Blood Management in Cardiac Surgery—Literature Review and Current Evidence

J Cardiothorac Vasc Anesth. 2018 Dec;32(6):2726-274

- Aneminin erken tespit ve tedavisi,
 - Allojenik kan transfüzyonundan kaçınmak,
 - Hasta çıktılarının düzelmesi ;
- Hasta kan yönetimi programının yararlarını destekleyen kanıtlar mevcuttur.

Sonuç

- Hb ≥ 8gr/dl
- Eşlik eden bir risk faktörü yok ise;
 - Yapılacak transfüzyonun, daha iyi klinik sonuçların sağlanmasına katkı sağlayacağına yönelik **KESİN** bir bilimsel verimiz yok,
 - Aksine yapılan transfüzyonun kötü klinik sonuçların gelişmesine neden olabileceğine yönelik **ÇOK CİDDİ** bilimsel verilerimiz var.

Sonuç

