



WHAT IS INTEGRAL?



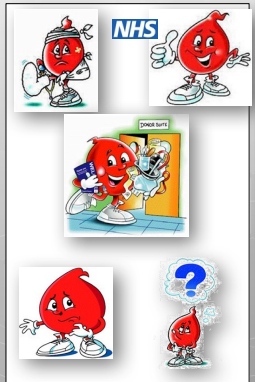
**BEZMİALEM**  
VAKIF ÜNİVERSİTESİ  
DRAGOS HASTANESİ

24. Ulusal Reüzyon

Pediyatrik ♥ Cerrahisinde  
Transfüzyon: Eşik Değer ?

*Ayda Türkçe*  
Bezmialem Vakıf Üniversitesi Dragos Hastanesi





### Sunum Akışı

- ◆ Transfüzyon Nedeni
- ◆ Preoperatif Anemi
  - Soruclar-yönetim
- ◆ İntraoperatif Anemi
  - Soruclar -yönetim
- ◆ Postoperatif Anemi
  - Soruclar ve yönetimi
- ◆ Aneminin Riskleri
- ◆ Hemoglobinin İşlevi
- ◆ **Transfüzyon Eşiği**
- ◆ Bizim Uygulamalarımız

Red Blood Cell Transfusion in the Postoperative Care of Pediatric Cardiac Surgery: Survey and Stated Practice

Red blood cell transfusion practice in children: current status and areas for improvement? A study of the use of red blood cell transfusions in children and infants

Helen V. New, John Grant-Casey, Derek Lowe, Andrea Kelleher, Sylvia Hennem, Simon J. Stanworth

Pediyatrik Kalp Cerrahisinde çocuk hastalara ayrılan kanın %13'ü kullanılır ve Hastaların % 80'ine transfüzyon yapılır.

### Transfüzyon nedeni

Patient Blood Management in Pediatric Cardiac Surgery: A Review

ANESTHESIA & ANALGESIA 2017

Jill M. Cholette, MD,\* David Faraoni, MD, PhD,† Susan M. Goobie, MD, FRCPC,‡§ Victor Ferraris, MD, PhD,|| and Nabil Hassan, MBBCh¶

### Transfüzyon nedeni

Gelişimsel fakt	<ul style="list-style-type: none"> <li>• Konj hast</li> <li>• DiGeorge synd</li> <li>• İmmatür hemostaz</li> </ul>
Fizyolojik fakt	<ul style="list-style-type: none"> <li>• Siyanoz</li> <li>• Şant</li> </ul>
Cerrahi ve KPB	<ul style="list-style-type: none"> <li>• Ciddi cerrahi kanama</li> <li>• Koagülopati ve Hemo dilüsyon</li> </ul>

**Transfüzyon Yönetimi**

...Oksijen sunumunu koruma stratejisi

**Transfüzyon Yönetimi**

.....Kant düzeyleri düşük!

**2C Weak recommendation. Low quality evidence.**

**Preop anemi prevalansı**

Polzer Cardiol (2014) 35:471-478  
DOI 10.1007/s00464-013-0988-8  
ORIGINAL ARTICLE

**Association Between Anemia and Packed Cell Transfusion and Outcomes of Ventricular Septal and Atrioventricular Canal Repair in Children**

Zoruban Khan - Girişçi Natarajan - Sulaim Saltaam - Igor Bondarenko - Henry K. Walker - Ralph Deline - Sanjeev Aggarwal

- Retrospektif, <1Y:195 olgu
- VSD ve AV kanal
- Anemi: HTC < %33, olgu prv: **%23**

Timing of surgery	<1 month	1 to <2 months	2 to <3 months	3 to <6 months	≥6 months
AV canal	n = 0	n = 5	n = 11	n = 55	n = 14
Mean (SD) Hb		11.3 (1.8)	11.0 (2.1)	12.8 (1.5)	12.8 (2.1)
Anemia (%)		2 (60)	1 (9)	4 (7)	2 (14)
VSD	n = 1	n = 7	n = 20	n = 47	n = 35
Mean (SD) Hb	14.2	14.6 (1.4)	13.7 (1.5)	12.2 (1.1)	11.6 (1.4)
Anemia (%)	0	1 (14)	11 (55)	14 (29)	10 (28)

Hb hemoglobin

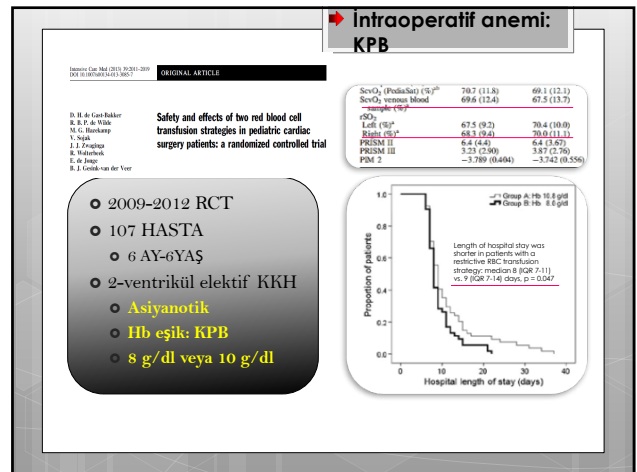
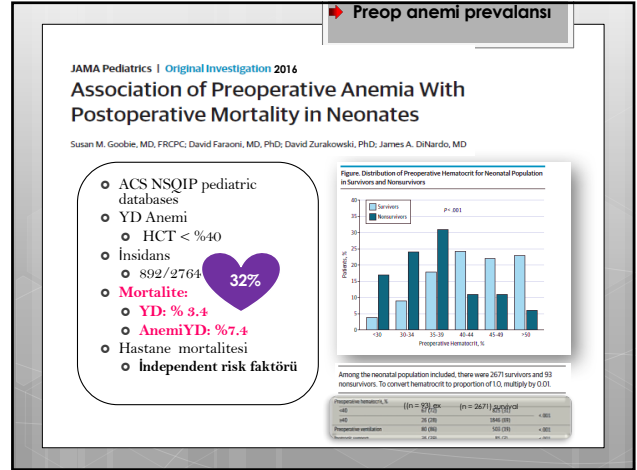
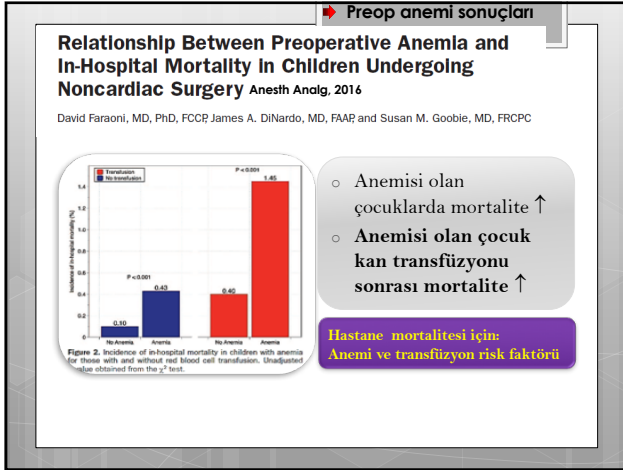
**Preop anemi prevalansı**

**Relationship Between Preoperative Anemia and In-Hospital Mortality in Children Undergoing Noncardiac Surgery** Anesth Analg, 2016

David Faraoni, MD, PhD, FCCP James A. DiNardo, MD, FAAR and Susan M. Goobie, MD, FRCP

Çerçhi kalite iyileştirme

- ACS NSQIP pediatric veritaba: 1-18 yaş
- 1-2 y: HTC < %33
- 2-4 y: HTC < %34
- 4-7 y: HTC < %35
- 7-12: HTC < %36
- 12-18: HTC < %36
- 12- 18: HTC < %38



**↳ Intraoperatif anemi: Hipotermik KPB**

**The influence of hemodilution on outcome after hypothermic cardiopulmonary bypass: Results of a randomized trial in infants**  
The Journal of Thoracic and Cardiovascular Surgery, 2003

• 1996-2000 Boston çocuk hastanesi  
 • 147 hasta < 9 ay  
 • 2-ventrikül elektif KKH  
 • Aşıyanotik siyanotik  
 • Hemodilüsyon KPB  
 • HCT:%20-%30  
 • Bu çalışmada eşik belirlenmiyor

**TABLE 2. Postoperative course according to treatment group. P values\***

Variable	Lower hematocrit level (n = 74)	Higher hematocrit level (n = 73)	P value*
Lowest cardiac index (l · min <sup>-1</sup> · m <sup>-2</sup> )	2.8 ± 1.1	3.1 ± 1.1	.02
Lactate 60 min after bypass	3.3 ± 1.9	2.7 ± 1.2	.00
Resistance (% change from preoperative day 1)	-28.2 ± 16.5	-28.4 ± 20.3	.006

**↳ Intraoperatif anemi Hipotermik KPB**

**Randomized trial of hematocrit 25% versus 35% during hypothermic cardiopulmonary bypass in infant heart surgery**  
J Thorac Cardiovasc Surg 2004;128:112-120

Jane W. Newburger, MD, MPH<sup>1,2</sup> Richard A. Jonas, MD<sup>1,3</sup> Janet Soud, MD<sup>1,4</sup> Barry D. Kussman, MBSCh<sup>1,5</sup> David C. Bellinger, PhD, MS<sup>1,6</sup> Peter C. Lauzon, MD<sup>1,7</sup> Richard Robertson, MD<sup>1,8</sup> John E. Mayer Jr, MD<sup>1,9</sup> Peter J. del Rio, MD<sup>1,10</sup> Emilio A. Guiza, MD<sup>1,11</sup> Joseph M. Fontana, MD<sup>1,12</sup> Frank Pigula, MD<sup>1</sup> Stephen J. Roth, MD, MPH<sup>1</sup> Karen J. Vaccaro, PhD<sup>1</sup> Adria J. du Plessis, MBSCh, MPH<sup>1,13</sup> David M. Farrell, MA, CCP<sup>1</sup> Elton McGrath, RN<sup>1</sup> Leonard A. Rappaport, MD<sup>1,14</sup> and David Wygi, PhD<sup>1,15</sup>

• 2001-2004 Boston çocuk hastanesi  
 • 124 hasta < 9 ay  
 • 2-ventrikül elektif KKH  
 • Aşıyanotik ve siyanotik  
 • KPB:Hemodilüsyon  
 • HCT eşik değeri?  
 • HCT:%25-%35

• Optimal Nöro-gelişimsel  
 • HCT > %25 olmalı

**TABLE 4. Scores on developmental tests according to treatment group**

Test	25% Hematocrit (n = 61)	35% Hematocrit (n = 58)	P value*
Psychomotor Development Index	87.6 ± 15.4	86.6 ± 16.3	.98
Mental Development Index	93.7 ± 11.5	93.6 ± 12.0	.38
Age with raw score equal to test score (%)			
Psychomotor Development Index	21/60 (44)	25/58 (43)	.85
±SD	18/45 (38)	19/58 (37)	.79
Mental Development Index	5/47 (18)	12/57 (21)	1.0
±SD	1/47 (2)	1/57 (2)	1.0

**↳ Intraoperatif anemi KPB yönetimi**

**■ NARRATIVE REVIEW ARTICLE**

**Patient Blood Management in Pediatric Cardiac Surgery: A Review** ANESTHESIA & ANALGESIA, 2017

Jill M. Cholette, MD,\* David Faraoni, MD, PhD,† Susan M. Gooble, MD, FRCP(C),‡§ Victor Ferraris, MD, PhD,|| and Nabil Hassan, MBChB¶

**Table 2. Consensus Recommendations for Blood Conservation Interventions in Children Having Cardiac Operations**

Intervention	Type of Evidence	Expected Outcome
<b>Intraoperative interventions</b>		
Prophylactic transfusion to avoid excessive hemodilution while on CPB	Multivariate adjusted study comparing prophylactic transfusion for Hct <20% compared to therapeutic transfusion after CPB	Prophylactic transfusion to keep Hct >20% was associated with reduced composite morbidity and mortality compared to therapeutic transfusion after CPB
Intraoperative cell salvage	Observational data only	Benefit is not clear, but extrapolation from adults supports use in children
Miniaturized CPB circuits	Observation data only	Decreases intraoperative blood utilization
Topical hemostatic agents	Only observational data in adults	Low risk, effective therapy
Low-dose antifibrinolytic therapy especially with tranexamic acid	In vitro evidence coupled with observational study in children	Plasma concentration of TXA of <20 µg/mL provides effective antifibrinolytic effect
Point-of-care tests of clotting (TEG and ROTEM)	In children only observational studies	Reduced transfusion with use of point-of-care technology

**↳ Intraoperatif KPB:Transfüzyon eşiği**

**bjh** Guidelines on transfusion for fetuses, neonates and older children  
British Journal of Haematology, 2011; 124, 784-828

• Aşıyanotik çocuk hastalarda 8 g/dl transfüzyon eşiği güvenlidir  
 • Gast-Bakker et al,2013

• Siyanotik çocuk hastalarda ~8.5 g/dl transfüzyon eşiği güvenlidir  
 • Jonas et al,2003; Newburger et al,2008

• YD için değer bildirilmemiştir

• Siyanotik çocuk klavuzu önerilmiştir

### Postoperatif anemi sonuçları

**Outcomes Using a Conservative Versus Liberal Red Blood Cell Transfusion Strategy in Infants Requiring Cardiac Operation**

Jill M. Cholette, MD, Michael F. Swartz, PhD, Jeffrey Rubenstein, MD, Kelly F. Henrichs, MT(ASCP), Hongyue Wang, PhD, Karen S. Powers, MD, Eugene Daugherty, MD, George M. Allert, MD, Francisco Gensini, MD, and Neil Blumberg, MD

Department of Pediatric Surgery, Pathology and Laboratory Medicine, and Biostatistics, University of Rochester, Rochester, NY

(Ann Thorac Surg 2017;103:206-15)

2012 -2014  
Rochester üniversitesi  
162 infants  
Biventrikül ve palyatif  
Liberal 9,5 v 12g/dl  
Restriktif 7 v 9 g/dl

**Klinik outcome**

Outcome	Conservative (n = 82)	Liberal (n = 80)	p Value
No. of RBC transfusions	0 (0-10)	1 (0-10)	<.001*
No. of RBC exposures	0 (0-4)	1 (0-5)	<.001*
No. of coagulant product transfusions	0 (0-2)	0 (0-2)	0.51
Total cancer exposures	0 (0-7)	1 (0-12)	<.001*
Thrombosis	7 (9)	4 (5)	0.37
Cerebral vascular accident	1 (1)	0	0.32
Mediastinal drainage, days	1 (1-93)	8 (1-133)	0.88
PCICU length of stay, days	1 (2-131)	6 (1-113)	0.35
Hospital length of stay, days	5 (4-143)	13 (6-133)	0.42
30-day mortality	2 (2.5)	3 (6)	1.0
Death secondary to intervention	0	2 (2)	0.09
In-hospital deaths <sup>a</sup>	4 (7)	5 (6)	0.97
Total fluid boluses (albumin + NS) mL/kg	4 (0-523)	7 (0-316)	0.67

### Postoperatif anemi sonuçları

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Department of Pediatric Surgery, Pathology and Laboratory Medicine, and Biostatistics, University of Rochester, Rochester, NY

**Fizyolojik metrik**

Fig 5. Comparison of the (A) overall arterial-venous difference (avdIF), (B) daily mean avdIF for all patients, and (C, D) before-and-after red cell transfusions for all patients. An arteriovenous oxygen difference (avO<sub>2</sub>dIF) of 3.5 to 5.0 mL O<sub>2</sub>/100 mL was considered normal and is demarcated. \*Statistically significant between conservative and liberal patients. BV = biventricular; Pa = palliative; Trans = transfusion.

### Postoperatif anemi sonuçları

**Outcomes Using a Conservative Versus Liberal Red Blood Cell Transfusion Strategy in Infants Requiring Cardiac Operation**

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Department of Pediatric Surgery, Pathology and Laboratory Medicine, and Biostatistics, University of Rochester, Rochester, NY

**Biyobelirteç**

Fig 4. Comparison of peak daily arterial lactate concentrations for (A) all patients, (B) biventricular (BV) patients, and (C) palliative (Pa) patients and (D) percentage of lactate time greater than 2.0.

Guidelines on transfusion for fetuses, neonates and older children. *BMJ Journal of Paediatrics*, 2016, 192, 789-820

### Postoperatif Transfüzyon eşik


- Asiyonotik (7 g/dl) güvenli
- Organ disfonksiyonu; (Willems et al, 2010)
- Asiyonotik (8 g/dl) güvenli
- Hastanede kalış; (Gast-Bakker et al, 2013)
- Siyanotik-tek ventrikül hastalarda 9 g/dl güvenli
- Lactate concentration, arteriovenous and arteriocerebral oxygen content and length of hospital stay (Cholette et al, 2011).
- Neonatal , siyanotik hastalar ile siyanotik olmayan kanamalı hastalarda değer bildirilmemiştir

Postoperatif transfüzyon eşiği

### Blood Transfusions After Pediatric Cardiac Operations: A North American Multicenter Prospective Study

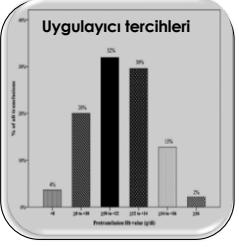
Max Transf. Surg. 2013;9(5):51-57  
© 2013 by The Society of Thoracic Surgeons

Amine Mazine, MS, Soha Rached-D'Astous, MD, Thierry Ducruet, MS, Jacques Lacroix, MD, FRCP(C), and Nancy Poirier, MD, FRSC, on behalf of the Pediatric Acute Lung Injury and Sepsis Investigators Network  
Departments of Cardiac Surgery, Pediatric and Biostatistics, Centre hospitalier universitaire (CHU) Sainte-Justine, Université de Montréal, Montréal, Québec, Canada



- Etyoloji: Dilüsyon- kanama
- 2004-2005 NA, 30 M
- >28 g-<18 y, Kompleks
- Transfüzyon eşiği
- Asiyantotik ve siyanotik
- $11.1 \pm 2.2$  and  $11.8 \pm 2.1$  g/dL
- Hastaların %83'ünde Kan transfüzyonu kararı anemi olmadan verilmiştir

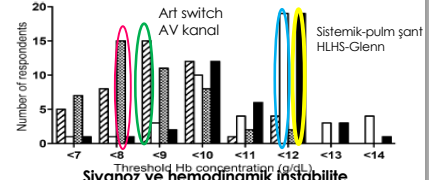
#### Uygulayıcı tercihleri



Postoperatif transfüzyon eşiği

### Red Blood Cell Transfusion in the Postoperative Care of Pediatric Cardiac Surgery: Survey on Global Practice

Journal of Intensive Care Medicine 2014;29(1):1-7  
© 2013 by Sage Publications



**Siyanoz ve hemodinamik instabilite**

**Fig. 1** Distribution of hemoglobin (Hb) threshold for hemodynamically stable patients (Part A) in all scenarios. The mean Hb threshold below which respondents would prescribe packed red blood cells transfusion was statistically different between acyanotic scenarios and cyanotic scenarios ( $p < 0.0001$ ). *Diagonal lines* 6 days of age, *arterial switch*. *White bar* 6 days, systemic-pulmonary shunt. *Dots* 5 months atrioventricular canal. *Black bar* 5 months Glenn for hypoplastic left heart syndrome

Hb işlevi



**Oksijen taşıma kapasitesi**

$Cao_2(Hb)(1.34)(SaO_2) + (0.0031)(PaO_2)$

**Global oksijen kullanım**


- Mixvenöz oks sat
- AV O2 farkı
- Kan Laktat seviyesi
- BE seviyesi

**Doku oksijenasyonu**

- O2 sensörü
- Ototregülasyon
- Hb afinitite

**Hemostazi kolaylaştırmak**

- İrambasi konsantrasyonlarını
- Agregasyonu



## SAVE BLOOD, SAVE LIVES

*Transfusions are the one of the most overused treatments in modern medicine, at a cost of billions of dollars. Researchers are working out how to cut back.*

24 | NATURE | VOL 520 | 2 APRIL 2015

**Blood Transfusion Therapy**  
Lawrence Tim Goodrough, MD<sup>1,2</sup>, Anil K. Paraghi, MD<sup>3,4</sup>  
Med Clin N Am 101 (2017) 431-447

**Transfüzyon riskleri**

to patients for multiple therapeutic purposes. While transfusion of blood products has no doubt increased over time, in recent years a greater emphasis has been placed on restrictive protocols and attempts to limit its adverse consequences. **The overall complication rate of transfusion in children is 10.7 complications per 1000 units transfused, substantially higher than the rate in adults of 2.5 complications per 1000 units transfused**

**Table 2 Transfusion reactions**

Immune-mediated	Nonimmune-mediated
Alloimmunization to red blood cell antigens and HLA antigens	Infectious
Idiosyncratic hemolytic transfusion reactions	Volume overload
Acute and delayed allergic transfusion reactions	Massive transfusion: metabolic, hypothermic, dilution and pulmonary microembolization
Febrile nonhemolytic transfusion reactions	Misdiagnosis
Allergic transfusion reactions	Transfusion-transmitted infections
Posttransfusion purpura	
Transfusion-related acute lung injury	
Transfusion-associated circulatory overload	
Transfusion-related graft versus host disease	
Transfusion-induced immunomodulation	

**Table 3 Transfusion-Associated Fatalities by Complication, FY2012-FY2016**

Complication	FY12 No.	FY12 %	FY13 No.	FY13 %	FY14 No.	FY14 %	FY15 No.	FY15 %	FY16 No.	FY16 %	Total No.	Total %
Anaphylaxis	2	5%	-	0%	2	7%	5	5%	5	12%	11	6%
Contamination	3	8%	5	13%	1	3%	5	14%	5	12%	19	10%
HTR (ABO)	3	8%	1	3%	4	13%	2	5%	4	9%	14	8%
HTR (non-ABO)	5	13%	5	13%	4	13%	4	11%	1	2%	19	10%
Hypotensive Reaction	-	0%	-	0%	1	3%	1	3%	1	2%	3	2%
TACO	8	21%	13	34%	5	17%	11	30%	19	44%	56	30%
TRALI	17	45%	14	37%	13	43%	12	32%	8	19%	64	34%

**İntelektüel olmayan ciddi transfüzyon hastalıkları (NCHCT)**

**Fig 1. The contributing factors and results of the RBC storage lesion. DPG, diphosphoglycerate; N.O, Nitric oxide; MOF, multiple organ failure.**

**RBClerin kalitesi, RBC miktarından daha önemlidir**

**Blood Transfusion Therapy**  
Lawrence Tim Goodrough, MD<sup>1,2</sup>, Anil K. Paraghi, MD<sup>3,4</sup>  
Med Clin N Am 101 (2017) 431-447

**Transfüzyon riskleri**

**Kırmızı kan hücrelerinde depolanma sırasında hasar ve immunomodülasyon**

**Storage Lesion**

**Ödemele injury**

**Microvascular Injuries**

**Immune Modulation**

**↓ Defensibility**

**↑ Hemostatic**

**↑ Hemorrhagic**

**↑ Infection**

**↓ N.O**

**↑ RBC Aggregation & Adhesion**

**↑ Hypocoagulability**

**↑ Endothelial Injury**

**↓ Microvascular Perfusion**

**↑↑ ↓ G. Consumption**

**↑ MOF**

**↑ Death**

**Fig 1. The contributing factors and results of the RBC storage lesion. DPG, diphosphoglycerate; N.O, Nitric oxide; MOF, multiple organ failure.**

**Potasyum laktat ve serbest [Hb]↑**

**Fleksibilite özelliği↓**

**2,3-difosfoglisarat ↓**

**Oksijen afinitesi ↓**

**Mikropartiküller ve aktif lipitler ↑**

**Makrofaq akt ↓ enzimleri ve proinf sitokinleri↑**

**Blood Transfusion Therapy**  
Lawrence Tim Goodrough, MD<sup>1,2</sup>, Anil K. Paraghi, MD<sup>3,4</sup>  
Med Clin N Am 101 (2017) 431-447

**Transfüzyon riskleri**

**Table 3: Transfusion-Associated Fatalities by Complication, FY2012-FY2016**

Complication	FY12 No.	FY12 %	FY13 No.	FY13 %	FY14 No.	FY14 %	FY15 No.	FY15 %	FY16 No.	FY16 %	Total No.	Total %
Anaphylaxis	2	5%	-	0%	2	7%	5	5%	5	12%	11	6%
Contamination	3	8%	5	13%	1	3%	5	14%	5	12%	19	10%
HTR (ABO)	3	8%	1	3%	4	13%	2	5%	4	9%	14	8%
HTR (non-ABO)	5	13%	5	13%	4	13%	4	11%	1	2%	19	10%
Hypotensive Reaction	-	0%	-	0%	1	3%	1	3%	1	2%	3	2%
TACO	8	21%	13	34%	5	17%	11	30%	19	44%	56	30%
TRALI	17	45%	14	37%	13	43%	12	32%	8	19%	64	34%

**(FDA) raporu: 2007 ve 2011 yılları arasında, ölüme sonuçlanan komplikasyonlar içerisinde, transfüzyonla ilişkili akut akciğer hasarı (TRALI), (% 43) ilk sıradadır**

**Transfusion Decision Making in Pediatric Critical Illness**  
Pediatr Clin N Am 64 (2017) 991-1015  
Chris Markham, MD<sup>1</sup>, Sara Small, MD<sup>2</sup>, Peter Howland, MD<sup>3</sup>, Allan Doctor, MD<sup>4</sup>

**Anemik çocukta Transfüzyon Eşiği**

Oksijen sunumu:  $DO_2 \downarrow$   
 $DO_2: CO \times CaO_2$

Oksijen sunumu  $DO_2 \downarrow$ :  
**Hemostatik sistem** bunu kompanse edebiliyor mu?

Oksijen sunumu  $DO_2 \sim$  ancak **organ spesifik** anemi intolaransı bulguları var

**Fizyolojik metrik:**  
 $VO_2 < \%10$   
Normal: 3-3.5 ml/kg/dk

$DO_2 < 7 \text{ ml/kg/dk}$   
 $O_2ER > \%40$   
MAP < %80-90 b  
KAH > %120-130 b  
SS > %120-130b

ST elevasyonu, HRV Kognitif Disfonk. Jugular bulb %hbO2 NIRS serebral NIRS Somatik stco2 > %20 ↓

**Biyobelirteç**  
Laktat: 3mM/l

**Biyobelirteç**  
ScvO2 ≈ % 50-60

**Biyobelirteç**  
Troponin artışı

**Anemik çocukta Transfüzyon Eşiği**

Transfusion Medicine Reviews  
Journal Homepage: www.intervivo.com

Special Issue Articles  
The Effects of red Blood Cell Transfusion on Tissue Oxygenation and the Microcirculation in the Intensive Care Unit: A Systematic Review  
Nathan D. Nielsen <sup>1,2</sup>, Ignacio Martín-González <sup>3</sup>, Catherine Wernowski <sup>1</sup>

**Kapiller ötesi monitörizasyon**  
**Fizyolojik metrikler...**

**Hb değeri**

**Organ disfonksiyon belirteçleri**

**Hemodinamik monitoring - Physiology**

CO<sub>2</sub> - SV + HR  
CO<sub>2</sub> - 70ml x 70 beattarım  
CO<sub>2</sub> - 5L/min

SpO<sub>2</sub> - 75%  
P<sub>50</sub> - 13.6kPa (100 mmHg)  
CvO<sub>2</sub> - 135ml/L

SpO<sub>2</sub> - 95%  
P<sub>50</sub> - 13.6kPa (100 mmHg)  
CvO<sub>2</sub> - 150ml/L

SpO<sub>2</sub> - 75%  
P<sub>50</sub> - 13.6kPa (100 mmHg)  
CvO<sub>2</sub> - 135ml/L

O<sub>2</sub> satırması - 30ml  
P<sub>50</sub> - 13.6kPa (100 mmHg)

**OPS: Gastrik tonometri, mikrosiyaliz**

**Transfüzyon eşiği yönetimimiz**

**Glenn**

	IPPV	SIMV	CPAP+PSV
SpO <sub>2</sub>	78 ± 10	77 ± 9	75 ± 8
End-tidal CO <sub>2</sub>	36 ± 5	38 ± 5	39 ± 5
PuCO <sub>2</sub>	46 ± 4	48 ± 5	45 ± 5
Hematocrit	37 ± 3	35 ± 2	36 ± 2
SAP	95 ± 18	99 ± 14	100 ± 11
DAP	50 ± 10	55 ± 9	60 ± 11
MAP	67 ± 11	71 ± 11	79 ± 10
Lactate	1.9 ± 1.1	2.2 ± 0.9	1.8 ± 0.8
Mean airway pressure	14 ± 4	14 ± 3	10 ± 1

**TABLE 3. Hematocrit and Systolic Arterial Pressure Results**

Variable	TGA			P
	Group 1 Mean ± SD	Group 2 Mean ± SD	Group 3 Mean ± SD	
Hematocrit (%)				
Preop	35.3	35.5	35.5	0.59
Postop	32.6	32.3	32.3	0.41
Midop	31.5*	31.5	31.5	0.38
KCI	31.4	31.3	31.4	0.87
CIS	31.4	31.5	31.5	0.90
ICIS	31.4	31.5	31.5	0.41
ICIS	31.3	31.3	31.3	0.98

**Preop Ventil: VSD, AV, Falot**

	Kontrol grubu	Çalışma grubu	p
Cardiyo pulmoner bypass zamanı	79.04±22.72	47.53±19.4	0.10
Kross klemep zamanı	50.26±11.8	46.94±15.7	0.08
Kross klemep kaldırma zamanı	21.78±9.95	20.34±7.08	0.58
En düşük tci	32.76±2.66	33.04±0.98	0.62
En düşük hct	27.76±2.78	27.66±3.24	0.92
Ventrikülötomisi	Var	18 (18/78.3)	17 (18/100)
Myotomi	Var	5 (5/21.7)	0 (0/0)
Myotomi	Var	13 (13/54.3)	17 (18/100)
Aktotomi	Var	10 (10/41.3)	0 (0/0)
Aktotomi	Var	2 (2/8.7)	2 (2/11.8)
Deltoidiyomi	Var	21 (21/91.3)	15 (15/88.2)
Pace	Var	2 (2/8.7)	0 (0/0)
Pace	Var	22 (22/95.7)	17 (18/100)
	Var	1 (1/4.3)	0 (0/0)

**Transfüzyon eşiği yönetimimiz**

**Preoperatif, multidisipliner**

- Preop kan transfüzyonu yapmadan anemiyi tedavi etmeye çalışıyoruz
- Preop gereksiz kan almamaya

**KPB: Bireysel faktörler belirleyici**

- Prime azalt
- HCT > 25, Stco2 > 50

**Pompa sonrası ve Postoperatif dönem**

- Hemodinamik stabilite ile belirteç, fizyometrik
- Stco2, ScvO2, avO2diff, %O2ER, laktat
- Palyatif ≈ 35, Tam düzeltme ≈ 30

