

# **Pediyatrik ve Eriřkin Travma Hastasında Resüsitasyon: Sıvılar ve Kan Ürünleri**

John Fowler, MD

Kent Hastanesi

Çiğli, İzmir

# Travmaya baėlı lmler

- %40-50 hastaneye gelmeden nce lr
- Hastaneye varanlardan %40'ında masif kan nakli / kanama ile ilgili komplikasyonlar
- Erken lmn en byk nedeni kanamaya baėlı komplikasyonlar

# Öğrendiğimiz

- 2 litre kristaloid...
- ? kolloid?
- kan...
- Tansiyon normal gelinceye kadar...

# Immediate versus Delayed Fluid Resuscitation for Hypotensive Patients with Penetrating Torso Injuries

- 1994, Houston'da, penetran gövde travması
  - tek günlerde ilk sıvı ameliyathanede
  - çift günlerde ilk sıvı olay yerinde (2 14 g DY, Ringer's asetat solüsyonu)

## The New England Journal of Medicine

©Copyright, 1994, by the Massachusetts Medical Society

Volume 331

OCTOBER 27, 1994

Number 1

### IMMEDIATE VERSUS DELAYED FLUID RESUSCITATION FOR HYPOTENSIVE PATIENTS WITH PENETRATING TORSO INJURIES

WILLIAM H. BICKELL, M.D., MATTHEW J. WALL, JR., M.D., PAUL E. PEPE, M.D.,

# Immediate versus Delayed Fluid Resuscitation for Hypotensive Patients with Penetrating Torso Injuries

- Hastaneye varıldığında:

olay yerinde

ameliyathanede

VARIABLE	IMMEDIATE RESUSCITATION (N = 309)	DELAYED RESUSCITATION (N = 289)	P VALUE
Systolic blood pressure (mm Hg)	79±46	72±43	0.02
Hemoglobin (g/dl)	11.2±2.6	12.9±2.2	<0.001
Platelet count ( $\times 10^{-3}/\text{mm}^3$ )	274±84	297±88	0.004
Prothrombin time (sec)	14.1±16	11.4±1.8	<0.001
Partial-thromboplastin time (sec)	31.8±19.3	27.5±12	0.007

# Immediate versus Delayed Fluid Resuscitation for Hypotensive Patients with Penetrating Torso Injuries

- Hastaneye varıldığında:

olay yerinde      ameliyathanede

VARIABLE	IMMEDIATE RESUSCITATION	DELAYED RESUSCITATION	P VALUE
Survival to discharge — no. of patients/total patients (%)	193/309 (62)*	203/289 (70)†	0.04
Estimated intraoperative blood loss — ml‡	3127±4937	2555±3546	0.11
Length of hospital stay — days§	14±24	11±19	0.006

# Travmaya bağı koagulopati

- Hipovolemi...
- Mikrodolaşım bozar...
- Endoteliuma hasarlar...

# Hasar kontrol resüsitasyon

- Hasar kontrol cerrahisi – kanamayı durdurmak
- Hemostatik resüsitasyon
- Permissive hypotension – kontrollü hipotansiyon?  
**“minimal normotansiyon” (radial nabız)**



## Sıvılar...

- İlaçları kullandığımız gibi

**Fluids are drugs: type, dose and toxicity**

---

# Sıvılar...

- İzotonik... 'normal saline' (normal değildir!)
- Dengeli solüsyonlar (RL, Plasmalyte vs)
- Kolloidler: HES – jelatin solüsyonlar

NS vs. PL-148	↑ major infection; ↑ composite of complications; ↑ blood transfusions; and ↑ RRT with NS
Chloride-rich vs. chloride-poor fluid strategy	↑ AKI (KDIGO stage II/III); ↑ RRT with chloride-rich strategy
NS vs. PL-148 (2 l infusion)	↑ $\Delta [\text{Cl}^-]$ ; ↑ strong ion difference; ↓ RBF; ↑ weight gain; ↑ extravascular volume; ↑ time to micturation
NS vs. PL-148	↑ $\Delta [\text{Cl}^-]$ ; ↓ UO with NS; ↑ $\Delta \text{BE}$ ; ↑ $\Delta [\text{HCO}_3^-]$ with PL
NS vs. PL-148	↑ $\Delta [\text{Cl}^-]$ ; ↓ $\Delta \text{BE}$ ; ↓ $\Delta [\text{HCO}_3^-]$ with NS
NS vs. RL	↓ pH; ↑ $[\text{Cl}^-]$ ; ↑ metabolic acidosis; ↑ $[\text{K}^+] > 6 \text{ mmol/l}$ with NS
NS vs. Hartmann's (in HES)	↑ $\Delta [\text{Cl}^-]$ ; ↓ $\Delta \text{BE}$ ; ↓ pH; ↓ $\Delta \text{CO}_2$ gap with NS
Chloride-rich vs. chloride-poor fluid strategy	↑ $\text{BE} < -5$ ; ↑ $\text{pH} < 7.3$ ; ↑ $[\text{Na}^+] > 156$ in chloride-rich; ↑ $\text{BE} > 5$ ; ↑ $\text{pH} > 7.5$ ; ↓ cost with chloride-poor strategy

# Sıvılar...

- ~~İzotonik... 'normal saline' (normal değildir!)~~
- Dengeli solüsyonlar (RL, Plasmalyte vs), sadece 1 L
- ~~Kolloidler: HES – jelatin solüsyonlar~~

# Albumin veya izotonik: SAFE çalışması

- 2004: YB'larda sıvı resüs: albumin = izotonik
- 2007: Kafa travması olan hastalarda...

## Saline or Albumin for Fluid Resuscitation in Patients with Traumatic Brain Injury

We followed 460 patients, of whom 231 (50.2%) received albumin and 229 (49.8%) received saline. The subgroup of patients with GCS scores of 3 to 8 were classified as having severe brain injury (160 [69.3%] in the albumin group and 158 [69.0%] in the saline group). Demographic characteristics and indexes of severity of brain injury were similar at baseline. At 24 months, 71 of 214 patients in the albumin group (33.2%) had died, as compared with 42 of 206 in the saline group (20.4%) (relative risk, 1.63; 95% confidence interval [CI], 1.17 to 2.26;  $P=0.003$ ). Among patients with severe brain injury, 61 of 146 patients in the albumin group (41.8%) died, as compared with 32 of 144 in the saline group (22.2%) (relative risk, 1.88; 95% CI, 1.31 to 2.70;  $P<0.001$ );

# Travmatik hemorajik şokta hedeflerimiz...

- **Kanamayı durdurmak**
- Dokulara dolaşım/oksijenasyonu sağlamak
- Organ disfonksiyonunu önlemek

# Kanamayı durdurmak

- Direkt bası, turnikeler
- Hemostatik tozlar, JETT
- Hasar kontrol cerrahisi

# Kanamayı durdurmak

- Direkt bası, turnikeler
- Hemostatik tozlar, JETT
- Hasar kontrol cerrahisi





# Hasar kontrol resüsitasyon

- **Hasar kontrol cerrahisi – kanamayı durdurmak**
- Hemostatik resüsitasyon
- Permissive hypotension – kontrollü hipotansiyon?  
“minimal normotansiyon”

## **Hemostatik resüsitasyon =**

- Verilen sıvı ya oksijenasyonu ya da koagülasyonu iyileştirecek. Başka sıvı verilmeyecek.

# **Kanamayı azaltmak / durdurmak**

- CRASH-2 Türkiye'de uygulanıyor mu?

# Kanamayı azaltmak / durdurmak

- 2010: CRASH-2
  - ‘kanama riski var... kan vermeyi düşünüyorum’
  - Traneksamik asit: 10 dk’da 1 gr, 1 saatte 1 gr

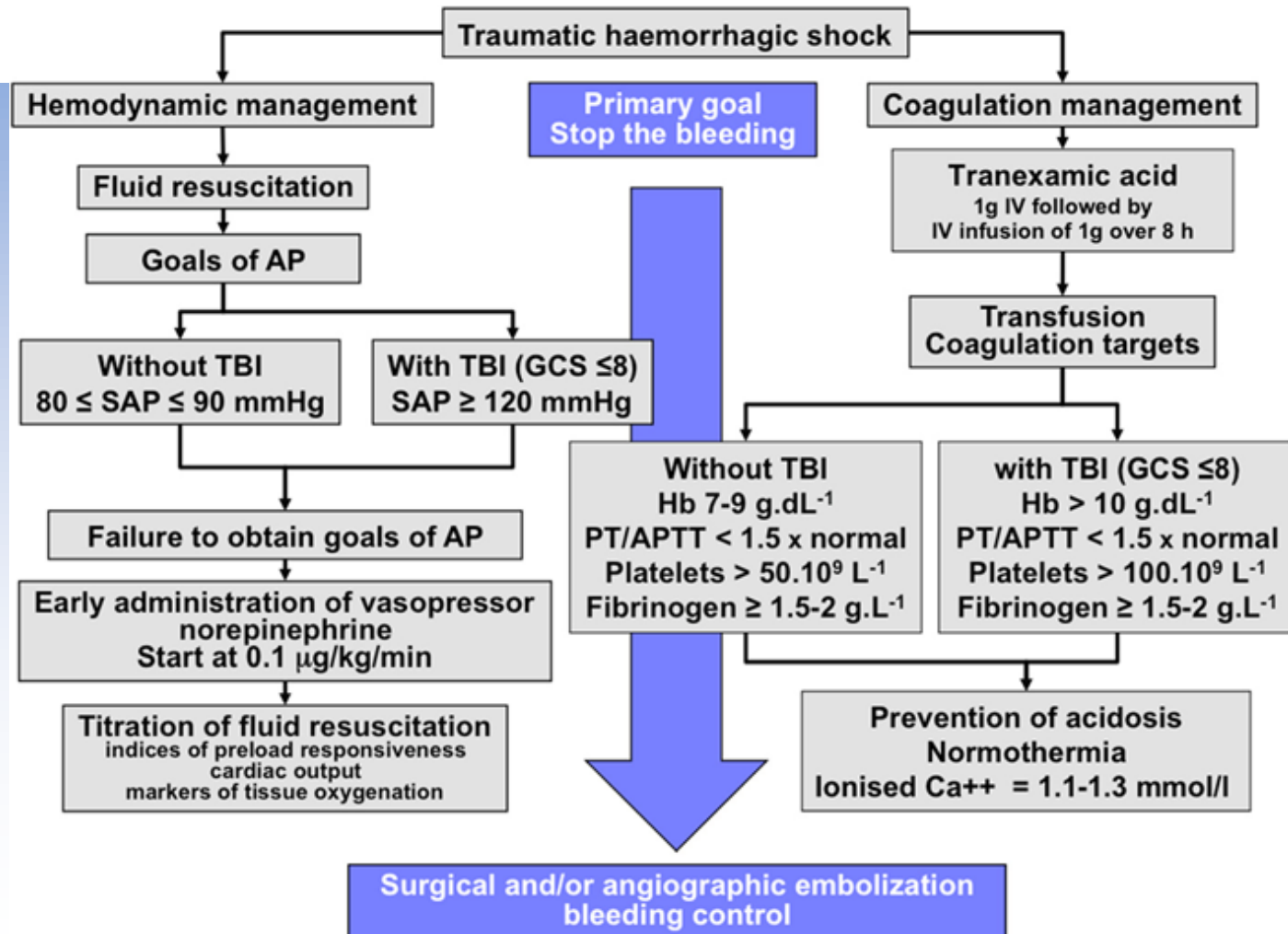
**Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised,**

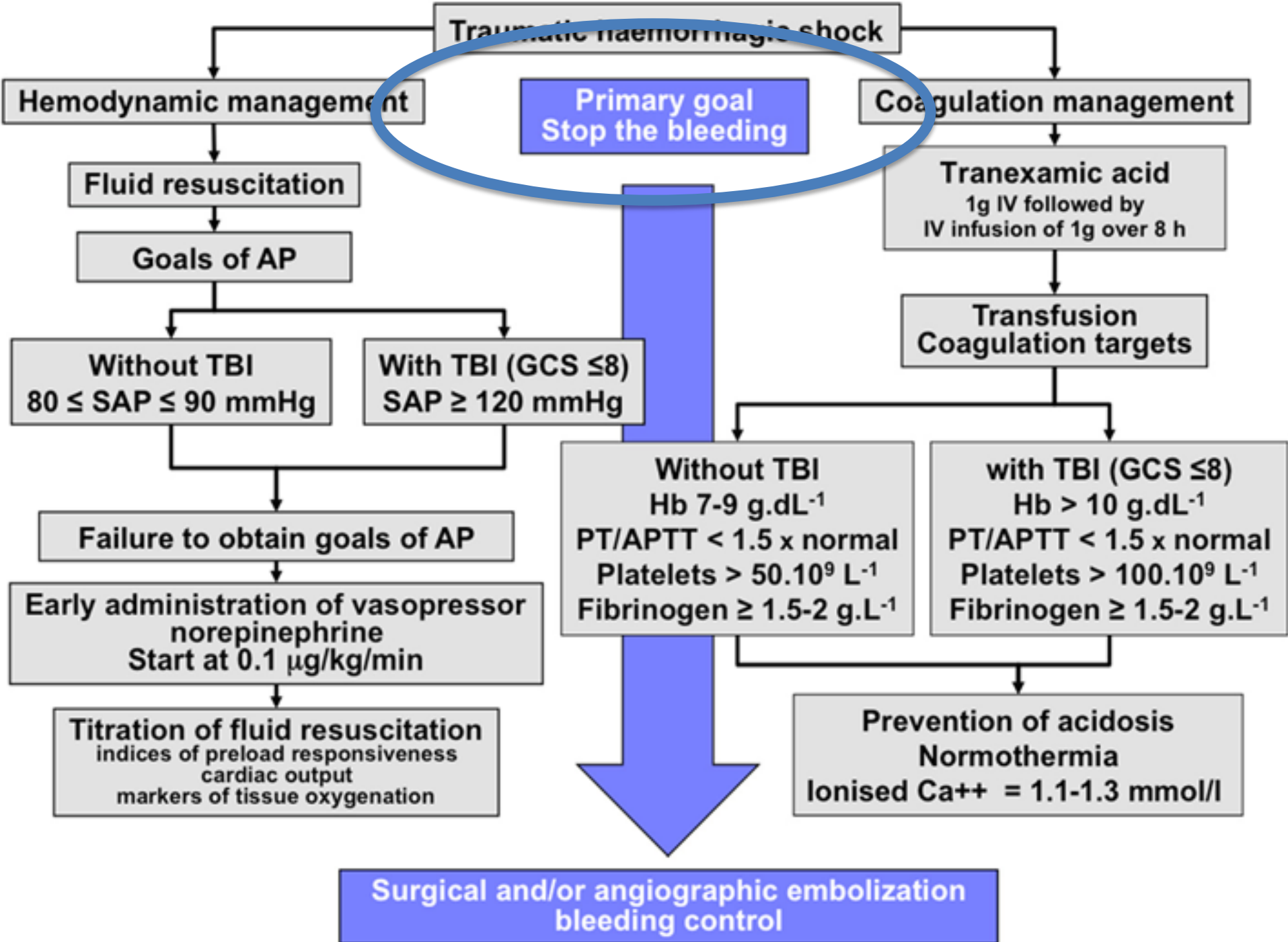
*Does the Use of Tranexamic Acid Improve Trauma Mortality?*

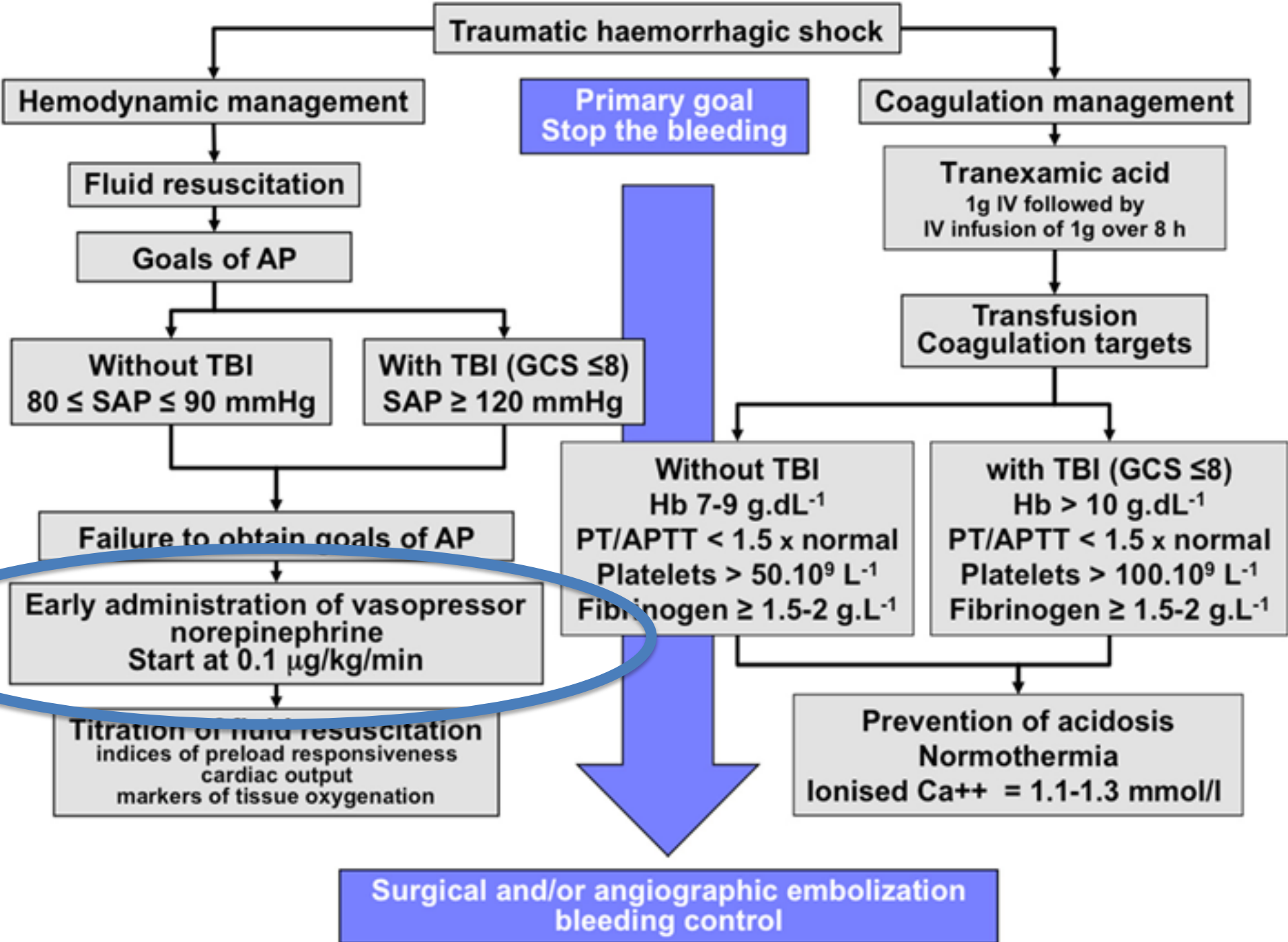
# Kanamayı azaltmak / durdurmak

## Resuscitative strategies in traumatic hemorrhagic shock

2013







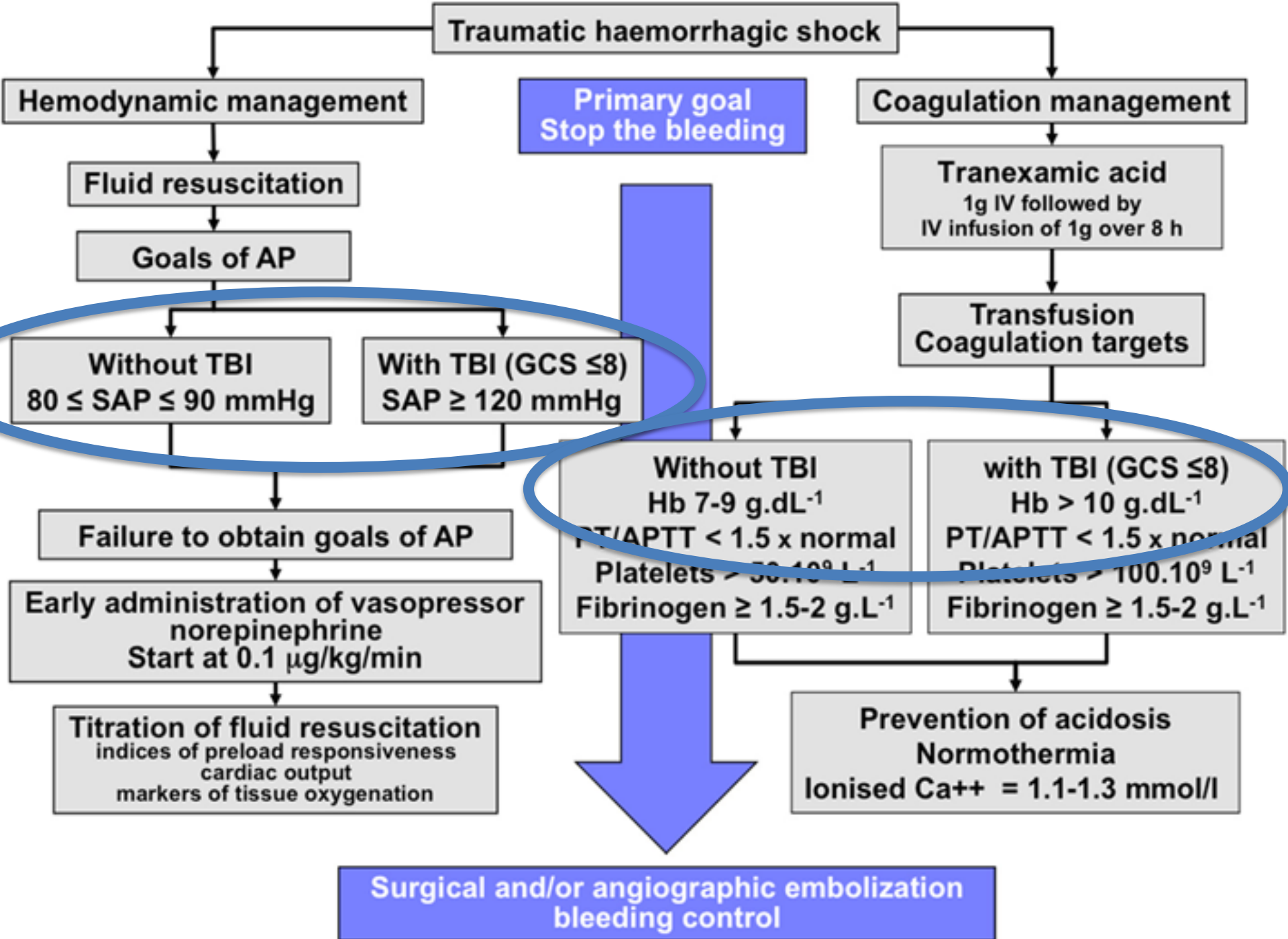
# Kanamayı azaltmak / durdurmak

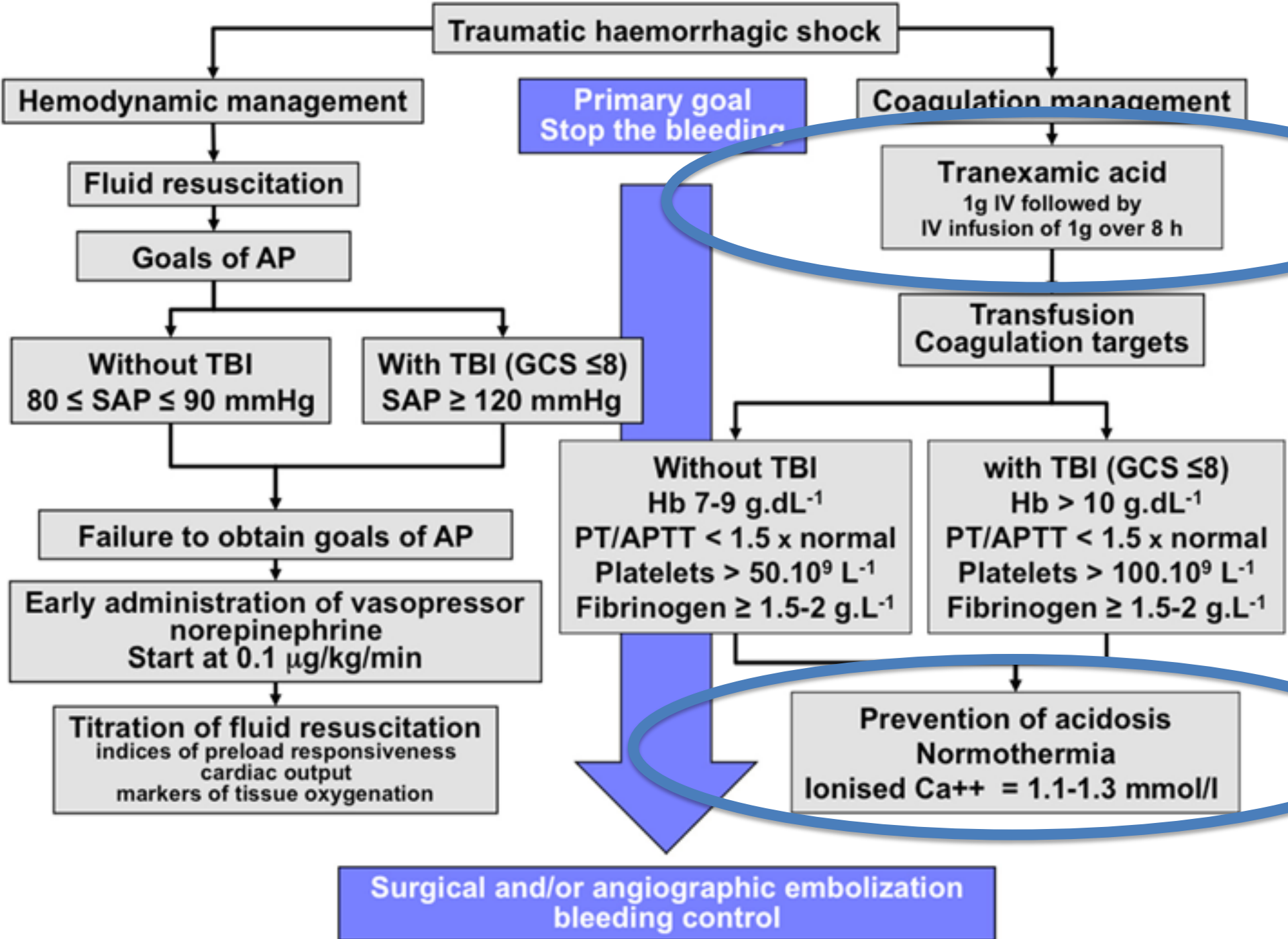
- Sıvı resüsitasyon tam yapılmamış olsa da erken vazopressor (terlipressin)
- Domuzlarda; laktat düzeyleri yükseliyor mu?

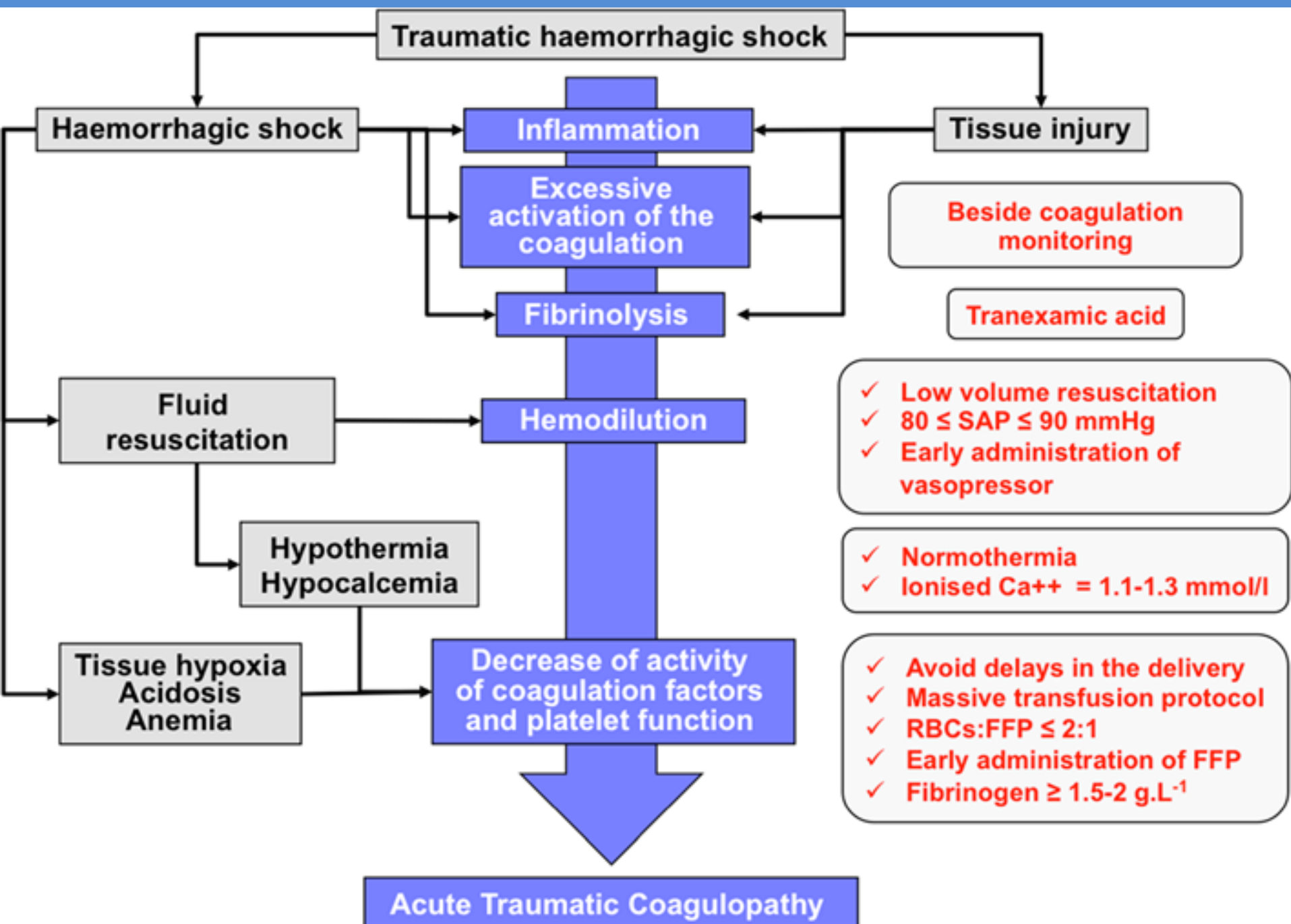
## TERLIPRESSIN WITH LIMITED FLUID RESUSCITATION IN A SWINE MODEL OF HEMORRHAGE

**Conclusion:** Subjects receiving  $7.5 \mu\text{g/kg}$  of TP demonstrated improved MAP within 10 min of administration. When combined with minimal IVF resuscitation, TP doses between  $3.75$  and  $15 \mu\text{g/kg}$  do not elevate lactate levels in hemorrhaged swine.









# Hemostatik resüsitasyon

- 24 saat içinde  $\geq 10$  ünite eritrosit alan hastalar
- Önce (2 yılda 390 hasta) – sonra (2 yılda 442 hasta)
- Arada protokol değiştirildi...
  - masif kan nakli öngörüldüğünde...
  - kan bankasından acile: 5 eritrosit, 5 TDP, 2 trombosit
  - diğer ürünler yoğun bakımda, tromboelastografi sonuçlarına göre

Effect of **Haemostatic Control Resuscitation** on mortality in massively bleeding patients: a before and after study

Masif transfüzyon

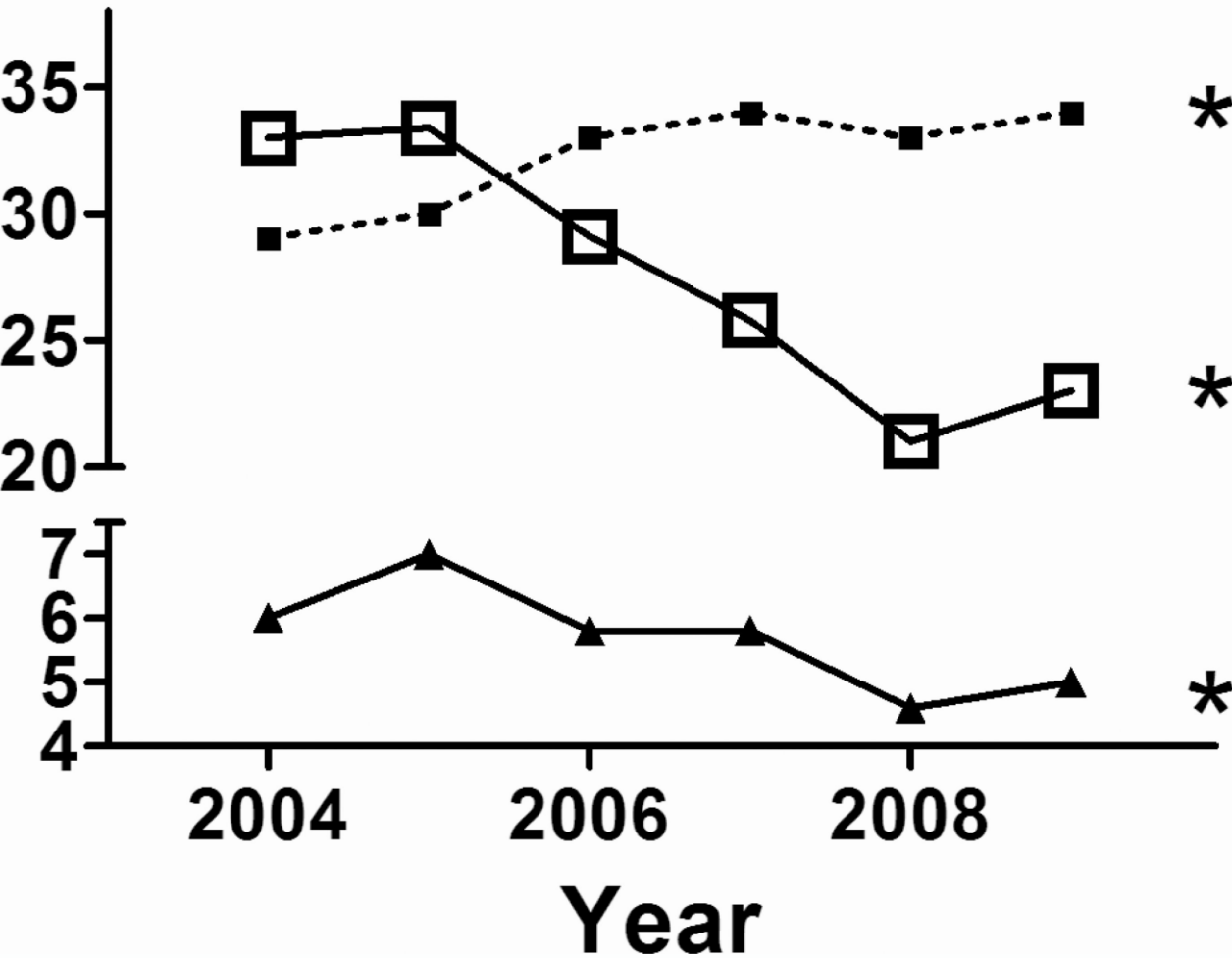
MT (% patients)

Yaralanma skoru

ISS

ilk 24 saatte verilen erit

Median 24hr PRBC



# Masif kanama ne demek?

- Eski: ilk 24 saat içinde  $\geq 10$  ünite eritrosit
- Yeni: ilk 24 saat içinde her hangi bir 60 dakikada  $\geq 3$  ünite eritrosit

# HKR uygulandıktan önce ve sonra

- 2011, Ann Surg

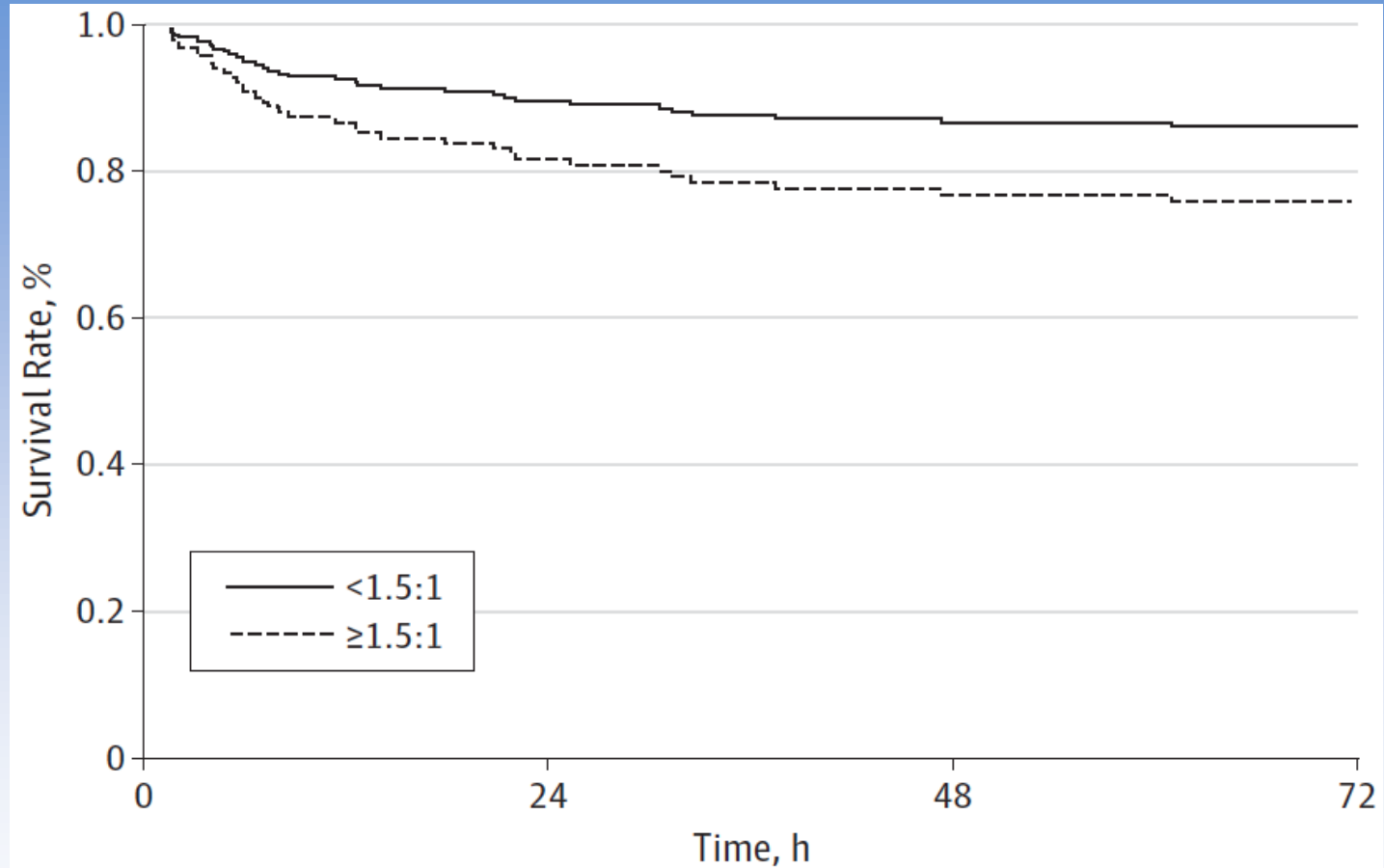
## DAMAGE CONTROL RESUSCITATION IS ASSOCIATED WITH A REDUCTION IN RESUSCITATION VOLUMES AND IMPROVEMENT IN SURVIVAL IN 390 DAMAGE CONTROL LAPAROTOMY PATIENTS

**RESULTS**—390 patients underwent DCL. Of these, 282 were pre-DCR and 108 were DCR. Groups were similar in demographics, injury severity, admission vitals and laboratory values. DCR patients received less crystalloids (median 14 L vs. 5 L), RBC (13 U vs. 7 U), plasma (11 U vs. 8 U) and platelets (6 U vs. 0 U) in 24-hr; all  $p < 0.05$ . DCR patients had less evidence of the lethal triad upon ICU arrival (80% vs. 46%,  $p < 0.001$ ). 24-hour and 30-day survival were higher with DCR (88% vs. 97%,  $p = 0.006$  and 76% vs. 86%,  $p = 0.03$ ). Multivariate analysis controlling



# Tek travma merkezi, 2005-2011, eritrosit:TDP

- 2013
- sağ kalım



**A Paradigm Shift in Trauma Resuscitation**  
Evaluation of Evolving Massive Transfusion Practices



# Kullanılacak sıvılar / kan ürünleri

- Taze kan
  - 1:1:1 eritrosit:TDP:trombosit
  - 1:1 eritrosit:TDP
  - eritrosit ya da TDP

# Hemostatik resüsitasyon: kan ürünleri (ya oksijen ya da pıhtılaşma faktörlerini taşır)

- **Dengeli** oranda daha iyi (1:1 veya 2:3, TDP:erit)
  - Borgman MA, et al. The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. J Trauma. 2007
  - Pidcock HF, et al. Ten-year analysis of transfusion in Operation Iraqi Freedom and Operation Enduring Freedom: increased plasma and platelet use correlates with improved survival. J Trauma Acute Care Surg. 2012.
  - Holcomb JB, et al. The PROMMTT study: comparative effectiveness of a time-varying treatment with competing risks. JAMA Surg. 2013

# **Hemostatik resüsitasyon: kan ürünleri (ya oksijen ya da pıhtılaşma faktörlerini taşır)**

- **Erken** daha iyi
  - Radwan ZA, et al. An emergency department thawed plasma protocol for severely injured patients. JAMA Surg. 2013
  - Cap AP, et al. Timing and location of blood product transfusion and outcomes in massively transfused combat casualties. J Trauma Acute Care Surg. 2012

# **Hemostatik resüsitasyon: kan ürünleri (ya oksijen ya da pıhtılaşma faktörlerini taşır)**

- Toplam kullanılan kan ürünleri daha az sayıda
  - Cotton BA, et al. Damage control resuscitation is associated with a reduction in resuscitation volumes and improvement in survival in 390 damage control laparotomy patients. Ann Surg. 2011
  - Kautza BC, et al. Changes in massive transfusion over time: an early shift in the right direction? J Trauma. 2012

# Plazma

- TDP: eritildikten sonra **5 saat** içinde kullanılmalı
- Eritilmiş (thawed plasma) plazma: 24 saat içinde eritilir, sonra soğutulur ( $1-6^{\circ}$  C) **5 gün...**
- Likid plazma (hiç donmamış): **26 gün...**
- Kurutulmuş plazma:

# Kurutulmuş veya taze donmuş plazma

- 2009, domuzlarda
- Pıhtılaşma faktörleri %14 daha az. Klinik sonuçlar arasında fark yoktu

## Lyophilized Plasma for Resuscitation in a Swine Model of Severe Injury

**Results:** Lyophilization decreased clotting factor activity by an average of 14%. Survival and heart rate were similar between all groups. Swine resuscitated with LP had equivalent or higher mean arterial pressures. Swine treated with LP had similar coagulation profiles, plasma lactate levels, and postinjury blood loss compared with those treated with FFP. Swine treated with 1:1 FFP-PRBCs were similar to those treated with 1:1 LP-PRBCs. Resuscitation

## Askeri yaklaşım sivil sektörde...

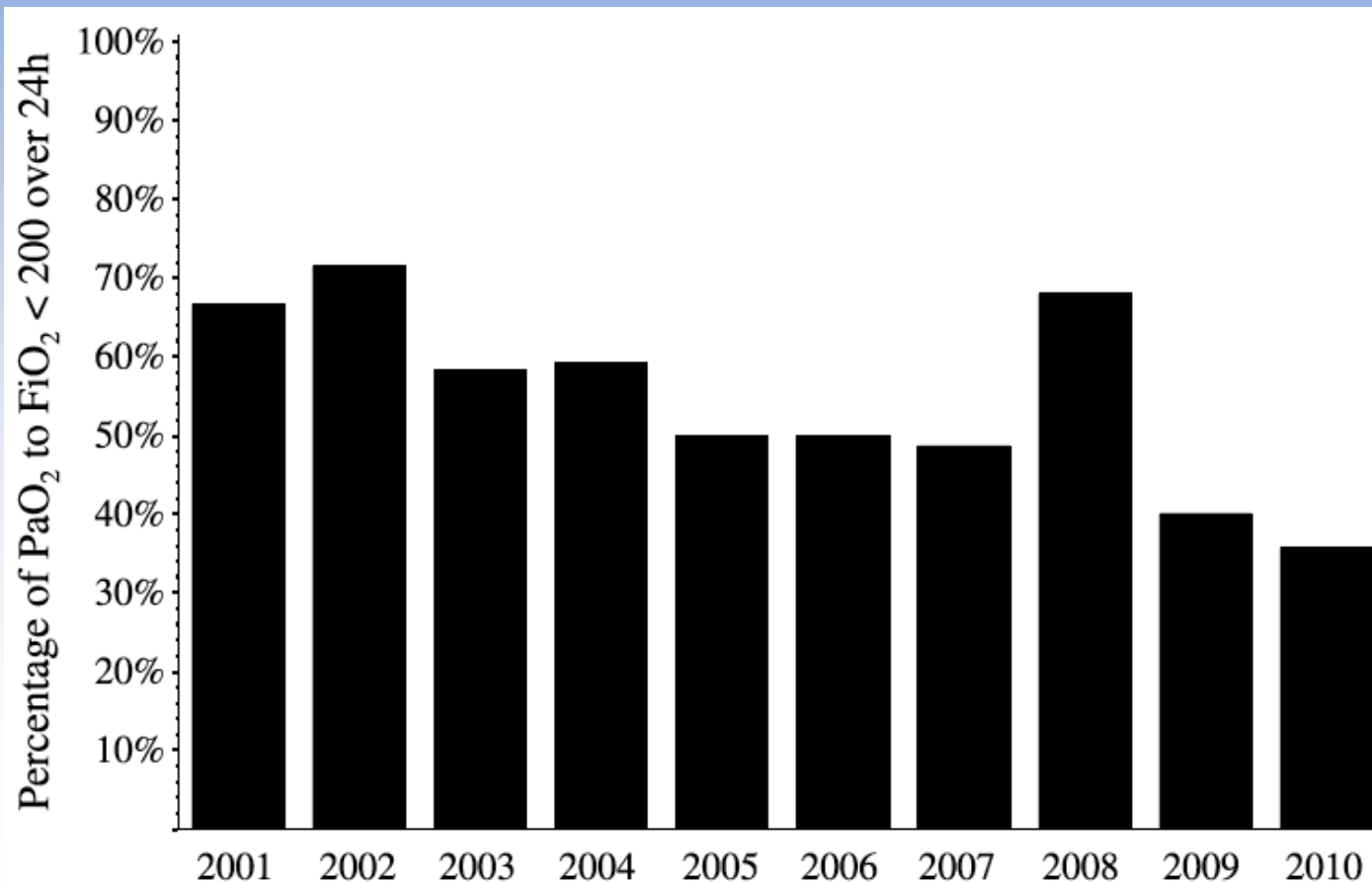
- 2001-2010... 2007 yılında Hasar Kontrol Resüs.
- HKR ile kristalloid kullanımı çok daha az

Crystalloid Use	Pre-DCR (2001–2006), n = 117	Post-DCR (2007–2010), n = 99
Crystalloid 1st 6 h, L	11.6 ± 0.5	6.2 ± 0.3
Crystalloid 1st 12 h, L	13.9 ± 0.6	7.7 ± 0.4
Crystalloid 1st 18 h, L	15.7 ± 0.7	9.3 ± 0.4
Crystalloid 1st 24 h, L	17.4 ± 0.8	10.8 ± 0.5

Implementation of a military-derived damage-control resuscitation strategy in a civilian trauma center decreases acute hypoxia in massively transfused patients

# Askeri yaklaşım sivil sektörde...

- HKR ile ilk 24 saatteki en iyi oksijenasyon ( $\text{PaO}_2:\text{FiO}_2$ ) daha düşüktü





# Plazma... ne kadar erken o kadar iyi

- 2012 PRospective Observational Multicenter Major Trauma Transfusion (PROMMTT) çalışması
- 2013

## Resuscitate early with plasma and platelets or balance blood products gradually: Findings from the PROMMTT study

Using PROMMTT data and multilevel logistic regression to adjust for center effects, we related in-hospital mortality to the early receipt of plasma or platelets within the first three to six transfusion units (including RBCs) and 2.5 hours of admission. We adjusted for the same covariates as in our previous report: Injury Severity Score (ISS), age, time and total number of blood product transfusions upon entry to the analysis cohort, and bleeding from the head, chest, or limb. Of 1,245 PROMMTT patients, 619 were eligible for this analysis. Early plasma was associated with decreased 24-hour and 30-day mortality (adjusted odds ratios of 0.47 [ $p = 0.009$ ] and 0.44 [ $p = 0.002$ ], respectively). Too few patients (24) received platelets early for meaningful assessment. In the subgroup of 222 patients receiving no early plasma but continuing transfusions beyond Hour 2.5, achieving gradually balanced plasma and platelet:RBC ratios of 1:2 or greater by Hour 4 was not associated with 30-day mortality (adjusted odds ratios of 0.9 and 1.1, respectively). There were no significant center effects.

# Primer resüsitasyon sıvısı plazma iken...

- 2013, hava ambulansları
- birinde plazma/erit, öbüründe kristalloid

## Plasma as the Primary Prehospital Resuscitation Fluid

- erit/plazma      kolloid

medians	LF (n=540)	PHI (n=131)
arrival SBP	115 (90, 135)	112 (90, 138)
arrival HR	96 (78, 116)	98 (80, 116)
arrival GCS	3 (3, 15)	3 (3, 15)
w-RTS	4.09 (4.09, 7.84)	4.09 (4.09, 7.84)
arrival base	-3 (-6, 0)	-4 (-8, -1)
arrival pH	7.30 (7.22, 7.35)	7.26 (7.19, 7.32)

# Primer resüsitasyon sıvısı plazma iken...

- 2013, hava ambulansları
- birinde plazma/erit, öbüründe kristalloid

## Plasma as the Primary Prehospital Resuscitation Fluid

- 6. saatte ölüm oranı

### 6-hour mortality (OR, IR and STICU admissions)

	Odds Ratio	95% C.I.	p-value
LF	0.23	0.062-0.890	0.033
Arrival base deficit	0.87	0.799-0.955	0.003
Arrival rTEG ACT	1.02	1.001-1.043	0.035
Arrival SBP	0.93	0.904-0.966	<0.001

# Primer resüsitasyon sıvısı plazma iken...

- 2013, hava ambulansları
- birinde plazma/erit, öbüründe kristalloid

## Plasma as the Primary Prehospital Resuscitation Fluid

- 24 saatte kan ürünlerinin kullanımı

Linear regression for total blood products 0 to 6 hours (All admissions)

	Coef.	95% C.I.	p-value
LF	-3.72	-6.783, -0.659	0.025
Arrival base deficit	-0.87	-1.126, -0.629	<0.001
Arrival rTEG ACT	0.09	0.022, 0.152	0.008
Arrival SBP	-0.05	-0.084, -0.011	0.012

# Pragmatic, Randomized Optimal Platelet and Plasma Ratios PROPPR çalışması (2012/2013)

- 11 merkez, 16 aylık bir çalışma, 680 hasta
- direkt olay yerinden getirilen, >15 yaşında
- 1:1:1 plazma, trombositler, eritrositler
  - kan bankasından 6:6:6 olarak gönderiliyor
- 1:1:2 plazma, trombositler, eritrositler
  - ilk paket: 3:0:6 olarak gönderiliyor
  - ikinci paket: 3:6:6 olarak gönderiliyor
- Sonuçlar: 24 saat, 30 gün

Pragmatic Randomized Optimal Platelet and Plasma Ratios (PROPPR)  
Trial: Design, rationale and implementation☆

# PROPPR çalışması: 1:1:1 veya 1:1:2 (plazma:trombosit:eritrosit)

- sonuçlar henüz yayınlanmadı

		Container 1	Container 2
Group 1 <sup>a</sup> 1:1:1	Platelets	1	1
	Plasma	6	6
	RBCs	6	6
Group 2 <sup>b</sup> 1:1:2	Platelets	0	1
	Plasma	3	3
	RBCs	6	6

<sup>a</sup> Group 1: Platelets first, then alternate RBCs and Plasma, as clinically required.

<sup>b</sup> Group 2: Platelets first (if available), then alternate 2 RBCs and 1 Plasma, as clinically required.

# Soğuk (donmuş değil) plazma: önce/sonra

- 2013, 14 aylık çalışma, 7. ayda farklı protokol...
- TDP'den plazma (raf ömrü 5 gün): 'thawed plasma'
- 294 hasta: önce 130 hasta, sonra 164 hasta

## An Emergency Department Thawed Plasma Protocol for Severely Injured Patients

TP-ED patients had greater anatomical injury (median Injury Severity Score, 18 vs 25;  $P = .02$ ) and more physiologic disturbances (median weighted Revised Trauma Score, 6.81 vs 3.83;  $P = .008$ ). The TP-ED patients had a shorter time to first plasma transfusion (89 vs 43 minutes,  $P < .001$ ). The TP-ED protocol was associated with a reduction in 24-hour transfusion of RBCs ( $P = .04$ ), plasma ( $P = .04$ ), and platelets ( $P < .001$ ).

# Likid plazma kullanımı

- Univ. of Cincinnati, 2014
- erkeklerden elde edilen tip A likid plazma (2 ü), 2 eritrosit
- erkeklerden elde edilen tip A eritilmiş plazma (2 ü), 2 eritrosit
- sırayla: plazma, erit, plazma, erit
- Transamin®
- Kan ürünleri yoksa...





# Hemorajik şok için sıvı resüsitasyonu: askeri kılavuz

- Güncel kılavuz üç ay önce
- Tercih sırası:
  - Taze kan
    - 1:1:1 eritrosit:TDP:trombosit
    - 1:1 eritrosit:TDP
    - eritrosit ya da TDP
    - (HES)
    - Ringer laktat

**Fluid Resuscitation for Hemorrhagic Shock  
in Tactical Combat Casualty Care**

*TCCC Guidelines Change 14-01 – 2 June 2014*

# Damage Control Resuscitation

- Damage control surgery
- Hemostatik resüsitasyon
- normal permissive hypotension

**Erkeklere Rhogam® ??**

# Erkeklere Rhogam® ??

## **Giving Rhogam (Rh Immunoglobulin) To A Man?**

Most trauma centers use O- blood as their universal donor units because it does not contain any major antigens. However, O- blood is uncommon, so busy centers may substitute O+ blood for men. This makes sense, since men don't ever have to worry about an Rh+ fetus. However, high rates of injury recidivism in trauma patients increase the likelihood of multiple blood transfusions during their lifetime;

## Erkeklere Rhogam®? evet...

at very busy trauma centers, there are a significant number of repeat offenders. Since Rh- patients who receive Rh+ blood are at risk of developing anti-Rh antibodies, such patients are at risk for a significant hemolytic reaction if they receive O+ blood again. Therefore, many trauma centers have adopted a policy of administering Rhogam to Rh- men who receive an O+ blood transfusion.

- Travma merkezlerine eğer O- erkeğe O+ kan veriliyorsa Rhogam® de verilir.



# Travma ile ilgili kanama: kan nakli $\pm$ plazma/trombosit nakli

- Çok merkezli, ileri dönük (rasgele değil)
- Geldikten sonra en az 30 dk yaşayan hastalar
- 6 saat içinde en az 1 eritrosit süspansiyonu
- İlk 24 saat içinde en az 3 ünite kan ürünü

## The Prospective, Observational, Multicenter, Major Trauma Transfusion (PROMMTT) Study

In a multivariable time-dependent Cox model, increased ratios of plasma:RBCs (adjusted hazard ratio=0.31; 95% CI, 0.16-0.58) and platelets:RBCs (adjusted hazard ratio=0.55; 95% CI, 0.31-0.98) were independently associated with decreased 6-hour mortality, when hemorrhagic death predominated. In the first 6 hours, patients with ratios less than 1:2 were 3 to 4 times more likely to die than patients with ratios of 1:1 or higher.

# **Travma ile ilgili kanama: kan nakli $\pm$ plazma/trombosit nakli**

- Sonlanım: hastanede ölüm
- 34.362 travmalı hastalardan 905 hasta



# Travma ile ilgili kanama: kan nakli $\pm$ plazma/trombosit nakli

- Sonlanım: hastanede ölüm
- 34.362 travmalı hastalardan 905 hasta

Ölüm nedenleri:

Cause of Death, No. (%) <sup>b</sup>	Patients Dying Within the Interval, No. (%)							
	>0.5 to ≤1 h (n = 8)	>1 to ≤3 h (n = 55)	>3 to ≤6 h (n = 32)	>6 to ≤12 h (n = 21)	>12 to ≤24 h (n = 16)	>24 to ≤72 h (n = 21)	>72 h to ≤30 d (n = 67)	>30 d (n = 6)
Hemorrhage	7 (88)	46 (84)	24 (75)	9 (43)	3 (19)	3 (14)	3 (4)	0
Brain injury	0	9 (16)	10 (31)	10 (48)	10 (63)	13 (62)	32 (48)	1 (17)
Airway/respiratory	1 (13)	2 (4)	3 (9)	2 (10)	1 (6)	2 (10)	15 (22)	3 (50)
Sepsis	0	0	0	0	0	1 (5)	6 (9)	2 (33)
Multiple organ failure	0	0	0	0	0	2 (10)	24 (36)	5 (83)
Cardiovascular	4 (50)	16 (29)	6 (19)	4 (19)	3 (19)	3 (14)	6 (9)	2 (33)
Other	0	5 (9)	4 (13)	2 (10)	3 (19)	1 (5)	18 (27)	1 (17)

# Travma ile ilgili kanama: kan nakli $\pm$ plazma/trombosit nakli

- Erken dönemdeki ölümler

Characteristic	Continuous Transfusion Ratio Variables		Low, <1:2	Moderate, $\geq 1:2$ to <1:1		High, $\geq 1:1$	
	HR (95% CI)	P Value	HR	HR	P Value	HR	P Value
Minute 31 to Hour 6 After ED Admission (n = 876) <sup>a</sup>							
Early initial and time-varying plasma:RBC ratios	0.31 (0.16-0.58)	<.001	1 [Reference]	0.42	<.001	0.23	<.001
Early initial and time-varying platelet:RBC ratios	0.55 (0.31-0.98)	.04	1 [Reference]	0.66	.16	0.37	.04
Sum of blood product transfusions	1.05 (1.04-1.06)	<.001	b				
Age	1.01 (1.00-1.02)	.03					
Injury Severity Score	1.02 (1.01-1.04)	.001					
Time interval at cohort entry	0.73 (0.63-0.86)	<.001					
Bleeding from head	3.73 (2.15-6.45)	<.001					
Bleeding from chest	1.52 (0.96-2.39)	.07					
Bleeding from limb	0.54 (0.32-0.89)	.02					

# Travma ile ilgili kanama: kan nakli $\pm$ plazma/trombosit nakli

- Erken dönemdeki ölümler

Characteristic	Categorical Transfusion Ratio Variables						
	Continuous Transfusion Ratio Variables		Low, <1:2	Moderate, ≥1:2 to <1:1		High, ≥1:1	
	HR (95% CI)	P Value	HR	HR	P Value	HR	P Value
	Hour >6 to Hour 24 After ED Admission (n = 809) <sup>c</sup>						
6-h cumulative plasma:RBC ratio	0.34 (0.14-0.81)	.02	1 [Reference]	0.79	.63	0.55	.23
6-h cumulative platelet:RBC ratio	0.81 (0.46-1.43)	.46	1 [Reference]	0.79	.56	0.49	.19
Sum of blood product transfusions at hour 6	1.04 (1.03-1.05)	<.001	<sup>b</sup>				
Age	1.01 (0.99-1.03)	.36					
Injury Severity Score	1.02 (0.99-1.04)	.11					
Time interval at cohort entry	0.84 (0.72-0.98)	.03					
Bleeding from head	8.46 (3.82-18.7)	<.001					
Bleeding from chest	0.87 (0.39-1.97)	.74					
Bleeding from limb	0.96 (0.48-1.92)	.90					

# Travma ile ilgili kanama: kan nakli $\pm$ plazma/trombosit nakli

- Erken dönemdeki ölümler

Characteristic	Categorical Transfusion Ratio Variables						
	Continuous Transfusion Ratio Variables		Low, <1:2	Moderate, $\geq 1:2$ to <1:1		High, $\geq 1:1$	
	HR (95% CI)	P Value	HR	HR	P Value	HR	P Value
Hour >24 to Day 30 After ED Admission (n = 773) <sup>c</sup>							
24-h cumulative plasma:RBC ratio	1.21 (0.90-1.61)	.20	1 [Reference]	1.41	.33	1.47	.26
24-h cumulative platelet:RBC ratio	0.78 (0.57-1.06)	.11	1 [Reference]	1.23	.46	0.69	.19
Sum of blood product transfusions at hour 24	1.02 (1.01-1.03)	<.001	b				
Age	1.03 (1.02-1.04)	<.001					
Injury Severity Score	1.04 (1.02-1.05)	<.001					
Time interval at cohort entry	0.98 (0.91-1.06)	.63					
Bleeding from head	5.96 (3.59-9.90)	<.001					
Bleeding from chest	0.45 (0.23-0.90)	.02					
Bleeding from limb	1.22 (0.76-1.96)	.41					

# **Travma ile ilgili kanama:**

## **kan nakli $\pm$ plazma/trombosit nakli**

- Erken yüksek oranlı trombosit/plazma = daha iyi sağkalım.

# Kanamayı azaltmak / durdurmak

- Transamin<sup>®</sup> yok, vazopresor yok... hasta gidiyor...
- Uyluk, pelvis, alt batın bölgelerinde ASY, hasta hipotansif ve...

# Kanamayı azaltmak / durdurmak

- Transamin<sup>®</sup> yok, vazopresor yok... hasta gidiyor...
- Uyluk, pelvis, alt batın bölgelerinde ASY, hasta hipotansif ve...



Temporization of Penetrating Abdominal-Pelvic Trauma With Manual External Aortic Compression: A Novel Case Report

# **Kanamayı azaltmak / durdurmak**

- Dışarıdan değil içinden aortun kapatılması !?

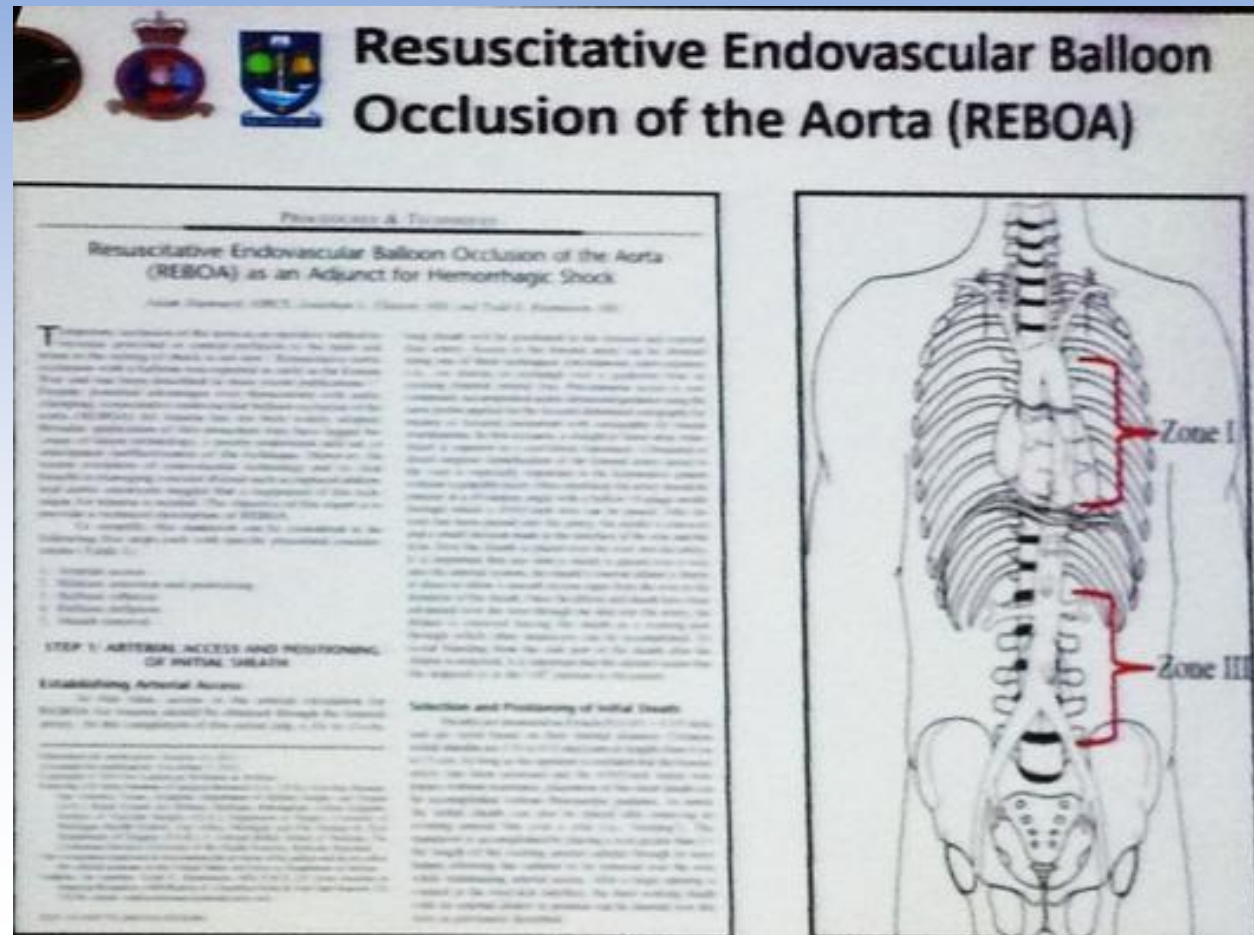


# Kanamayı azaltmak / durdurmak

- Dışarıdan değil içinden aortun kapatılması !?

- REBOA:

- Resüsitatif
- Endovasküler
- Balon
- Oklüzyon
- Aort



# Kanamayı azaltmak / durdurmak

•Dışarıdan değil içinden aortun kapatılması !?

•REBOA:

- Resüsitatif
- Endovasküler
- Balon
- Oklüzyon
- Aort



ER-REBOA™ Catheter



# Kanamayı azaltmak / durdurmak

- Dışarıdan değil içinden aortun kapatılması !?

- REBOA:

- Resüsitatif
- Endovasküler
- Balon
- Oklüzyon
- Aort

