KOAGULOPATICKÉ KRVÁCANIE PRI TRAUME

MUDr. Eva Kušíková

II KAIM SZU a FNsP FD Roosevelta
Banská Bystrica

KONFLIKT ZÁUJMOV

Bez relevantného konfliktu záujmov pri spracovaní témy.

Timing and causes of death after injuries

Justin Sobrino, MD, and Shahid Shafi, MD, MPH

Table. Causes of death by timing category

Immediate and early deaths	Late deaths	Postdischarge
Brain injury	Infection	Cardiovascular disease
Hemorrhage	Multiple-organ failure	Second major trauma
	Brain injury	Neurologic disease
	Hemorrhage	Malignancy

Proc (Bayl Univ Med Cent) 2013;26(2):120–123

- Poranenia CNS cca 45-50%
- Obehový kolaps pre krvácanie 30-40%
- až 50% úmrtí do 48h je pre exsangvináciu

KRVÁCANIE PRI TRAUME

- Akútna traumatická koagulopatia (ATC)
- Traumou indukovaná koagulopatia (TIC)
- Akútna koagulopatia pri traumatickom šoku (ACOTS)
- Diseminovaná intravaskulárna koagulopatia (DIC)
- ....

KRVÁCANIE PRI TRAUME

- ***1) NEKOAGULOPATICKÉ***
  - z ciev
  - kontrolovateľné kompresiou, ligáciou, sutúrou, embolizáciou
- ***2) KOAGULOPATICKÉ***
  - ***zlyhanie hemostázy na úrovni kapilár***
  - ***difúzne krvácanie aj z nepoškodených miest***
  - ***mechanicky obtiažne zastaviteľné***

Chang, Blood 2019

TRAUMA → **KRVÁCANIE** → **LIEČBA**

↓

DILÚCIA
ACIDÓZA
HYPOTERMIA

↓

KLINICKY ZJAVNÉ KOAGULOPATICKÉ KRVÁCANIE

LETÁLNA TRIÁDA

- ACIDÓZA
- DILÚCIA
- HYPOTERMIA

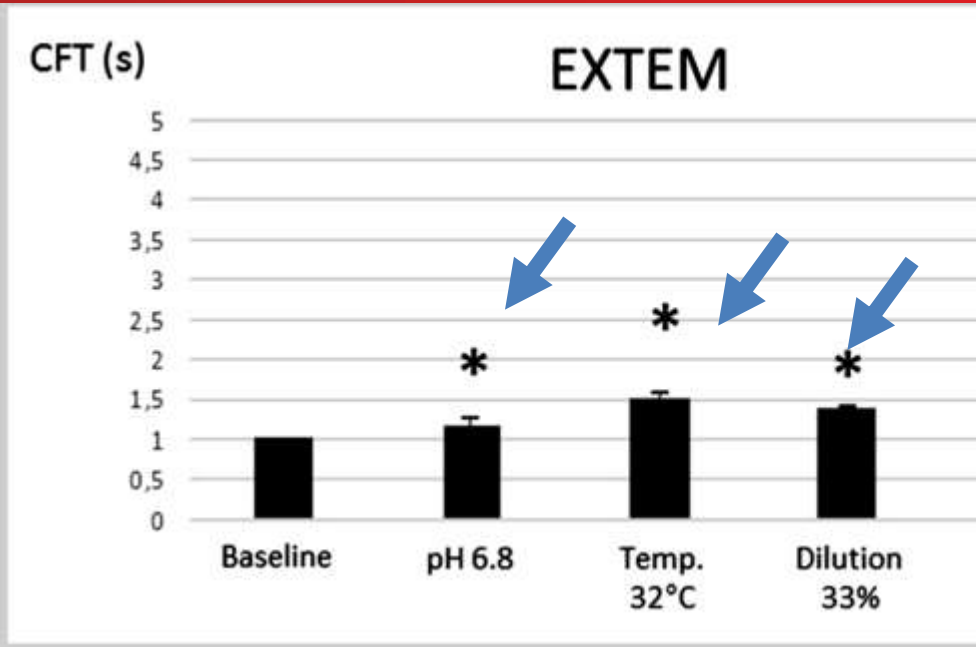
Caspers et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine
(2018) 26:66
https://doi.org/10.1186/s13049-018-0536-8

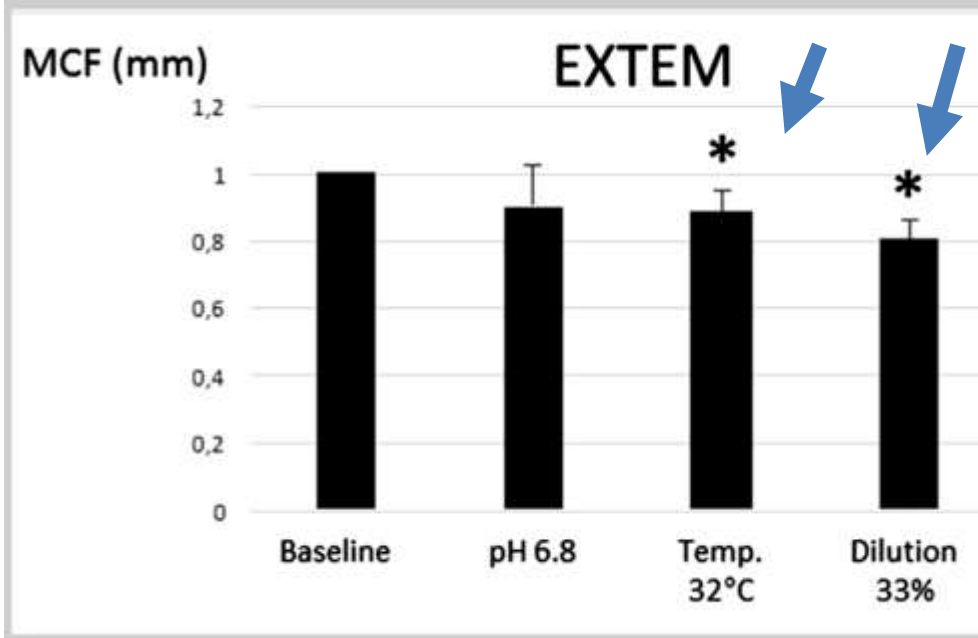
Scandinavian Journal of Trauma,
Resuscitation and Emergency Medicine

ORIGINAL RESEARCH Open Access

How do external factors contribute to the hypocoagulative state in trauma-induced coagulopathy? – In vitro analysis of the lethal triad in trauma

	Blood count			Standard coagulation tests			
	Haemoglobin level [g/dl]	Platelets [10^3/µl]	Haematocrit [%]	aPTT [s]	TT [s]	INR	Fibrinogen [mg/dl]
Baseline	11.4 (0.3)	257 (103)	32.7 (2.5)	30.3 (0.3)	16 (0.3)	1.18 (0.1)	250 (59)
pH 6.8	12.6 (1.4)	211 (70)	35.4 (3.1)	27.5 (0.3)	17.5 (0.3)	1.14 (0.09)	268 (39)
Temp. 33 °C	11.4 (1)	247 (98)	33.1 (2.3)	32.1 (0.1)	15.7 (0.1)	1.16 (0.13)	243 (62)
Dilution	7.5 (0.9)	167 (44)	22.2 (2.3)	43.3 (0.6)	20.8 (0.6)	1.41 (0.07)	166 (39)
Lethal Triad	7.7 (0.8)	125 (59)	22.8 (2)	34.9 (0.8)	23.8 (0.8)	1.46 (0.11)	154 (27)



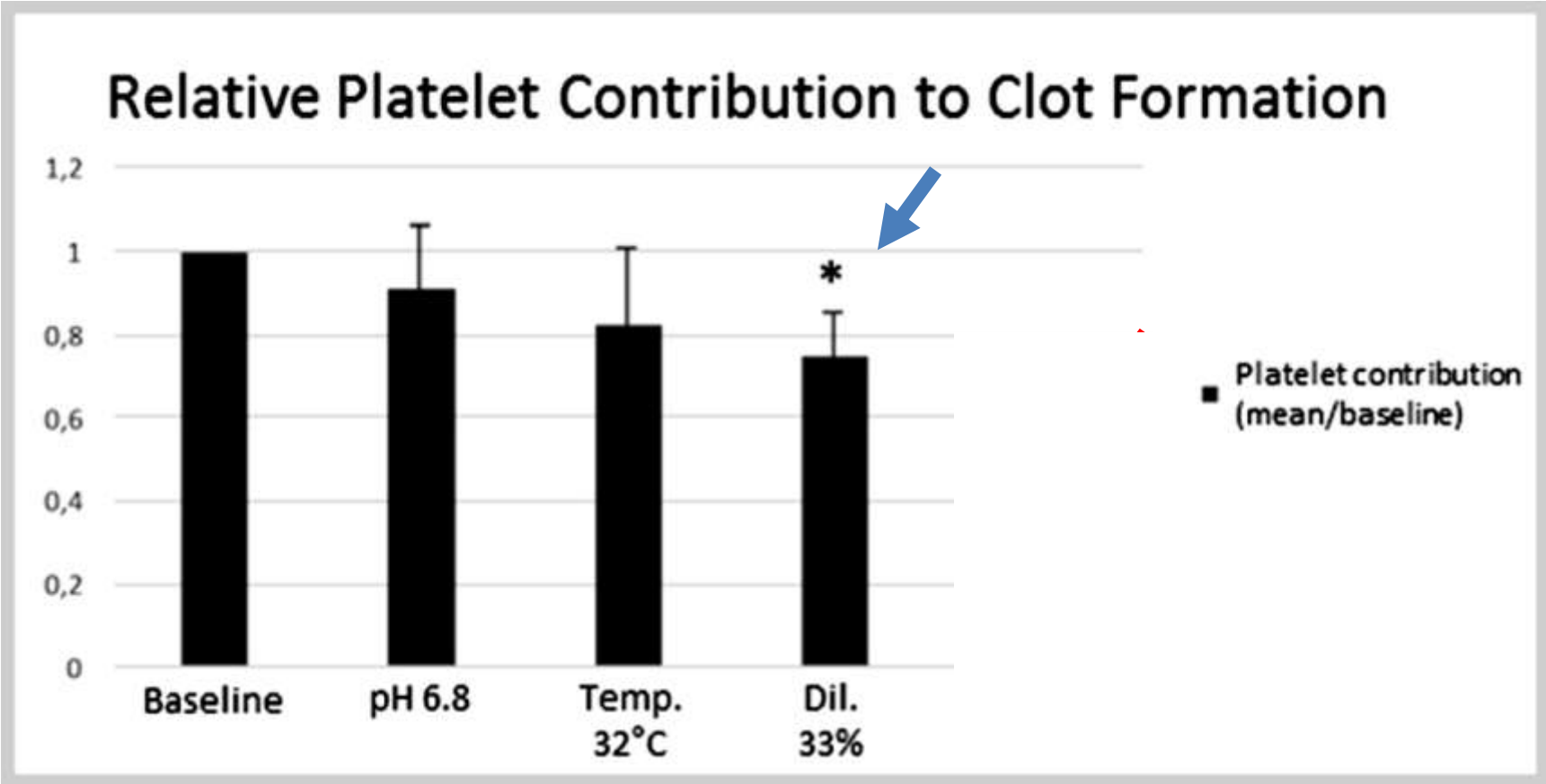


CFT – rýchlosť tvorby koagula

PREDĹŽENÁ

MCF – maximálna pevnosť koagula

ZNÍŽENÁ


Relative Platelet Contribution to Clot Formation
1,2
1
0,8
0,6
0,4
0,2
0
*
Baseline
pH 6.8
Temp. 32°C
Dil. 33%
Platelet contribution (mean/baseline)

Chang, Blood 2019

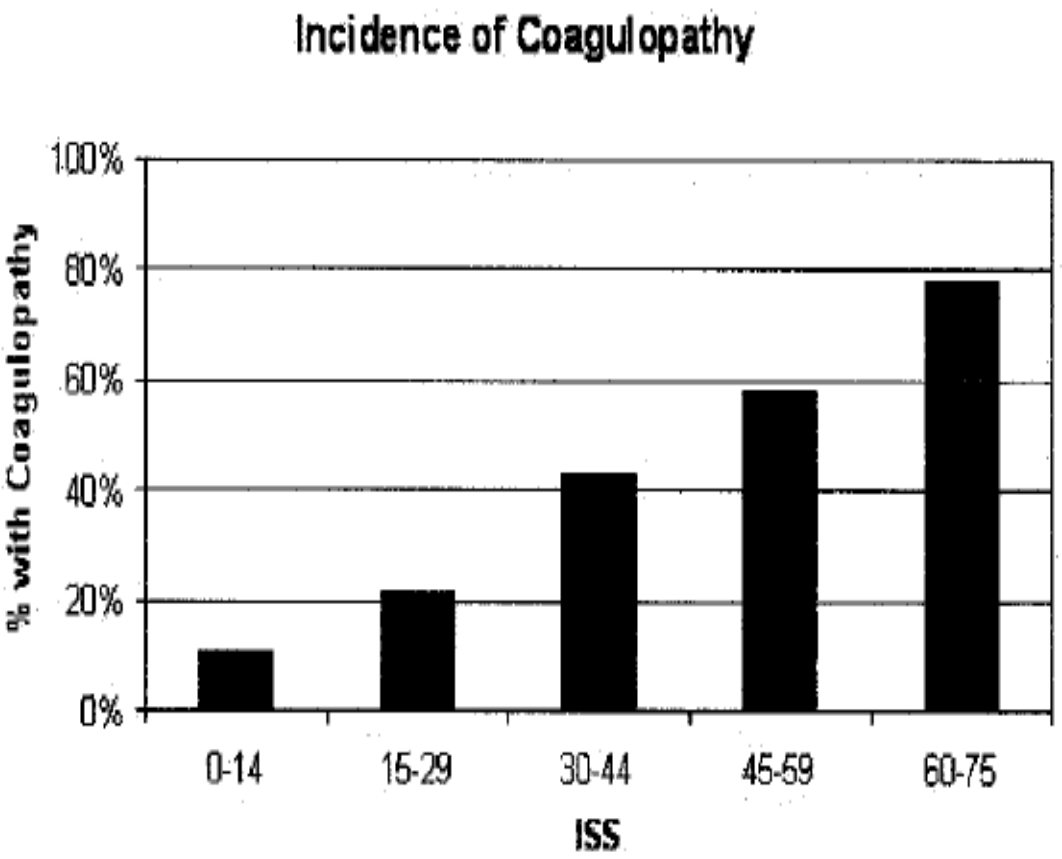
TRAUMA → **KRVÁCANIE** → **LIEČBA**

↓

~~**DILÚCIA**~~
~~**ACIDÓZA**~~
~~**HYPOTERMIA**~~

↓

~~**KLINICKY ZJAVNÉ KOAGULOPATICKÉ KRVÁCANIE**~~



24,4 % všetkých

33,1 % pri ISS > 15

Pacienti s koagulopatiou- 46% mortalita

The Journal of TRAUMA® *Injury, Infection, and Critical Care*

Acute Traumatic Coagulopathy

Karim Brohi, BSc, FRCS, FRCA, Jasmin Singh, MB, BS, BSc, Mischa Heron, MRCP, FFAEM, and Timothy Coats, MD, FRCS, FFAEM

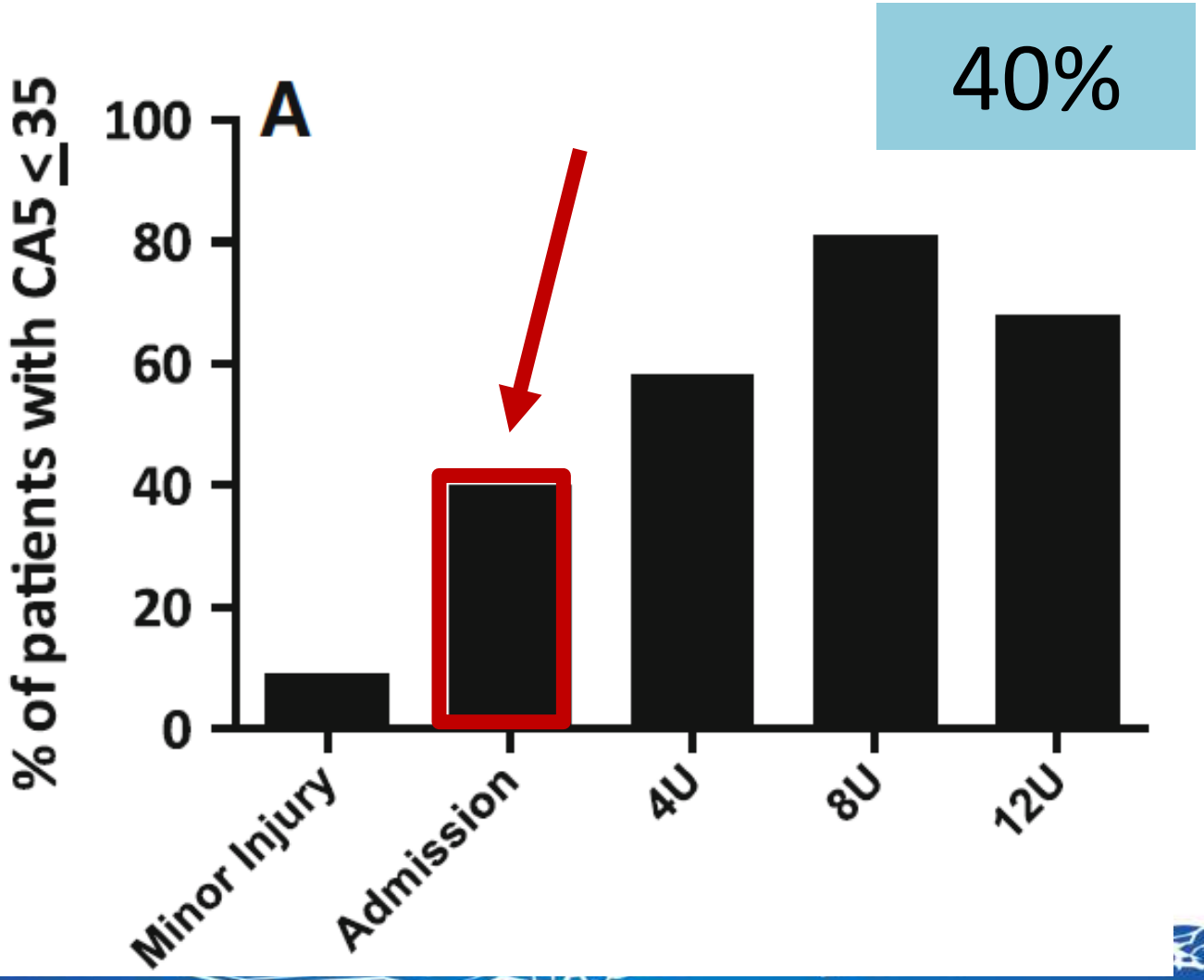
J Trauma. 2003;54:1127–1130.

Intensive Care Med (2015) 41:239–247
DOI 10.1007/s00134-014-3584-1

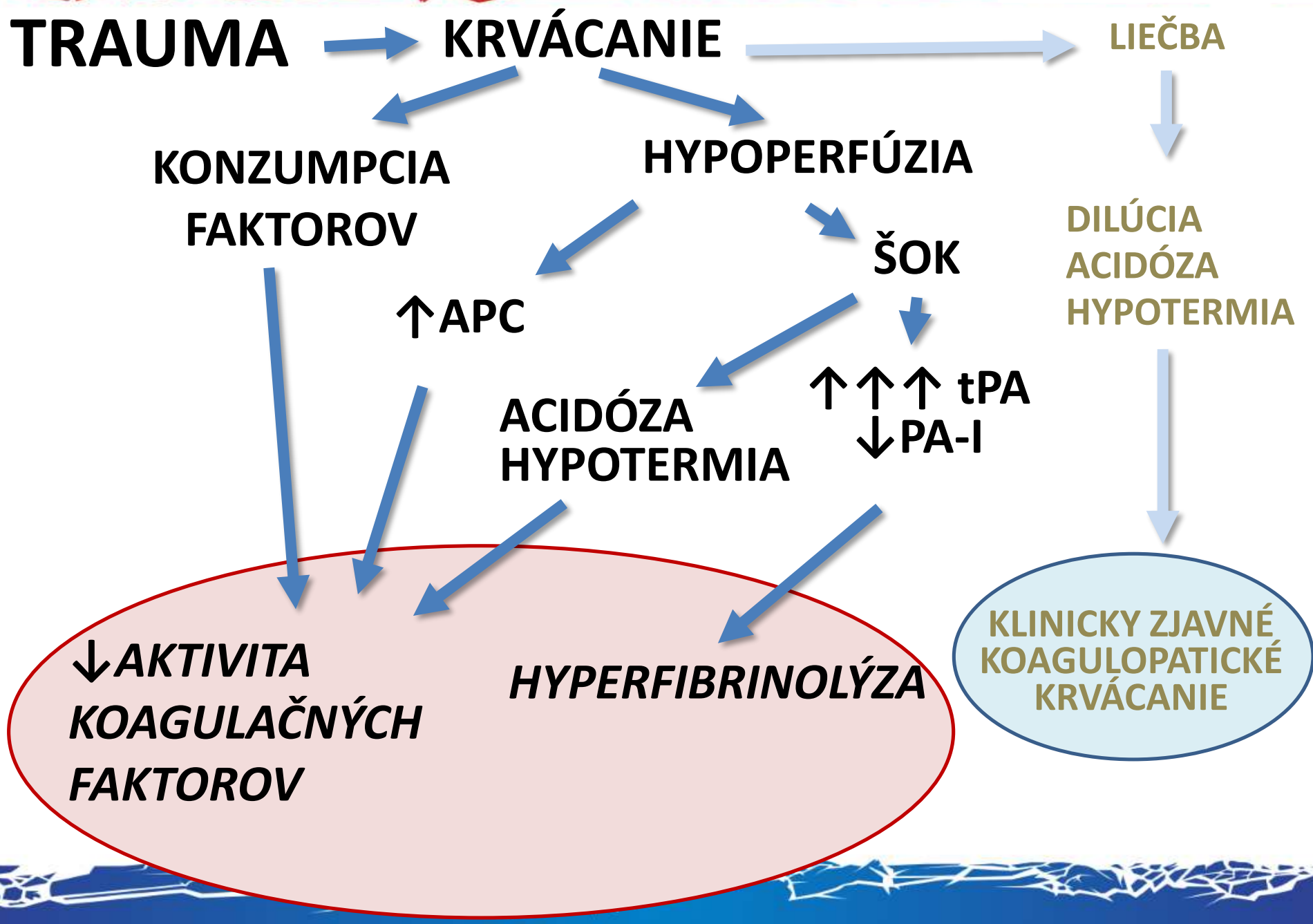
ORIGINAL

Sirat Khan
Ross Davenport
Imran Raza
Simon Glasgow
Henry D. De'Ath
Pär I. Johansson
Nicola Curry
Simon Stanworth
Christine Gaarder
Karim Brohi

Damage control resuscitation using blood component therapy in standard doses has a limited effect on coagulopathy during trauma hemorrhage



Chang, Blood 2019



Chang, Blood 2019

MODIFIKUJÚCE SITUÁCIE

- antikoagulanciá a antiagregancia v chronickej terapii
- kraniocerebrálna trauma
- trauma u tehotnej
- popáleninová trauma
- komorbidity
- genetický podklad

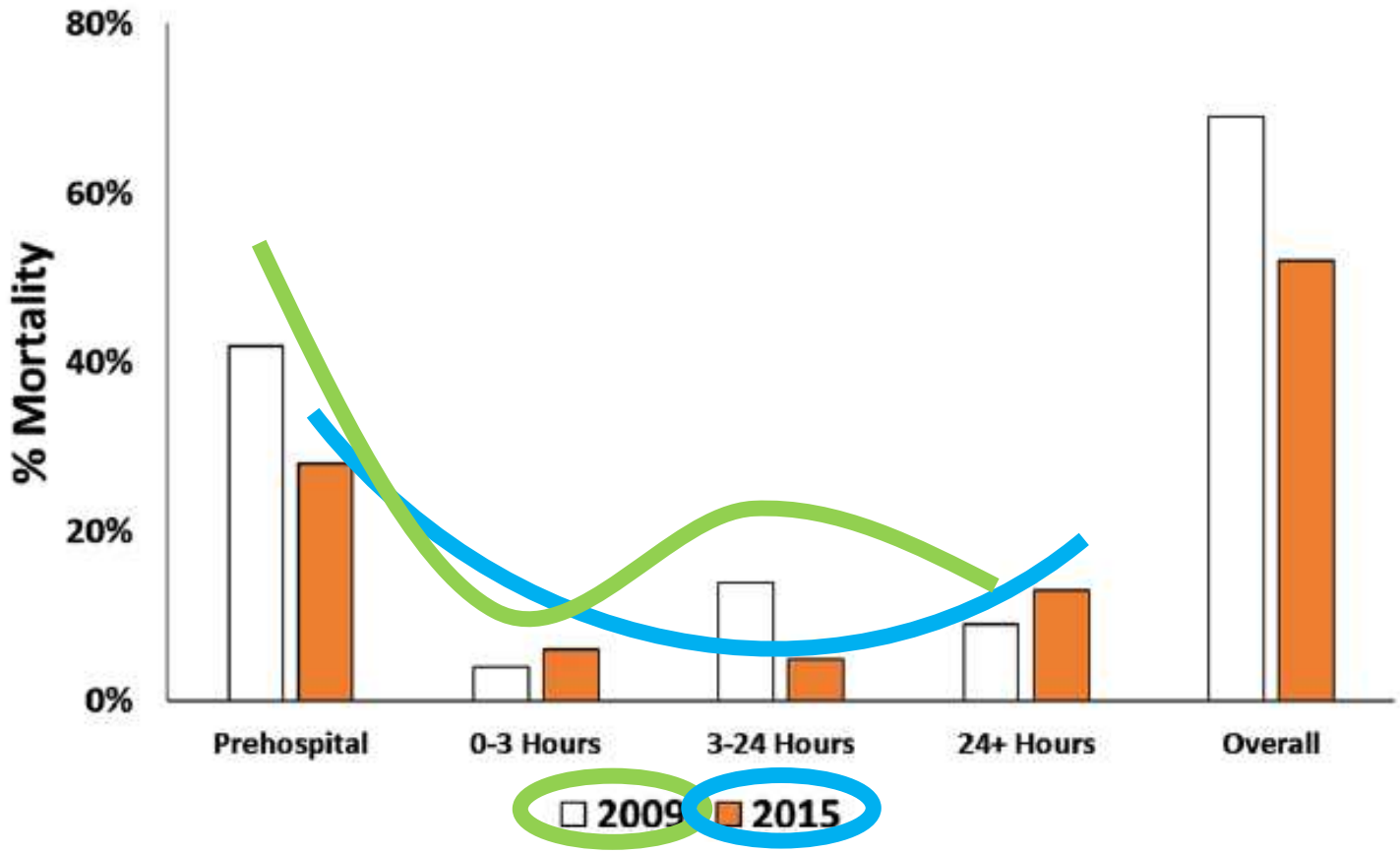
Acute traumatic coagulopathy: pathophysiology and resuscitation

J. W. Simmons* and M. F. Powell

Why are bleeding trauma patients still dying?

Karim Brohi[1,2,3*], Russell L. Gruen[4,5] and John B. Holcomb[6]

Intensive Care Med (2019) 45:709–711
https://doi.org/10.1007/s00134-019-05560-x



1. ZLYHANIE SRDCA A CIEVNEHO SYSTÉMU

- z OS pacient odchádza s dobrým srdcovým výdajom, s minim. presorickou podporou
- po pár hodinách rozvoj kardiogénneho, , hypovolemického a distribučného šoku
- navyšovanie obehovej podpory, volumosubstitúcia...
- prehlbovanie šoku
- ***PRÍČINA?***

2. POZVOĽNÝ NÁSTUP MULTIORGÁNOVÉHO ZLYHANIA

- ***PERSISTENT INFLAMMATION, IMMUNOSUPRESSION AND CATABOLISM SYNDROME (PIICS)***

2. POZVOĽNÝ NÁSTUP MULTIORGÁNOVÉHO ZLYHANIA

- porucha funkcie leukocytov a tvorby cytokínov
- proteokatabolizmus
- imunosupresia
- zhoršené hojenie rán
- zvýšené riziko infekcií
- …

Acute Medicine & Surgery 2019; **6**: 329–335 doi: 10.1002/ams2.426

Review Article

Complement and coagulation cascades in trauma

Abhigyan Satyam,[1] Elizabeth R. Graef,[1] Peter H. Lapchak,[1] Maria G. Tsokos,[1] Jurandir J. Dalle Lucca,[2] and George C. Tsokos[1]

- **„Pacienti s ťažkou traumou stále umierajú na multiorgánové zlyhanie,**

  len jeho klinický obraz sa mení“

Brohi, 2019

Ťažko zranený pacient má byť transportovaný rýchlo a ošetrený v špecializovanom traumacentre kedykoľvek je to možné

Spahn *et al. Critical Care* (2019) 23:98
https://doi.org/10.1186/s13054-019-2347-3

Critical Care

RESEARCH Open Access

The European guideline on management of major bleeding and coagulopathy following trauma: fifth edition

Having listened to your lecture, I am still confused.

But on a higher level.

Enrico Fermi