Dssa Giovanna Perone

Dssa Elisa Seghelini

Dssa Paola Bera

Dssa Angela Faletti

Basi di Bs-Ao-Co


VIA
DI MEZZO

TRAUMA

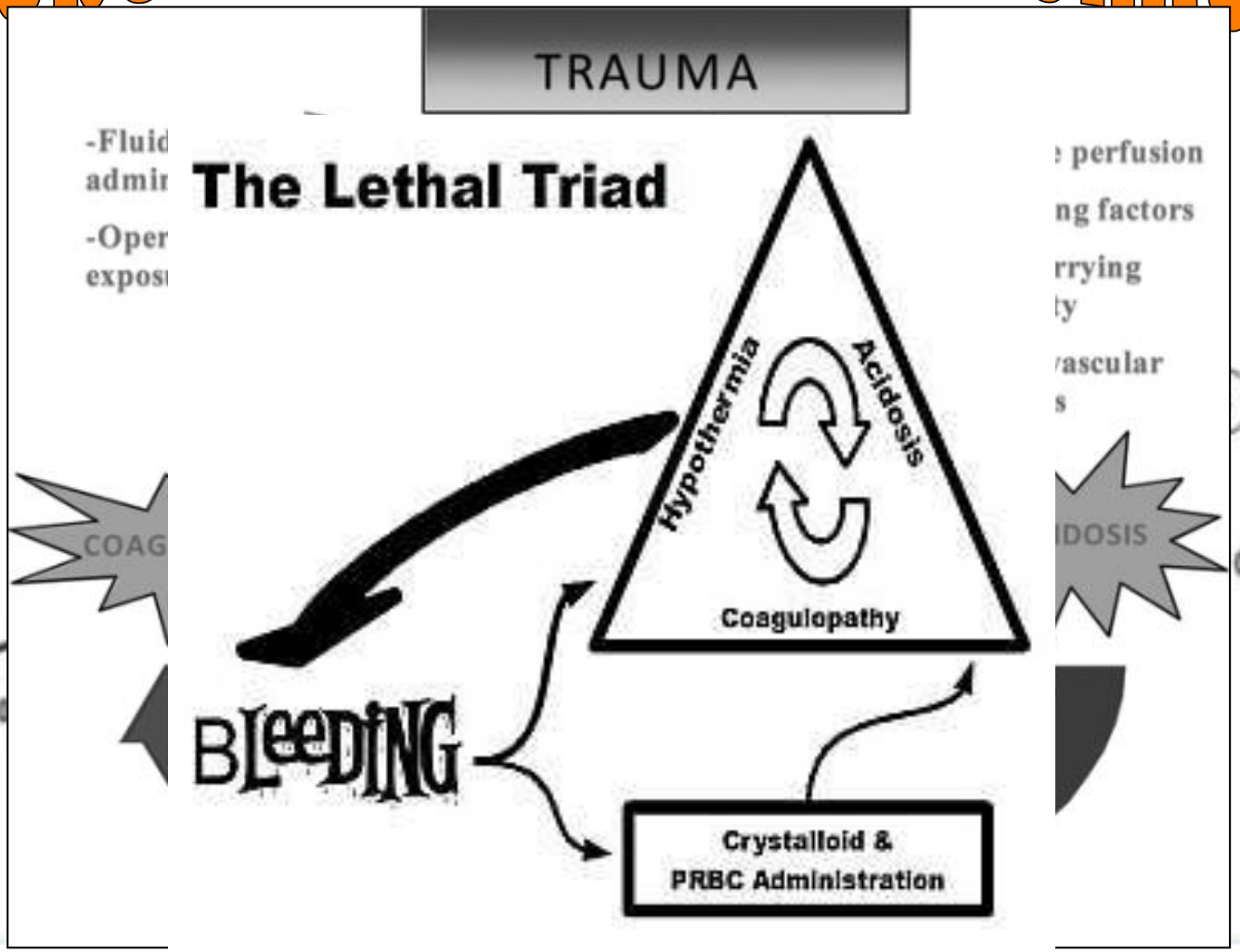
I decessi precoci sono imputabili a :

Emorragia → controllo delle perdite, trattamento della coagulopatia, mantenimento della perfusione, gestione della risposta infiammatoria

Lesioni neurologiche → utilizzo DPI (prevenzione primaria ed educazione alla popolazione)

1 causa di morte per età < 44aa

Scopo del rimpiazzo volemico



19-21 Settembre 2013
Aeroporto Cinquale di Massa

Hems Association

Causes of acute coagulopathy of trauma-shock

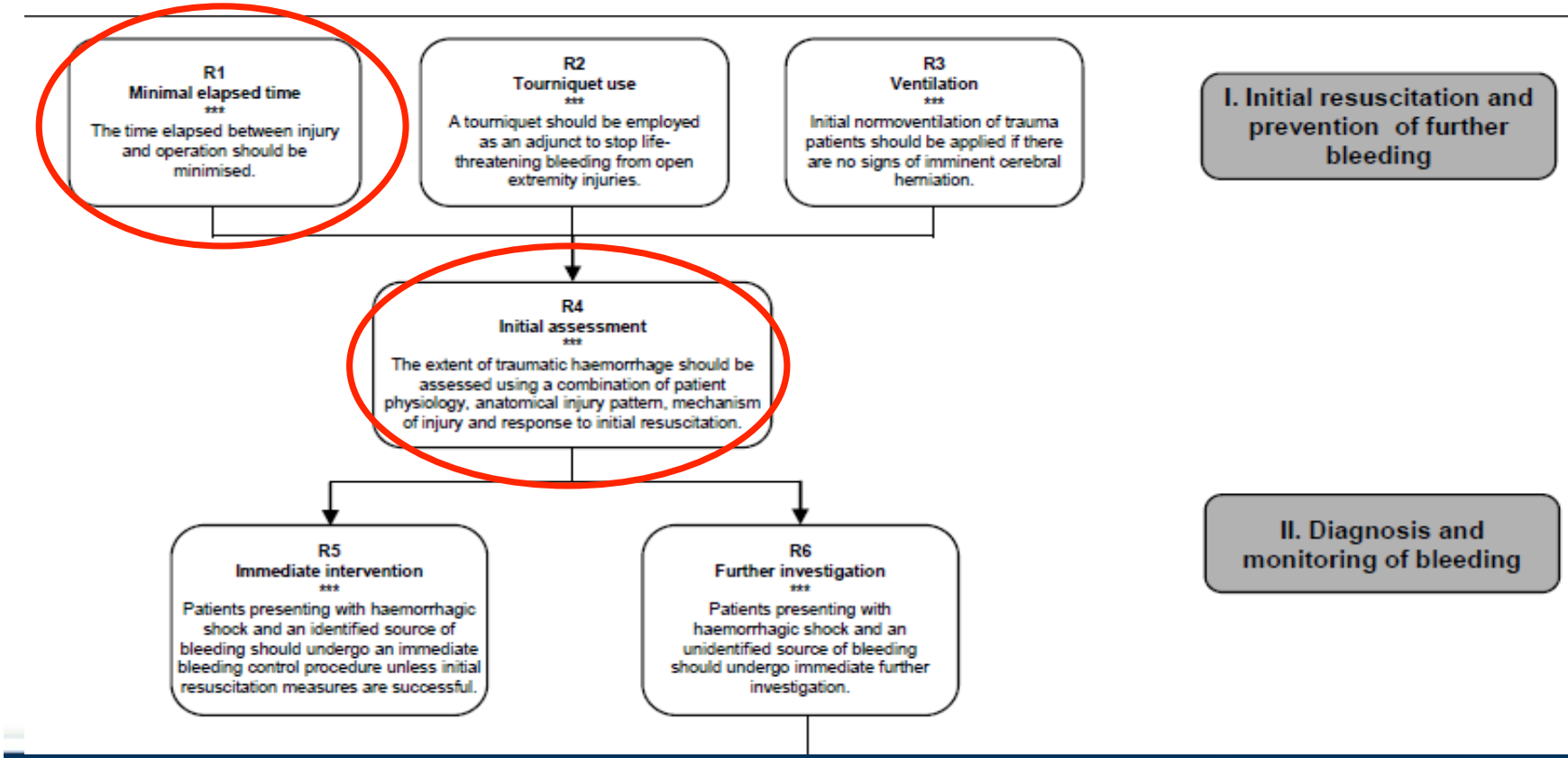
Causes	Effects
Tissue trauma	Exposing the subendothelial matrix with platelet activation Liberation of Factor VII and thrombin
Fibrinolysis	Tissue thromboplastin increases in the resence of thrombin
Shock	Mechanism unknown; related to depletion of Protein C
Hypothermia	Inhibits coagulation serinases. Decreases platelet function
Haemodilution	Dilution of clotting factors. Incorporation of colloids into clot.
Acidosis	Reduction of Xa-Va prothrombinase complex activity Platelet form spheres which are devoid of aggregating tendency
Inflamation	Activated by neutrophils with platelet dysfunction Monocyte adherence to platelets
Hypocalcaemia	Due to citrate in blood and blood components

Spahn *et al. Critical Care* 2013, **17**:R76
http://ccforum.com/content/17/2/R76

CRITICAL CARE

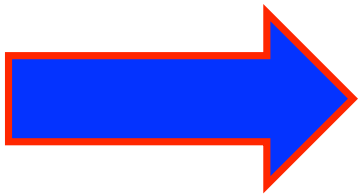
RESEARCH Open Access

Management of bleeding and coagulopathy following major trauma: an updated European guideline



What	Cosa ???
When	Quando ???
Where	Dove ???
Who	Chi ???
Why	Perché ???

1990



2010

BMJ 2012;345:e5752 doi: 10.1136/bmj.e5752 (Published 11 September 2012) Page 1 of 6

CLINICAL REVIEW

Early fluid resuscitation in severe trauma

Tim Harris *professor of emergency medicine*[1], G O Rhys Thomas *Lieutenant Colonel and honorary consultant*[2 3 4], Karim Brohi *professor of trauma sciences and consultant trauma and vascular*

Fluid Therapy in Trauma

MJAFI 2010; 66 : 312-316

Col R Datta*, Air Cmde R Chaturvedi+

Con cosa rimpiazziamo

Management of bleeding following major trauma: an updated European guideline

Rolf Rossaint[1], Bertil Bouillon[2], Vladimir Cerny[3], Timothy J Coats[4], Jacques Duranteau[5], Enrique Fernández-Mondéjar[6], Beverley J Hunt[7], Radko Komadina[8], Giuseppe Nardi[9], Edmund Neugebauer[10], Yves Ozier[11], Louis Riddez[12], Arthur Schultz[13], Philip F Stahel[14], Jean-Louis Vincent[15], Donat R Spahn[16*]

NHS
National Institute for Clinical Excellence

itiation of
ent therapy

Guidelines for Prehospital Fluid Resuscitation in the Injured Patient

(*J Trauma*. 2009;67: 389–402)

Bryan A. Cotton, MD, MPH, Rebecca Jerome, MLIS, MPH, Bryan R. Collier, DO, Suneel Khetarpal, MD, Michelle Hol
William Brom

SHOCK, Vol. 26, No. 4, pp. 322–331, 2006

Review Article

KEY ISSUES IN ADVANCED BLEEDING CARE IN TRAUMA

Rolf Rossaint,* Vladimir Cerny,† Timothy J. Coats,‡ Jacques Duranteau,§ Enrique Fernández-Mondéjar,‖ Giovanni Gordini,¶ Philip F. Stahel,** Beverley J. Hunt,†† Edmund Neugebauer,‡‡ and Donat R. Spahn§§

Phillips et al. Critical Care 2013, 17:319
http://ccforum.com/content/17/3/319

CRITICAL CARE

JOURNAL CLUB CRITIQUE

Crystalloids vs. colloids: KO at the twelfth round?

Curr Opin Crit Care 2013, 19:290–298

CURRENT OPINION

Fluids are drugs: type, dose and toxicity

Recent findings

Context is vital and any fluid can be harmful if dosed incorrectly. When contrasting 'crystalloid versus colloid', differences in efficacy are modest, but differences in safety are significant. Differences in chloride load and strong ion difference appear to be clinically important. Quantitative toxicity is mitigated when dosing is based on dynamic parameters that predict volume responsiveness. Qualitative toxicity for colloids (even with newer hydroxyethyl starch 130/0.4 solutions) and isotonic saline remain a concern.

J Trauma. 2006;61:1350–1358. *The Journal of* TRAUMA® *Injury, Infection, and Critical Care*

The Resuscitative Fluid You Choose May Potentiate Bleeding

Attualmente uniformità di vedute:

- cristalloidi
- rianimazione ipotensiva e rianimazione emostatica
  (→ combinazione di strategie che hanno come fine ridurre il sanguinamento/coagulopatia da trauma e migliorare l'outcome)

Compromesso:

Ambiente ostile, estremo, necessità di peso/volume di rimpiazzo accettabili

Ridurre al minimo il periodo di rianimazione ipotensiva-ipovolemica

L'organizzazione dei soccorsi **deve** prevedere un ***PDTA*** per la risoluzione rapida e definitiva della perdita ematica

Comunicazione ottimale tra extra ed intra-ospedaliero

Quando è necessario rimpiazzare

Summary points

- Critically injured trauma patients may have normal cardiovascular and respiratory parameters (pulse, blood pressure, respiratory rate), and no single physiological or metabolic factor accurately identifies all patients in this group
- Initial resuscitation for severely injured patients is based on a strategy of permissive hypovolaemia (hypotension) (that is, fluid resuscitation delivered to increase blood pressure without reaching normotension, aiming for cerebration in the awake patient, or 70-80 mm Hg in penetrating trauma and 90 mm Hg in blunt trauma) and blood product based resuscitation
- This period of hypovolaemia (hypotension) should be kept to a minimum, with rapid transfer to the operating theatre for definitive care
- Crystalloid or colloid based resuscitation in severely injured patients is associated with worse outcome
- Once haemostasis has been achieved, resuscitation targeted to measures of cardiac output or oxygen delivery or use improves outcome
- Tranexamic acid administered intravenously within 3 h of injury improves mortality in patients who are thought to be bleeding

Basta la clinica???

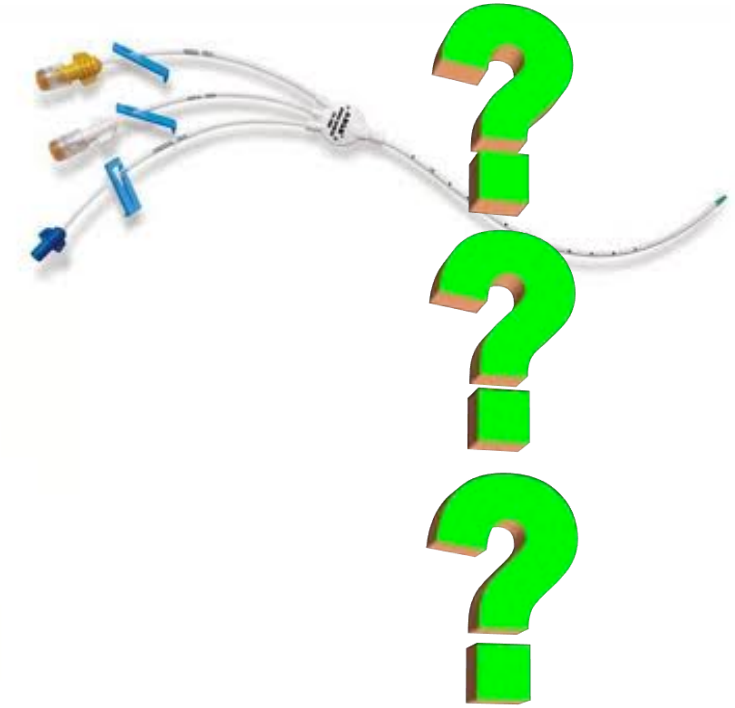
Esperienza personale???

Alcune certezze:

PAS 70-80mmHg (trauma penetrante) PAS 90mmHg (trauma chiuso)

se PAS 110mmHg (trauma cranico)

Dove!? Accesso infusivo idoneo!!



Guidelines for Prehospital Fluid Resuscitation in the Injured Patient

Bryan A. Cotton, MD, MPH, Rebecca Jerome, MLIS, MPH, Bryan R. Collier, DO, Suneel Khetarpal, MD, Michelle Holevar, MD, Brian Tucker, DO, Stan Kurek, DO, Nathan T. Mowery, William Bromberg, MD, Oliver L. Gunter, MD, and William P. Riordan, Jr., MD; EAST Practice Parameter Workgroup for Prehospital Fluid Resuscitation

(*J Trauma.* 2009;67: 389–402)

Guideline committee to answer the following questions regarding prehospital resuscitation: (1) should injured patients have vascular access attempted in the prehospital setting? (2) if so, what location is preferred for access? (3) if access is achieved, should intravenous fluids be administered? (4) if fluids are to be administered, which solution is preferred? and (5) if fluids are to be administered, what volume and rate should be infused?

Chi necessita di rimpiazzo

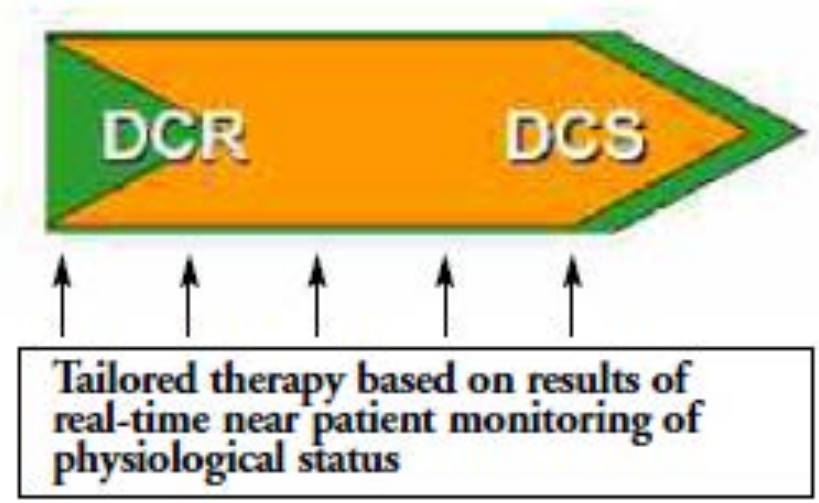
1) Trauma penetrante ?????
2) Trauma cranico grave ?????
3) Trauma chiuso ?????

Damage Control Resuscitation DCR

Rianimazione dilazionata Emostasi precoce

Ipotensione permissiva → minimizzo/ottimizzo il riempimento volemico fino all'arresto chirurgico dell'emorragia

Integrated approach DCR -DCS



Possiamo fare altro!!!

CRASH-2

The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial

*The CRASH-2 collaborators**

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

*CRASH-2 trial collaborators**

RESEARCH ARTICLE Open Access

Avoidable mortality from giving tranexamic acid to bleeding trauma patients: an estimation based on WHO mortality data, a systematic literature review and data from the CRASH-2 trial

Massive transfusion protocol **MTP** condivisi e conosciuti

extraospedaliero

ZEOLITE (pietra che bolle)

Agente emostatico scoperto nel 1984

Assorbe l'acqua del sangue provocando un miglioramento dei processi coagulativi e delle piastrine.

Il processo produce calore e può dare ustioni di 2° grado.

A seguito dell'attentato alle Torri Gemelle l'esercito americano ha condotto una serie di test comparativi riguardanti le tecnologie anti-emorragia:

QuikClot ha ottenuto le migliori votazioni

Sempre a seguito dei test l'esercito americano ne ha approvato l'impiego in Afghanistan ed in Iraq

USO ESTERNO!!!

Floseal Hemostatic Matrix | Stop Bleeding Fast.

ProFibrix

Coseal Surgical Sealant | Ready, Set, Seal

intraospedaliero

HEMOSTATIC RESUSCITATION

Stinger HK et al.

The ratio of fibrinogen to red cells transfused affects survival in casualties receiving massive transfusions at an army combat support hospital

J Trauma 2008 Feb;64(2 Suppl):S79-85; discussion S85

RACCOMANDAZIONI DELLE LINEE GUIDA (1C):
3-4 grammi di fibrinogeno o 15-20 Unità di crioprecipitato
Livello ottimale di fibrinogeno 200 mg/dl
Uso del Tromboelastogramma

Proposta

5.01- Introduzione

Il trattamento del traumatizzato gravemente ipoteso prevede una sequenza di azioni rapide finalizzate alla precoce ospedalizzazione, al controllo delle perdite e alla stabilizzazione del paziente (ALLEGATO A).

5.02 – Indicazioni

Il target di un corretto trattamento può essere riassunto come segue:

reperimento di 2 accessi venosi periferici. L'accesso venoso periferico è da ritenersi la prima scelta; nel caso in cui il reperimento dell'accesso vascolare periferico richieda più di due tentativi andrebbero considerare altre vie infusive quali il cateterismo di vena centrale e il posizionamento di ago intraosseo (ALLEGATO B).

infusione di liquidi a boli di 250ml (rianimazione ipovolemica) (ALLEGATO C)

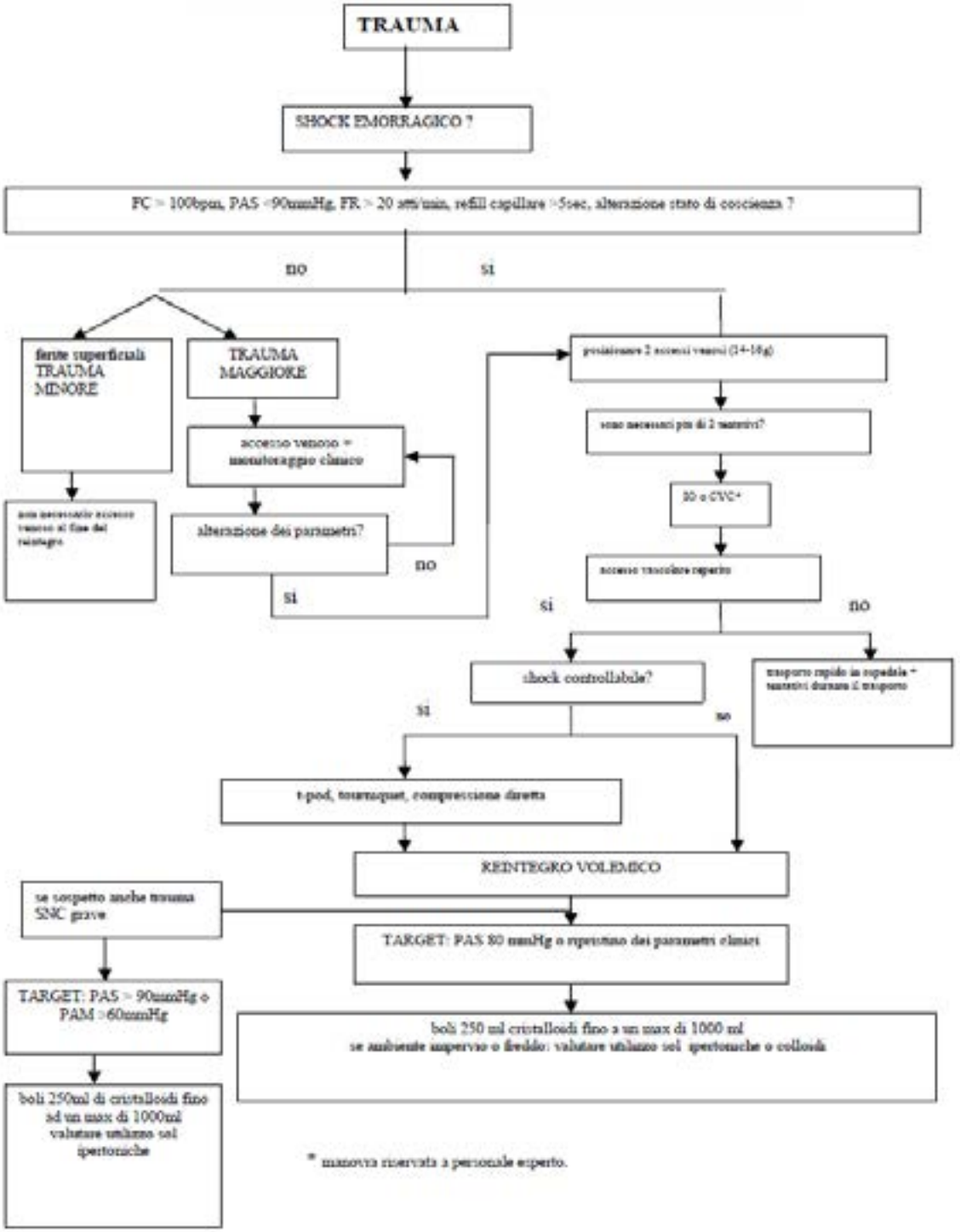
raggiungimento di un target pressorio (PAS 80 mmHg; PAS > 90 mmHg se trauma cranico grave) o ripristino di parametri clinici: nel paziente in shock emorragico l'obiettivo è l'ipotensione permissiva (una buona perfusione tissutale valutata con la misurazione della pressione arteriosa e la normalizzazione dell'eccesso di basi e del valore dei lattati così come il raggiungimento di una Sv > 70% (10-11). Come sottolineato dalle Linee Guida Europee la pressione arteriosa sanguigna dovrebbe essere mantenuta tra i 70 e i 100 mmHg. Nello specifico 70-80 mmHg NEL TRAUMA PENETRENTE E 90mmHg nel trauma chiuso.

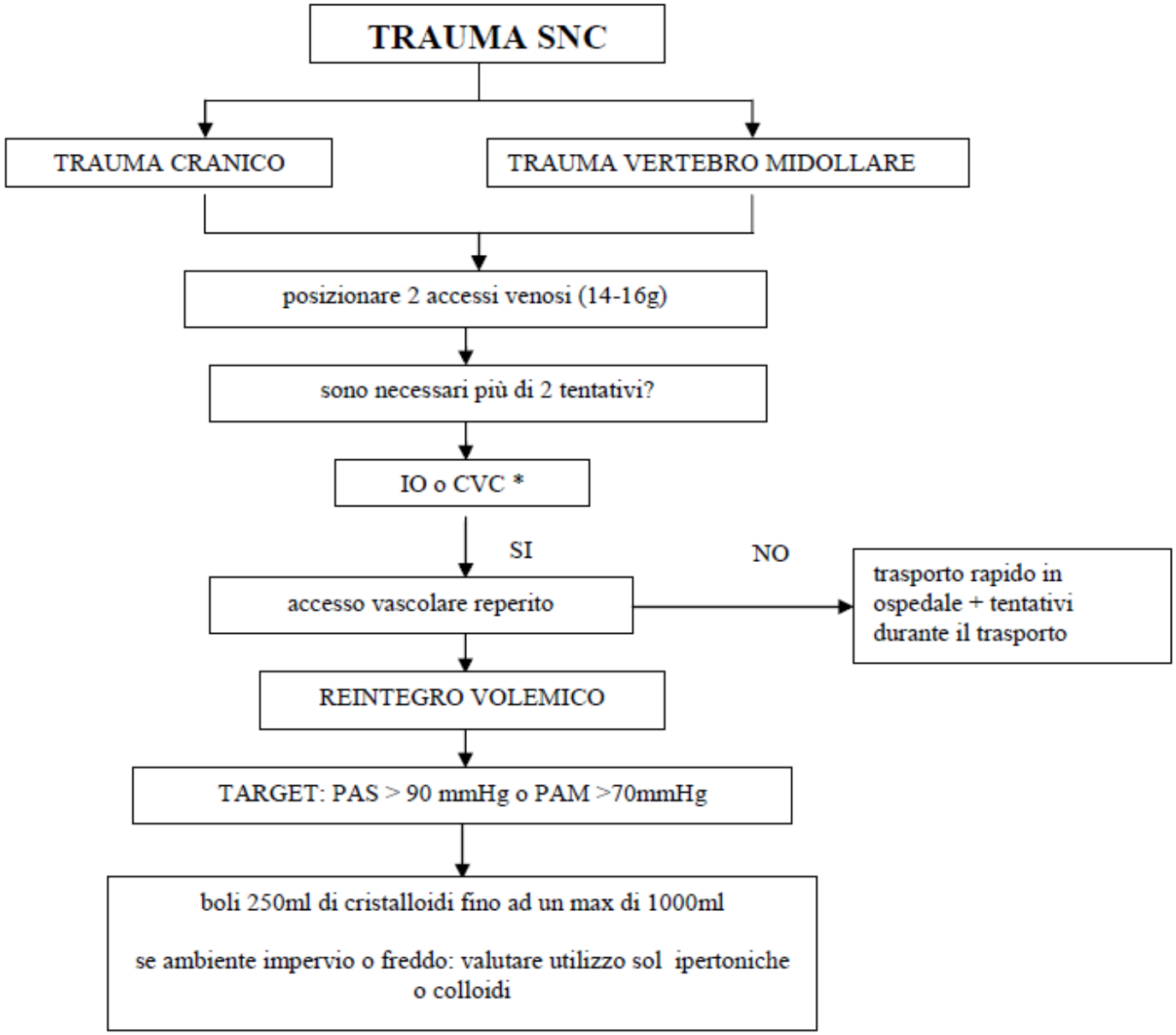
Tali valori sono, però proscritti nei traumi cranici-spinali, e perseguiti con molta attenzione nel paziente anziano ed iperteso (2).

attivazione di un protocollo di trasfusione massiva nell'ospedale accettante (se previsto)

evitare l'ipotermia

stabilizzare il coagulo in formazione – studio CRASH2




TRAUMA SNC
TRAUMA CRANICO
TRAUMA VERTEBRO MIDOLLARE
posizionare 2 accessi venosi (14-16g)
sono necessari più di 2 tentativi?
IO o CVC *
SI
NO
accesso vascolare reperito
trasporto rapido in ospedale + tentativi durante il trasporto
REINTEGRO VOLEMICO
TARGET: PAS > 90 mmHg o PAM >70mmHg
boli 250ml di cristalloidi fino ad un max di 1000ml
se ambiente impervio o freddo: valutare utilizzo sol ipertoniche o colloidi

domande?

È difficile ma non impossibile


VIA
DI MEZZO

ITALY

Population: 60 550 850
Income group: High
Gross national income per capita: US$ 35 530

INSTITUTIONAL FRAMEWORK

Lead agency	Ministry of Transport
Funded in national budget	Yes
National road safety strategy	Yes
Funding to implement strategy	Partially funded
Fatality reduction targets set	Yes (2001–2010)
Fatality reduction target	50%

SAFER ROADS AND MOBILITY

Formal audits required for new road construction	Yes
Regular inspections of existing road infrastructure	Yes
Policies to promote walking or cycling	Subnational
Policies to encourage investment in public transport	Subnational
Policies to separate road users to protect VRUs	Subnational

SAFER VEHICLES

Total registered vehicles (2009)	52 586 499
Cars and 4-wheeled light vehicles	40 169 966
Motorized 2- and 3-wheelers	10 074 121
Heavy trucks	944 534
Buses	98 724
Other	1 299 154
Vehicle standards applied	
UN World forum on harmonization of vehicles standards	No
New car assessment programme	Yes
Vehicle regulations	
Front and rear seat-belts required in all new cars	Yes
Front and rear seat-belts required all imported cars	Yes

DATA

Reported road traffic fatalities (2009)	4 237[a], 78%M, 22%F
Estimated GDP lost due to road traffic crashes	2%[b]

[a] Police records. Defined as died within 30 days of crash.
[b] 2008, Automobile Club of Italy (ACI) and National Statistics Institute (ISTAT).

SAFER ROAD USERS

Penalty/demerit point system in place	Yes
National speed limits	Yes
Local authorities can set lower limits	Yes
Maximum limit urban roads	50 km/h
Enforcement	0 1 2 3 4 5 6 ⑦ 8 9 10
National drink–driving law	Yes
BAC limit – general population	0.05 g/dl
BAC limit – young or novice drivers	0 g/dl
BAC limit – professional/commercial drivers	0 g/dl
Random breath testing and/or police checkpoints	Yes
Enforcement	0 1 2 3 4 5 6 ⑦ 8 9 10
% road traffic deaths involving alcohol	—
National motorcycle helmet law	Yes
Applies to drivers and passengers	Yes
Helmet standard mandated	Yes
Enforcement	0 1 2 3 4 5 6 ⑦ 8 9 10
Helmet wearing rate	92% All riders[c]
National seat-belt law	Yes
Applies to front and rear seat occupants	Yes
Enforcement	0 1 2 3 4 5 ⑥ 7 8 9 10
Seat-belt wearing rate	63% Drivers[c] 10% Rear seats[c]
National child restraint law	Yes
Enforcement	0 1 2 3 4 ⑤ 6 7 8 9 10
National law on mobile phones while driving	Yes
Law prohibits hand-held mobile phone use	Yes
Law also applies to hands-free mobile phones	No

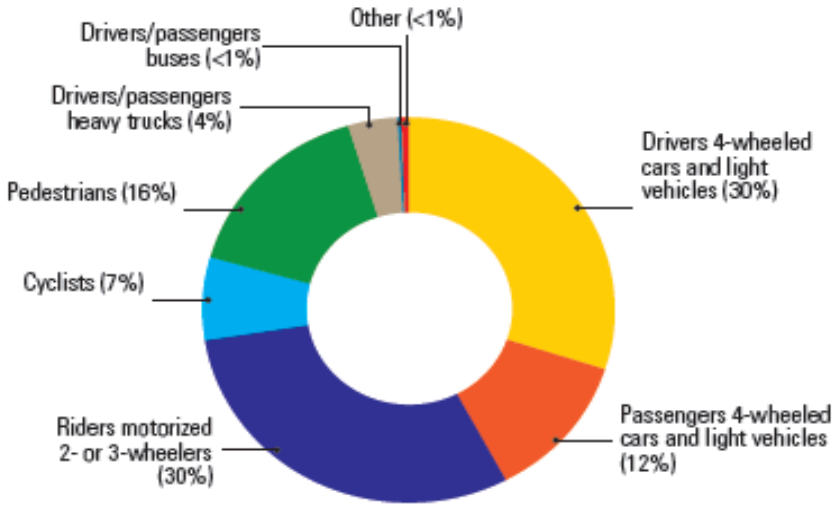
[c] 2011, ULISSE (Health National Institute and Ministry of Transport).

POST-CRASH CARE

Vital registration system	Yes
Emergency Room based injury surveillance system	No
Emergency access telephone number(s)	118
Seriously injured transported by ambulance	50–74%
Permanently disabled due to road traffic crash	1.8%[d]
Emergency medicine training for doctors	Yes
Emergency medicine training for nurses	Yes

[d] 2010, INTEGRIS database.

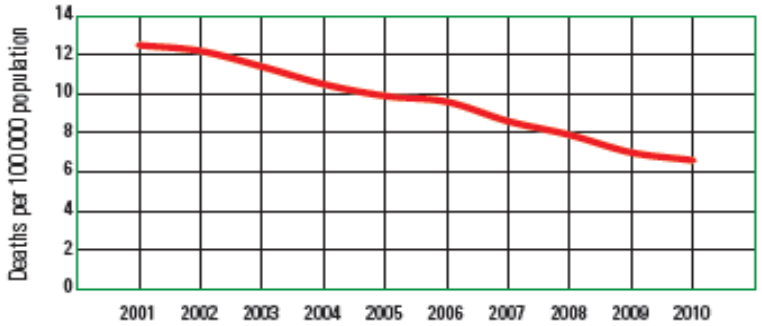
DEATHS BY ROAD USER CATEGORY



Source: 2009, ISTAT Survey on road accidents resulting in deaths or injuries.

Further data on each country can be found in the statistical annex.

TRENDS IN ROAD TRAFFIC DEATHS



Source: 2010, ISTAT Survey on road accidents resulting in deaths or injuries.

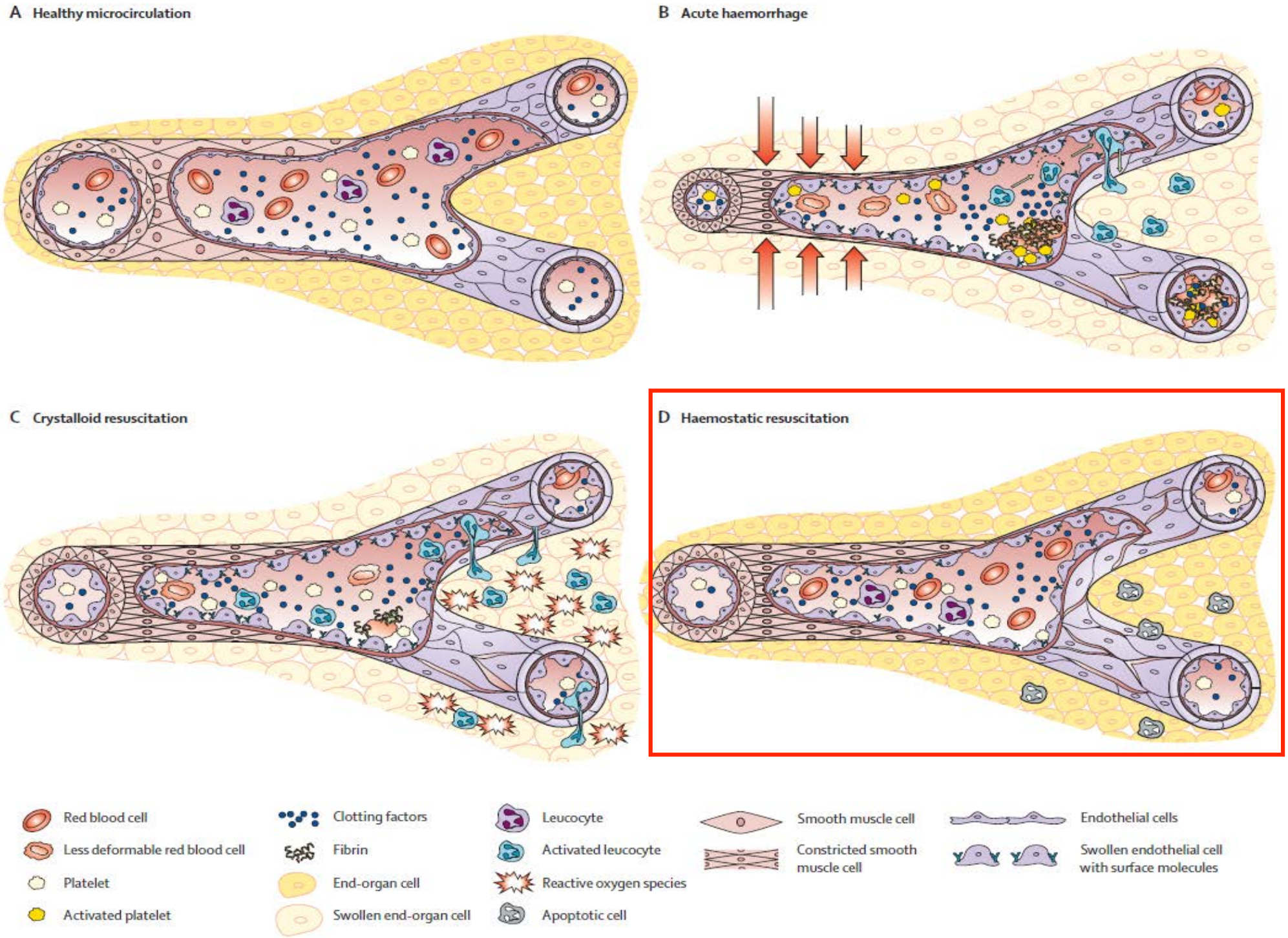
Data collected by multisectoral consensus meeting and cleaned by Ministry of Health.

BMJ

BMJ 2012;345:e5752 doi: 10.1136/bmj.e5752 (Published 11 September 2012)

Table 1| **Randomised trials of permissive hypotension in trauma**

Trial	Intervention	Patient group	Setting	Findings	Comments
Pseudo-randomised controlled trial[16]	No fluid resuscitation before surgical intervention in operating theatre *v* crystalloid based resuscitation	Penetrating truncal trauma and systolic blood pressure >90 mm Hg (n=598)	Prehospital and in emergency department	Lower mortality in group with no fluid resuscitation than in group with crystalloid based resuscitation (survival 70% *v* 62%, P=0.04)	Short transport distances, mortality benefit predominantly vascular injuries, young cohort (mean age 31 years), 8% in no fluid group received fluids
Randomised controlled trial[17]	Resuscitation to target systolic blood pressure 100 mm Hg *v* 70 mm Hg	Blunt or penetrating trauma and systolic blood pressure <90 mm Hg in first hour (n=110)	Urban trauma centre resuscitation room	No mortality difference, low mortality of four (7.3%) patients in each group	Low mortality, study underpowered to show mortality difference, observed systolic blood pressures were 114 mm Hg and 100 mm Hg despite targets
Randomised controlled trial: interim analysis[w27]	Intraoperative resuscitation to mean arterial pressure 50 mm Hg *v* 65 mm Hg	Traumatic injuries excluding traumatic brain injury with at least one episode of systolic blood pressure <90 mm Hg (n=90)	Operating theatre	No mortality difference	Observed blood pressures did not differ significantly despite targets; results may not translate to preoperative environment


A Healthy microcirculation
B Acute haemorrhage
C Crystalloid resuscitation
D Haemostatic resuscitation
Red blood cell
Less deformable red blood cell
Platelet
Activated platelet
Clotting factors
Fibrin
End-organ cell
Swollen end-organ cell
Leucocyte
Activated leucocyte
Reactive oxygen species
Apoptotic cell
Smooth muscle cell
Constricted smooth muscle cell
Endothelial cells
Swollen endothelial cell with surface molecules

E’ sempre necessario il rimpiazzo

perché!!!!

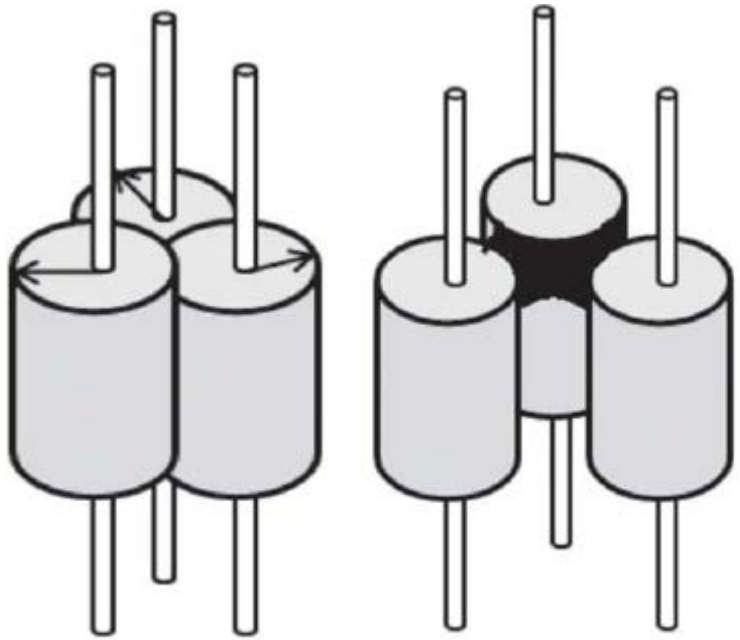


Fig. 2: Diagrammatic Presentation of Krogh’s Model of Tissue Perfusion. Cylindrical area of supply around each capillary normally overlaps. Tissue oedema separates the cylinders, causing hypoperfusion in the intervening area (black).