SALA CONCORDIA C

PIANETA TRAUMA

Moderatori: **Geminiano Bandiera – Mario Rugna**

Marcello Baraldi

L’impiego dei protocolli di trasfusione massiva

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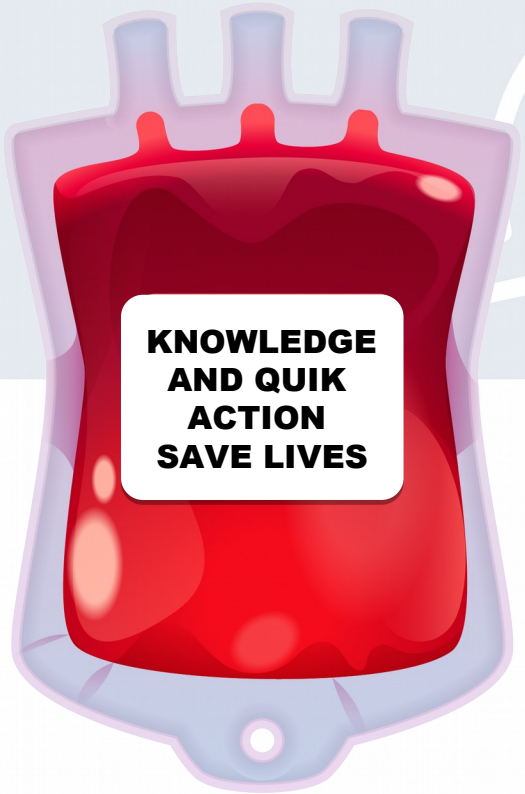

L'IMPIEGO DEI PROTOCOLLI DI TRASFUSIONE MASSIVA

Dott. Marcello Baraldi - Responsabile SET 118 Modena
Inf. Alberto Di Martino - SET 118 Modena - Specialista in Area Critica
Gabriele Lorenzini - CdL Infermieristica - Università degli Studi di Modena

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MASSIVE TRANSFUSION PROTOCOL (MTP) – UNIVERSITY OF MICHIGAN

Appropriate initial interventions:

- Intravenous access – 2 large bore Ivs and CVC
- Labs: T&C, CBC, Pits, INR, PT, PTT, Fibrinogen, Electrolytes, BUN/Creatinine, ionized calcium
- Continuous monitoring: VS, U/O, Acid-base status
- Aggressive re-warming
- Prevent/Reverse acidosis
- Correct hypocalcemia: CaGluconate or CaCl
  - Target goal ionized calcium 1.2 – 1.3
  - If use CaCl 1 mg, give slowly IV
- Repeat lab testing to evaluate coagulopathy
- Stop crystalloid – avoid dilutional coagulopathy

Other considerations:

- Heparin reversal: Protamine 1 mg IV/100 U heparin
- Warfarin reversal: Vitamin K 10 mg IV; Consider PCC
- CRF and VW: DDAVP 0.3 µg/kg IV x 1 dose
- Consider antifibrinolytics:
  - Tranexamic acid 10 mg/kg IV
  - Amicar 5 mg IV bolus then 1 gm/hr IV infusion
- Intraoperative RBC salvage techniques

General Guidelines for Lab-based Blood Component Replacement in Adults:

Product	Threshold	Dose
RBCs	No threshold	MD discretion
FFP	INR > 1.5	4 units FFP
Platelets	< 100,000	Ine 5-pack Pits
Cryoprecipitate	Fibrinogen < 100	Two 5-packs Cryoprecipitate

IDENTIFY AND MANAGE BLEEDING
(SURGERY, ANGIOGRAPHIC EMBOLIZATION, ENDOSCOPY)

4U RBCs in < 4 hours and ongoing uncontrolled bleeding

Clinical Team Activates MTP & Designates Clinical Contact

Clinical Contact phone Blood Bank (BB) at 936-6888 and:

- Provides name of clinical contact person to BB
- Provides MR#, sex, name, location of patient
- Records name of BB contact, calls if location/contact information changes
- Ensures that MTP protocol electronic order is entered in CareLink

BB Prepares MTP Pack; Transfuse as 1:1:1 Ratio MTP Pack: 6U RBCs; 4U FFP; One (1) 5-pack Platelets

Hemostasis & resolution of coagulopathy?

NO

Clinical Designate contacts BB at 6-6888 for another MTP pack.
** MD can adjust pack based on labs PRN

YES

Repeat Labs:

- CBC, plts
- INR, PT, PTT
- Fibrinogen
- Ionized Calcium
- Consider rapid coagulation tests

Stop MTV

- Notify BB & return any unused blood ASAP
- Resume standard orders
- D/C MTP Electronic order

Consider rFVIIa

- If persistent coagulopathy
- 40 to 100 µg/kg dose
- Round up to 1, 2, 5 mg vial size

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CASE REPORT

Pre-Hospital Setting

SC01R	AVANZATO
MARIO ROSSI VIA XX XXXX N XX TEL XXXXXXXXXX	**Allertamento:** **11:22 AM**
	Arrivo sul luogo: **11:35 AM**
MOTOCICLISTA SBALZATO – Cosciente **NO**; Respira **SI**; **Emorragia**; Sesso M; Età 30 aa	

Valutazione della scena/situazione

Scena sicura

- Unico paziente a lato della carreggiata.
- Casco ancora indossato (visibilmente danneggiato).
- Sbalzato a lato autovettura. Verosimile impatto contro ostacolo fisso (segnaletica stradale). Molto distante c.ca 6 mt.
- Importanti tracce di sanguinamento nel punto di impatto con l'auto.

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Quick look:

X. A B C D E

GCS 14 (E4.V4.M6.)

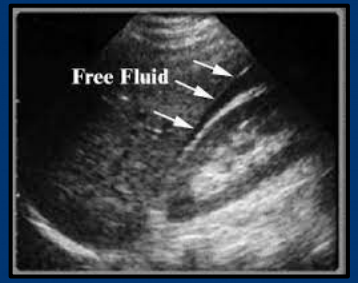
RR 35 bpm

HR 145 bpm

PAS 75 mmHg

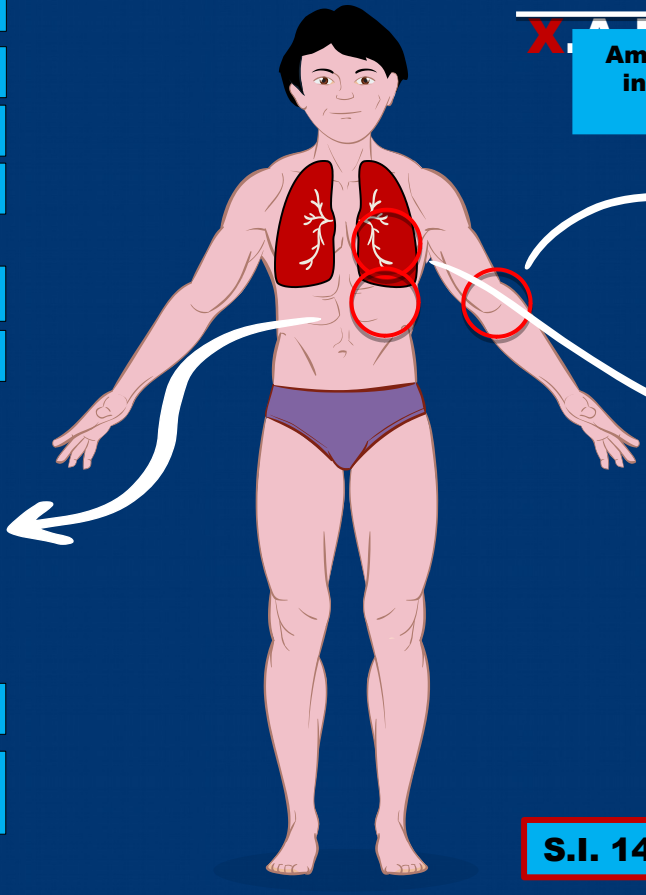
SpO_2 81% A.A. >>>> 94%

FAST +++

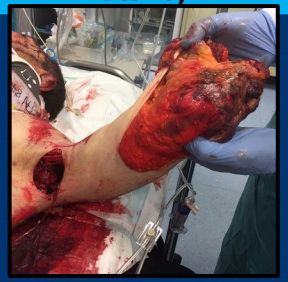


Addome teso

Polso radiale filiforme, cute fredda, diaforetica



Amputazione AS SX + ferita penetrante incavo ascellare SX (sanguinamento attivo)



MV ridotto emitorace SX

Bacino stabile

Apparentemente nulla AAII

S.I. 145/75 = 1.9

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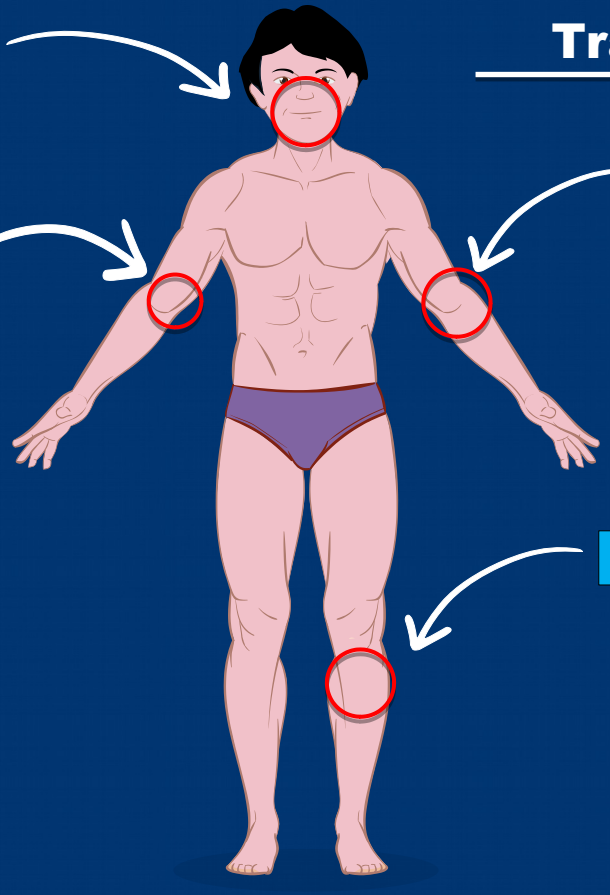
Trattamento sulla scena

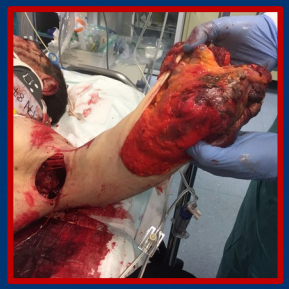
O_2 TP Reservoir 15 LT/min

Acido tranexamico 1 gr EV

Cristalloidi
250+250+250 ml >>> **STOP**



CAT + WOUND PACKING



ACCESSO IO

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CASE REPORT

Trasporto

Attivazione PTM + pre-allertamento sala ibrida (contatto telefonico con Trauma Leader)

SC01R	AVANZAT
MARIO ROSSI VIA XX XXXX N XX TEL XXXXXXXXXX	**Allertamento:** 11:22 AM
	Arrivo sul luogo: 11:35 AM
MOTOCICLISTA SBALZATO – Cosciente **NO**; Respira **SI**; **Emorragia**; Sesso M; Età 30 aa	**Partenza dal luogo:** 12:02 PM
	Arrivo in shock room: 12:09 PM

- Passaggio consegne (S.B.A.R.)
- FAST+ liquido libero in loggia spleno-renale
- EGA: Hb 6.4 mg Dl – pH 7.24 – Lat 8.1
- Conferma attivazione sala ibrida (CH gen. + CH vasc. + Ortop.)
- Emodinamica instabile
- Inizio infusione sangue con Level One®
- Trasferimento in S.O. **H 12:43**

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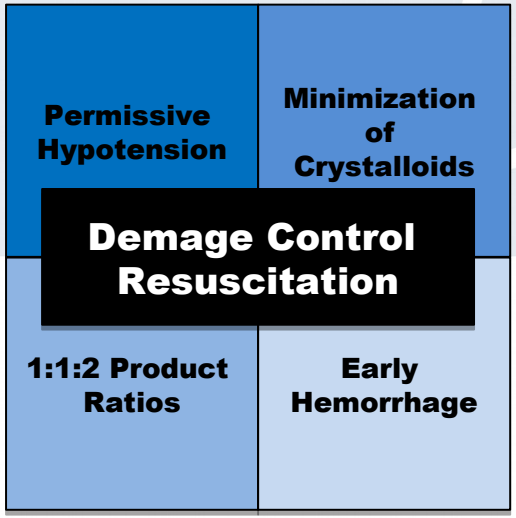

8.2 ATTIVAZIONE DELLA PROCEDURA DI PREALLERTAMENTO DELLA SALA IBRIDA

L'attivazione della procedura può avvenire da parte dell'equipaggio sanitario 118, direttamente sul territorio, da parte del Team di Emergenza del Pronto Soccorso oppure da parte di qualunque altro medico che, di fronte ad un paziente gravemente sanguinante, lo ritenga necessario. I criteri generali di attivazione, in qualunque contesto operativo, sono di fatto riconducibili a quelli descritti più sotto nell'ambito dell'attivazione dal territorio.

L'attivazione della Sala Ibrida dal territorio potrà avvenire sostanzialmente con gli stessi criteri di attivazione della procedura Trasfusioni Massive:

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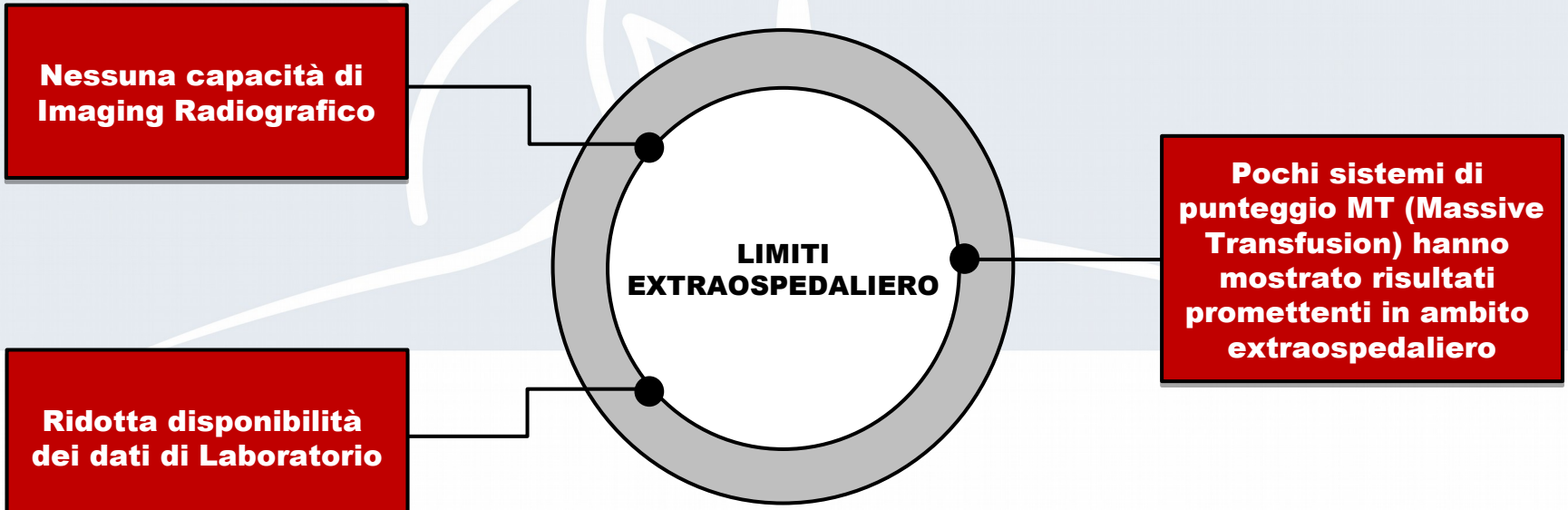
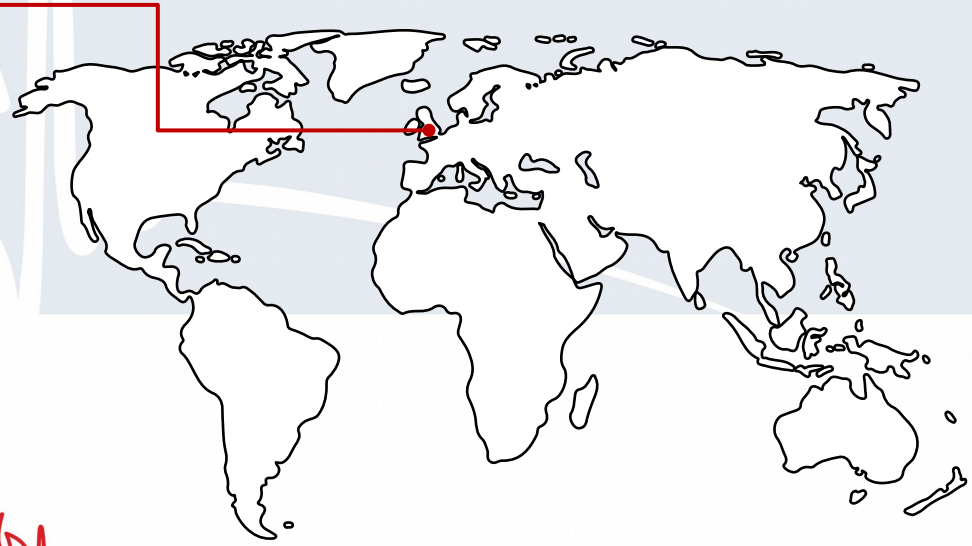

Nessuna capacità di Imaging Radiografico
Ridotta disponibilità dei dati di Laboratorio
LIMITI EXTRAOSPEDALIERO
Pochi sistemi di punteggio MT (Massive Transfusion) hanno mostrato risultati promettenti in ambito extraospedaliero

Expert Review of Hematology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ierr20

Predicting the need for massive transfusion in the prehospital setting

Thaddeus J Puzio , Kyle Kalkwarf & Bryan A Cotton



Pochi sistemi di punteggio MT (Massive Transfusion) hanno mostrato risultati promettenti in ambito extraospedaliero

L'emorragia massiva successiva a un trauma è una delle principali cause di morte che può essere prevenuta con un'emostasi tempestiva e un'adeguata rianimazione (Damage Control Resuscitation)

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TABLE 1. MTP activation categories

- Adult indications
  - Trauma
  - Surgical bleeding
    - Cardiac surgery (includes coronary artery bypass grafting and valve replacement)
    - Vascular surgery: ruptured abdominal aortic aneurysm
    - Vascular surgery: other bleeding
    - Transplant surgery (liver, heart, lung, intestine, etc.)
    - Head/neck/neurosurgical bleeding
    - Other surgical bleeding
  - GI bleeding
    - GI bleeding in decompensated cirrhotic
    - GI bleeding in noncirrhotic
  - Adult nonsurgical bleeding, not otherwise specified
  - OB bleeding (includes postpartum hemorrhage)
  - Procedure-related bleeding
    - ECMO-related bleeding
    - Procedural complication (includes interventional radiology- and endoscopy-related bleeding)
  - Other indications for MTP activations, not otherwise specified
- Pediatric indications
  - Trauma
  - Surgical bleeding
    - Cardiac surgery
    - Transplant surgery (liver, heart, lung, intestine, etc.)
    - Other surgery
  - Procedure-related bleeding
    - ECMO-related bleeding
    - Procedural complication (includes interventional radiology- and endoscopy-related bleeding)
  - Nonsurgical bleeding
    - Nonsurgical complications of neonatal patient (includes necrotizing enterocolitis, hypoxic–ischemic encephalopathy, disseminated intravascular coagulation, sepsis)
    - Nonsurgical complications of pediatric patient (includes GI bleeding)

The majority of MTP activation in both adults and pediatric patients was for nontrauma indications. Differences in

(Thomasson et al., 2019)

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Contents lists available at ScienceDirect

Injury

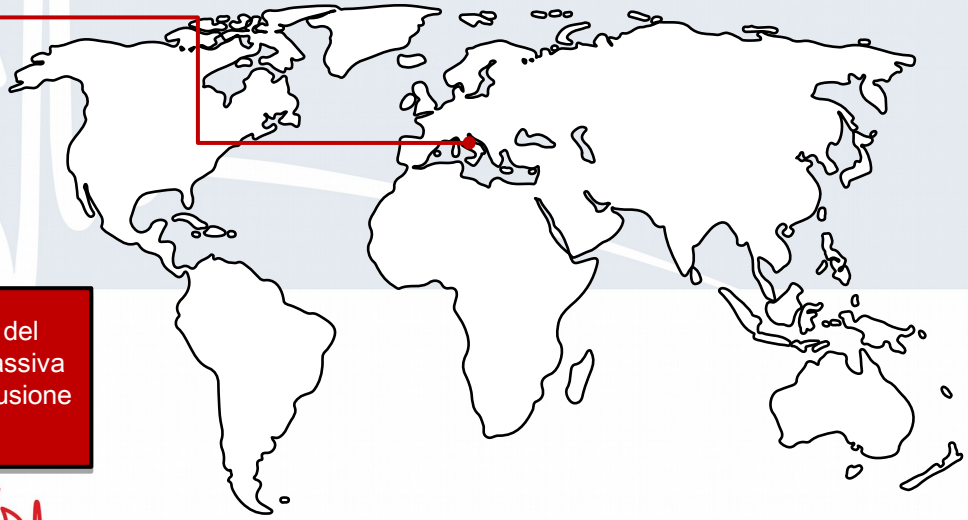
journal homepage: www.elsevier.com/locate/injury

Effectiveness of massive transfusion protocol activation in pre-hospital setting for major trauma

Marco Botteri[a,b,1], Simone Celi[a,1], Giovanna Perone[a], Enrica Prati[c], Paola Bera[a], Guido Francesco Villa[b], Claudio Mare[b], Giuseppe Maria Sechi[b], Alberto Zoli[b], Nazzareno Fagoni[a,b,d,1,*]

L'attivazione della MTP pre-ospedaliera è utile per identificare i pazienti che necessitano di una trasfusione di sangue urgente all'arrivo al Pronto Soccorso

L'attivazione dal territorio del Protocollo di Trasfusione Massiva (MTP) riduce i tempi di trasfusione e la mortalità.



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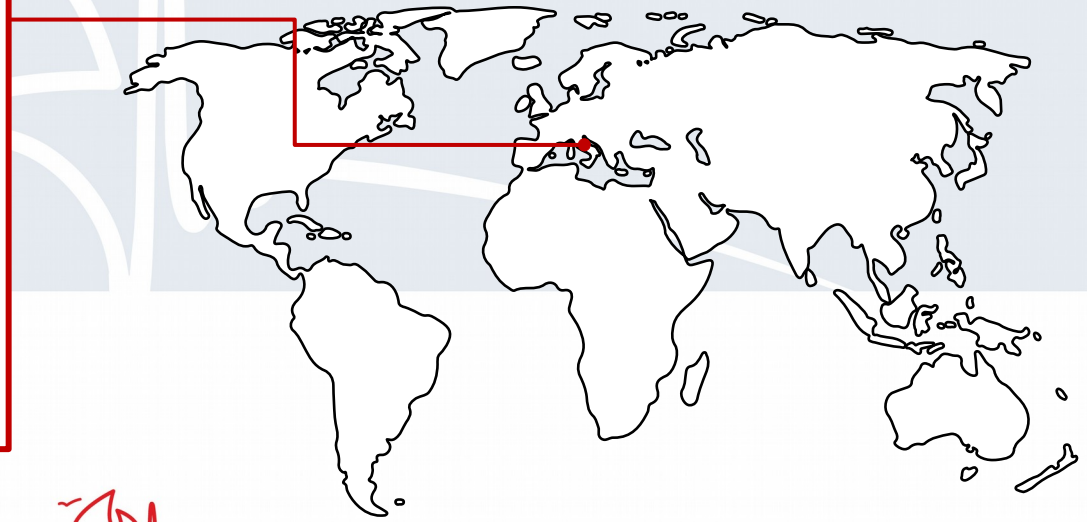
BRESCIA

Attivazione protocollo dal territorio se due di questi criteri sono soddisfatti:

1)Ipotensione, definita da una pressione arteriosa sistolica (SAP) **< 90 mmHg**, dopo una risposta fallita a un bolo di cristalloidi.
2)Frequenza cardiaca (FC) **> 110 bpm**.
3)Focolaio emorragico incontrollabile.
4)Ferita penetrante.
5)Shock ipovolemico di classe 3 o 4, secondo le linee guida ATLS.

(AAT Brescia Emergency Medical System - November 2012 to December 2019)



PROVINCIA DI MODENA: attivazione dal territorio PTM

Nel caso di Trauma Grave, con riferimento al trauma penetrante di torace, addome, collo, radice degli arti o al trauma chiuso con emorragia non comprimibile (es instabilità/asimmetria di bacino, amputazioni e subamputazioni degli arti), che si presenti in shock di Classe III o IV della classificazione ATLS (es. PAS **< 110 mmHg** in paziente ipoperfuso con trauma cranico, **< 90 mmHg** nel caso di trauma chiuso o **< 70 mmHg** nel trauma penetrante).

(Servizio Emergenza Territoriale 118 Modena – Emilia Romagna)

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Nel Regno Unito l'attivazione del MHP (Massive Haemorrhage Protocol) dovrebbe essere effettuato dal “Consultant” presente ove possibile, altrimenti dalla persona più anziana presente sulla scena.

Criteri clinici:

- Pressione arteriosa sistolica **< 90 mmHg** .
- Frequenza cardiaca **> 110 battiti al minuto** (bpm).
- Sospetta emorragia attiva o **Hb < 90 g/L**.
- Aumento della concentrazione di lattato

(NHS – South West London & Surrey – Trauma Network

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RESPECT THE
SHOCK INDEX
= HR / SBP

- NORMAL SI = <0.7
- SI >1.0
  Most specific predictor of **hyperlactemia** & **28-day mortality**
- A Pre-RSI SI > 0.8
  Predicts **post-intubation crash — resuscitate more first!**

SCORES

KEY POINTS

- Shock index outperformed the ABC score for correlation with MT for blunt injury and geriatrics.
- The majority of deaths from hemorrhage occurred within the first 3–6 hr; timely intervention is key to survival.
- Shock index empowers nurses to anticipate need for MT, improving early outcomes.

RESEARCH

NCPD 2.0 ANCC Contact Hours

Comparison of Shock Index With the Assessment of Blood Consumption Score for Association With Massive Transfusion During Hemorrhage Control for Trauma

Darcy L. Day, BSN, RN, CCRN, TCRN, CEN ■ Karen Ng, RN ■ Jonathan B. Huang, MD ■ Richard Severino, MS ■ Michael S. Hayashi, MD

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Contents lists available at ScienceDirect
The American Journal of Surgery
journal homepage: www.americanjournalofsurgery.com

The Extremity/Mechanism/Shock Index/GCS (EMS-G) score: A novel pre-hospital scoring system for early and appropriate MTP activation

Alexandra Kovar [a], Heather Carmichael [a], Robert C. McIntyre Jr. [a], Jacob Mago [b], Alicia Heelan Gladden [a], Erik D. Peltz [a], Franklin L. Wright [a,*]

IN-HOSPITAL MANAGEMENT

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(Aichholz et al., 2022)

Platelet Transfusion and Outcomes After Massive Transfusion Protocol Activation for Major Trauma: A Retrospective Cohort Study

Pudkrong K Aichholz [1], Sarah A Lee [2], Carly K Farr [3], Hamilton C Tsang [4], Monica S Vavilala [1 5], Lynn G Stansbury [1 5], John R Hess [4]

Background: Incorporation of massive transfusion protocols (MTPs) into acute major trauma care has reduced hemorrhagic mortality, but the threshold and timing of platelet transfusion in MTP are controversial. This study aimed to describe early (first 4 hours) platelet transfusion practice in a setting where platelet counts are available within 15 minutes and the effect of early platelet deployment on in-hospital mortality. Our hypothesis in this work was that platelet transfusion in resuscitation of severe trauma can be guided by rapid turnaround platelet counts without excess mortality.

Conclusions: In an advanced trauma care setting where platelet counts are available within 15 minutes, approximately half of massively transfused patients received early platelet transfusion. Early platelet transfusion guided by protocol-based clinical judgment and rapid-turnaround platelet counts was not associated with increased mortality.

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(Lee et al., 2022)

Whole Blood Versus Conventional Blood Component Massive Transfusion Protocol Therapy in Civilian Trauma Patients

Janet S Lee [1 2], Abid D Khan [1], Franklin L Wright [2], Robert C McIntyre Jr [2], Warren C Dorlac [3], Chris Cribari [3], Valerie Brockman [1], Stephanie A Vega [2], Jessica M Cofran [3], Thomas J Schroeppel [1]

Background: Military data demonstrating an improved survival rate with whole blood (WB) have led to a shift toward the use of WB in civilian trauma. The purpose of this study is to compare a low-titer group O WB (LTOWB) massive transfusion protocol (MTP) to conventional blood component therapy (BCT) MTP in civilian trauma patients.

between the groups. The LTOWB group had a lower in-hospital mortality rate compared to the BCT group (19.5% vs 30.0%, *P* = .035). There were no differences in total transfusion volumes at 4

Discussion: Resuscitating severely injured trauma patient with LTOWB is safe and may be associated with an improved survival.

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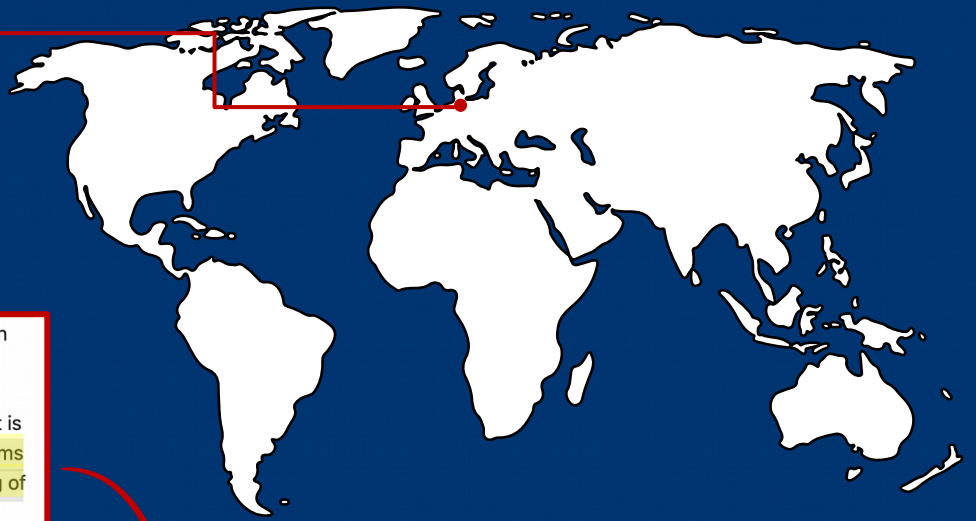
(Fleming et al., 2022)

Cryoprecipitate use during massive transfusion: A propensity score analysis

Andrew M Fleming [1], Kinjal S Shah [2], Saskya E Byerly [3], Louis J Magnotti [4], Peter E Fischer [5], Catherine P Seger [6], Andrew J Kerwin [7], Martin A Croce [8], Isaac W Howley [9]



Introduction: Cryoprecipitate is frequently administered as an adjunct to balanced transfusion in the setting of traumatic hemorrhage. However, civilian studies have not demonstrated a clear survival advantage, and prior observational studies noted selection bias when analyzing cryoprecipitate use. Additionally, due to the logistics involved in cryoprecipitate administration, it is inconsistently implemented alongside standardized massive transfusion protocols. This study aims to evaluate the effects of early cryoprecipitate administration on inpatient mortality in the setting of massive transfusion for exsanguinating trauma and to use propensity score analysis to minimize selection bias.

Conclusions: Patients receiving cryoprecipitate within 4 h of presentation were more severely injured at presentation and had increased inpatient mortality. Multivariable logistic regression and propensity score analysis failed to show that early administration of cryoprecipitate was associated with survival benefit for exsanguinating trauma patients. The prospect of definitively assessing the utility of cryoprecipitate in exsanguinating hemorrhage warrants prospective investigation.

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Dynamic use of fibrinogen under viscoelastic assessment results in reduced need for plasma and diminished overall transfusion requirements in severe trauma

Marta Barquero López [1], Javier Martínez Cabañero [2], Alejandro Muñoz Valencia [3], Clara Sáez Ibarra [2], Marta De la Rosa Estadella [2], Andrea Campos Serra [4], Aurora Gil Velázquez [5], Gemma Pujol Caballé [2], Salvador Navarro Soto [4], Juan Carlos Puyana [3]

(López et al., 2022)

Background: Despite advances in trauma management, half of trauma deaths occur secondary to bleeding. Currently, hemostatic resuscitation strategies consist of empirical transfusion of blood products in a predefined fixed-ratio (1:1:1) to both treat hemorrhagic shock and correct trauma-induced coagulopathy (TIC). At our hospital, the implementation of a resuscitation protocol guided by viscoelastic hemostatic assays (VHA) with ROTEMTM has resulted in a goal-directed approach. The objective of the study is twofold, first to analyze changes in transfusion practices overtime and second to identify the impact of these changes on coagulation parameters and clinical outcomes. We hypothesized that progressive VHA implementation results in a higher administration of fibrinogen concentrate (FC) and lower use of blood products transfusion, especially plasma.

Conclusion: Implementing a VHA-based algorithm resulted in a plasma-free strategy with higher use of FC and a significant reduction of packed red blood cells transfused. Additionally, we observed an improvement in outcomes without an increase in thrombotic complications.

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(Potestio al., 2022)

The Incidence, Degree, and Timing of Hypocalcemia From Massive Transfusion: A Retrospective Review

Christopher P Potestio [1], Noud Van Helmond [1], Nadder Azzam [1], Ludmil V Mitrev [2], Akhil Patel [2], Talia Ben-Jacob [2]

Background: Electrolyte administration during massive transfusion without readily available calcium laboratory values is likely ubiquitous but not well standardized. We aimed to quantify the incidence, degree, and timing of hypocalcemia during the first 24 hours after initiation of a massive transfusion with the institutional massive transfusion protocol (MTP). We hypothesized that hypocalcemia is prevalent during acute resuscitation (first six hours) despite efforts of the treatment team to replete calcium during active resuscitation.

Conclusions: Hypocalcemia from massive transfusion is common. The incidence of hypocalcemia in MTP has been reported to be 85-97%. Calcium supplementation that is not standardized in MTP may lead to underutilization during massive transfusion and to hypocalcemia in these patients.

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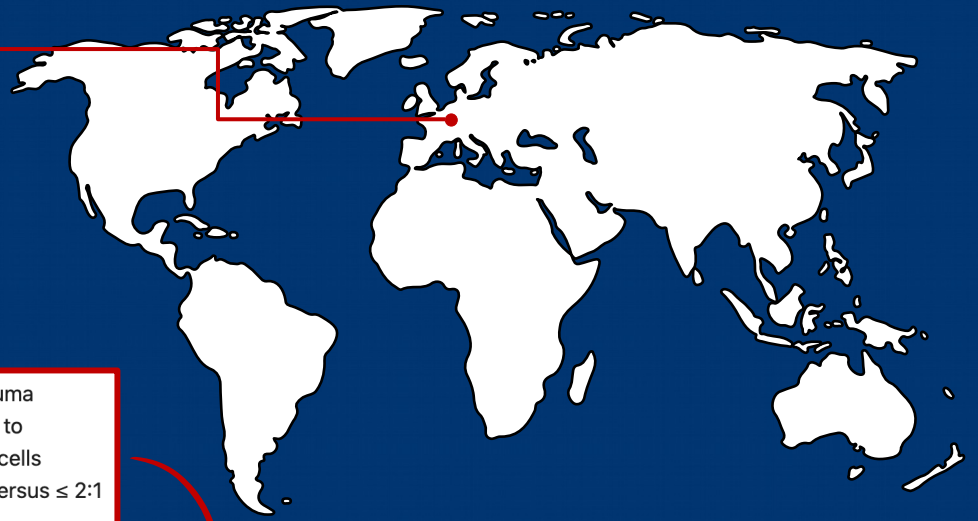
MASSIVE PEDIATRIC TRANSFUSION

Comparing unbalanced and balanced ratios of blood products in massive transfusion to pediatric trauma patients: effects on mortality and outcomes

Manmeet Sehdev [1] [2], Areg Grigorian [3], Catherine Kuza [4], Matthew Dolich [3], Boris Borazjani [3], Michael Lekawa [3], Jeffry Nahmias [3]



Background: The utilization and impact of various ratios of transfusions for pediatric trauma patients (PTPs) receiving a massive transfusion (MT) are unknown. Therefore, we sought to determine the risk for mortality in PTPs receiving an MT of ≥ 6 units of packed red blood cells (PRBC) within 24 h. We compared PRBC: plasma ratio of > 2:1 (Unbalanced Ratios, UR) versus ≤ 2:1 (Balanced Ratios, BR), hypothesizing decreased risk of mortality with BR.

Conclusion: In contrast to adult studies, this study demonstrated that MT ratios of > 2:1 and even ≥ 4:1 were associated with similar mortality compared to BR for PTPs. These results suggest pediatric MT resuscitation may not require strict BR as has been shown beneficial in adult trauma patients. Future prospective studies are needed to evaluate the optimal ratio for PTP MT resuscitation.

(Sehdev al., 2022)

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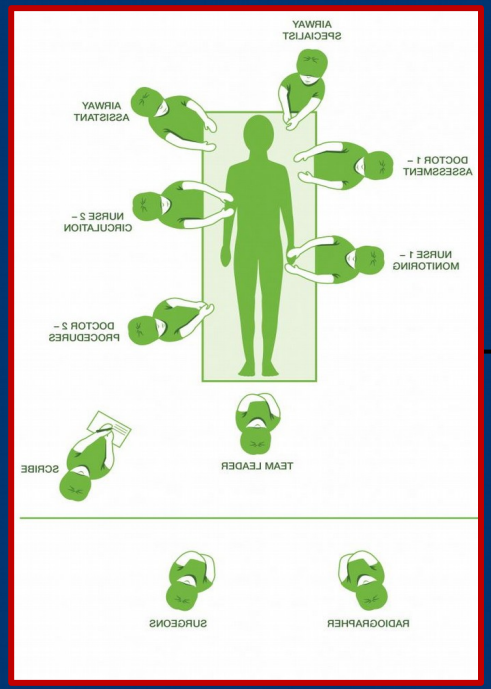
TAKE HOME MESSAGES

Attiva PTM già dal territorio
Stop the Bleed
Limita i Cristalloidi
Damage control strategy

Our dream… Pre-Hospital Blood Transfusion.

Meta-Analysis › Injury. 2019 May;50(5):1017-1027. doi: 10.1016/j.injury.2019.03.033. Epub 2019 Mar 21.

Is prehospital blood transfusion effective and safe in haemorrhagic trauma patients? A systematic review and meta-analysis



Damage Control Resuscitation

- **Limit Crystalloid/Colloid infusion**
- **Early ratio based blood component therapy**
- **Damage Control Surgery**
- **Permissive Hypotension**
- **Rapid rewarming**
- **Correction of hyperfibrinolysis, hypofibrinogenaemia, and other coagulopathies**

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STOP THE ED HEMORRAGE !!

I pronto soccorso si svuotano di medici e la loro crisi è diventata una polveriera: sociale, sanitaria e umana

di Carlo Bonini (coordinamento editoriale) , Michele Bocci , Arianna Di Cori , Rosario di Raimondo e Giusi Spica. Coordinamento multimediale di Laura Pertici. Produzione Gedi Visual

25 NOVEMBRE 2021 — 21 MINUTI DI LETTURA

Vignola, lo staff del pronto soccorso

Home > Modena > Cronaca > Vignola, ingerisce acce...

Vignola, ingerisce accendisigari. Bimbo smette di respirare, salvato

Il piccolo di un anno e mezzo aveva perso conoscenza

Nobody bleeding is negligible, every red blood cell counts!

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