Trauma Anaesthesia

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DAMAGE CONTROL SURGERY

DC RESUSCITATION

DAMAGE CONTROL ANAESTHESIA

Damage Control Anaesthesia

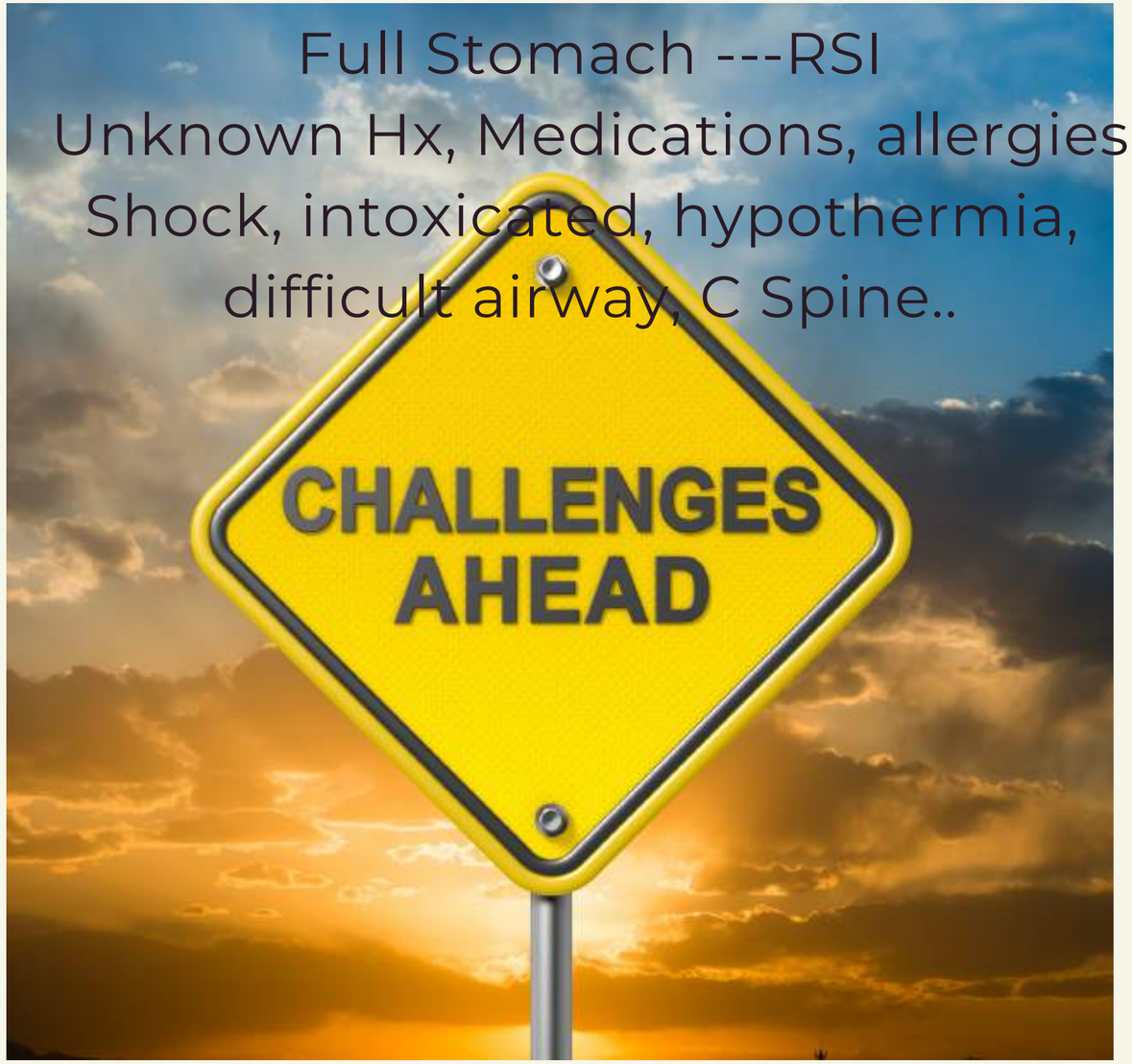
INDUCTION OF GA

DRUGS

AIRWAY

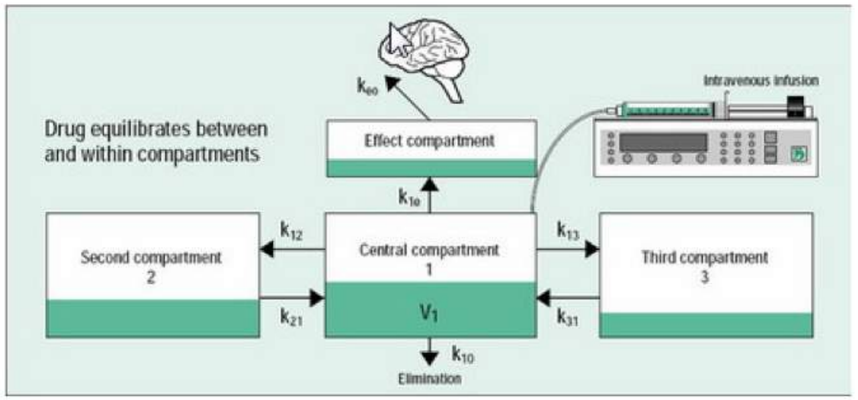
VASCULAR ACCESS

MONITORING



Drug Dosing

Euvolemic Patients



Shock patients

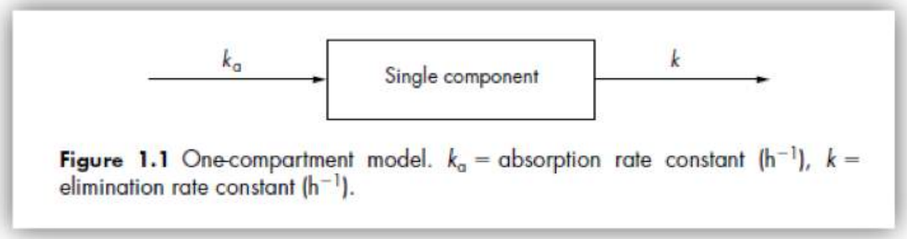


Figure 1.1 One-compartment model. k_a = absorption rate constant (h^{-1}), k = elimination rate constant (h^{-1}).

Protein-loss = increased free fraction of drug
Therefore reduce the dose

DRUGS


10 mg/ml
FRESENIUS PROPOFOL


10 ml
Hypnomidate
Piramal Critical


Sublimaze
10 ampoules 2 ml
JANSSEN-CILAG


S5 Ketamine Fresenius
Y/2.1/373 Injection
KETAMINE (Ketamine HCl)
Preservative: Benzethonium
Preserveermiddel: Benze
IM • slow IV use / IM
Store at or below 25 °C.
KEEP OUT OF REACH OF
Fresenius Kabi Manufacturing


S5 42267/0327
Accord Midazolam
15 mg/3 ml

Opiods

Reduced opioid requirements in haemorrhagic shock.

No evidence-based recommendations for choice of opioids in the hemodynamically compromised.

- Fentanyl Titration, best HD stability
- Morphine titration only when haemodynamics restored.

MUSCLE RELAXANTS

TRAUMA ANESTHESIOLOGY SOCIETY

Succinylcholine is still KING!

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"A drug capable of generating so many controversies, surviving so many crises, so uniquely short acting and rapid in onset, and inexpensive, will not just die."

-Dr. Chingmuh Lee, 1984

This was quoted over 3 decades ago and still holds true today. As you can see in **Figure 1**, it was preferred at our annual meeting this past year. With its low cost, fast onset, and reliable end point, Succinylcholine is still widely used for neuromuscular blockade, but why is it a particularly good drug in trauma? Below we present 5 more reasons why we feel Succinylcholine is superior to Rocuronium.

KEY POINTS

- Succinylcholine produces better intubation conditions than Rocuronium
- Succinylcholine improve your ability to mask ventilate
- Recovery from Succinylcholine is realistically as quick as Rocuronium followed by megadose Suggamadex

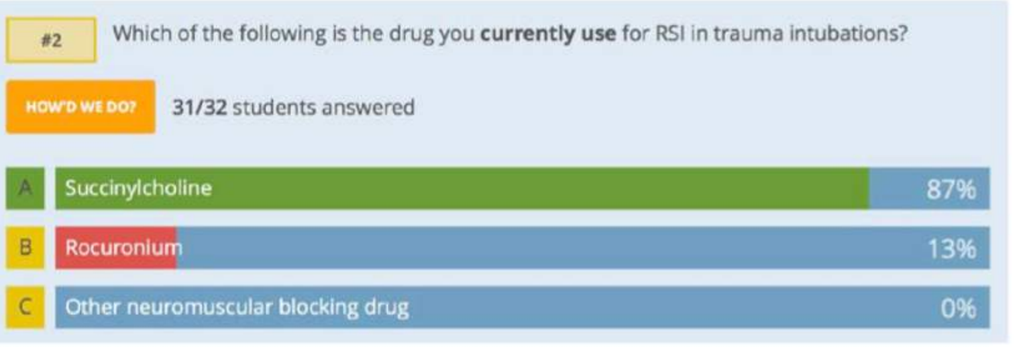
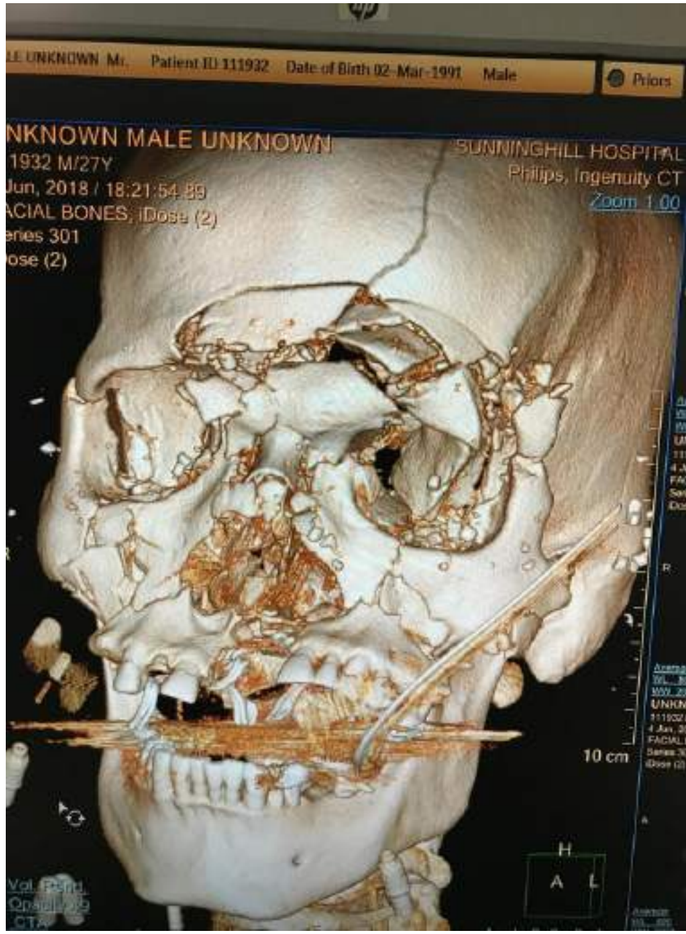


Fig 1. Response from the TAS annual meeting 2016 to what medication is given for RSIs



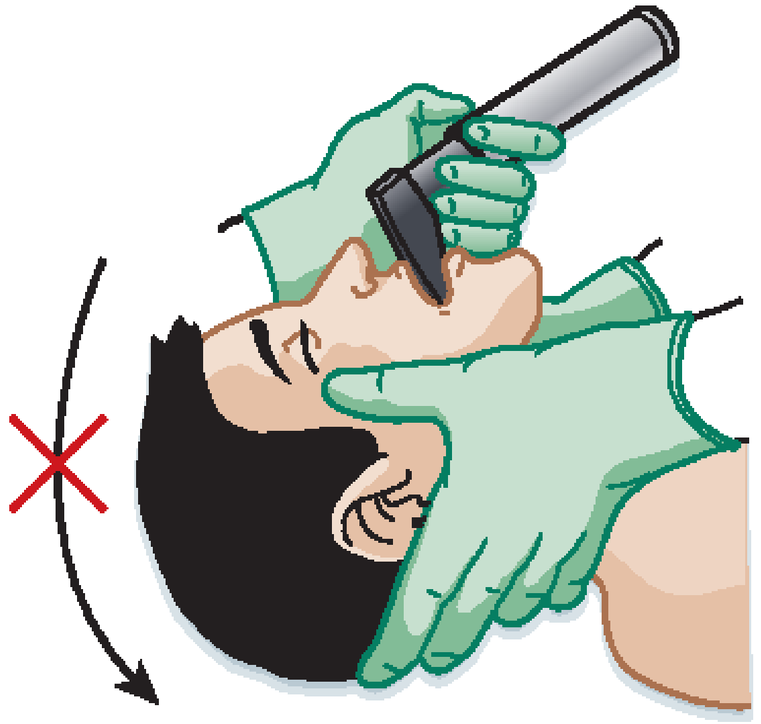
Airway Management

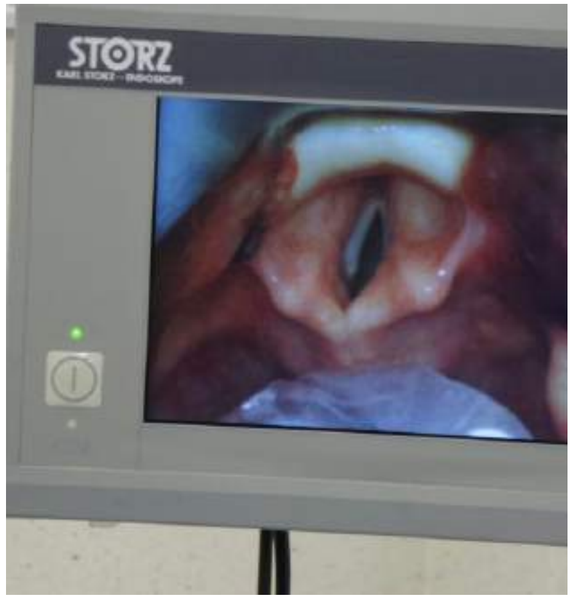
Airway Management

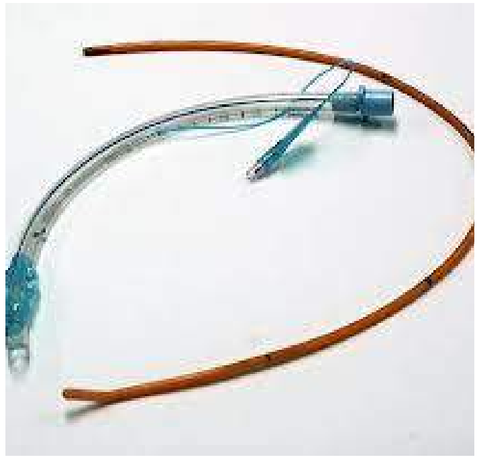
Apneic Oxygenation

C spine inmobilisation

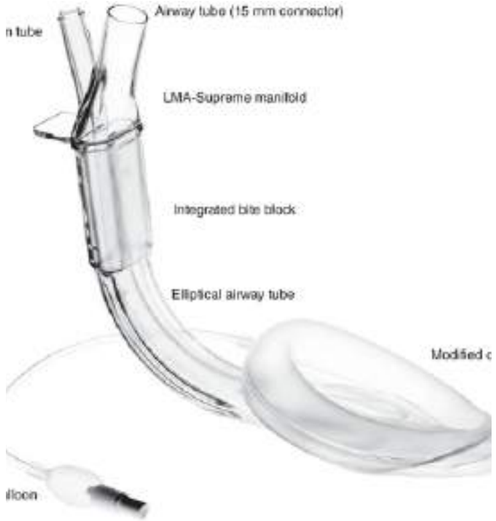
Manual Inline Stabilisation

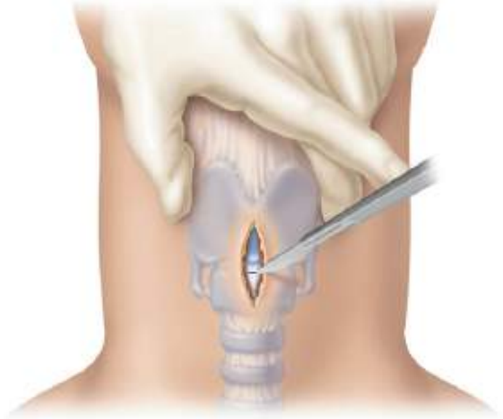






In our arsenal





Resuscitation end points of DCA

1. Blood Pressure
2. Base Deficit
3. ETCO2
4. Calcium
5. Lung and Kidney Protection
6. TEMPERATURE


Emergency
Trauma Theatre
2

Damage Control Resuscitation

DCR

01

Limiting fluid administration early use of blood product

02

Permissive hypotension

03

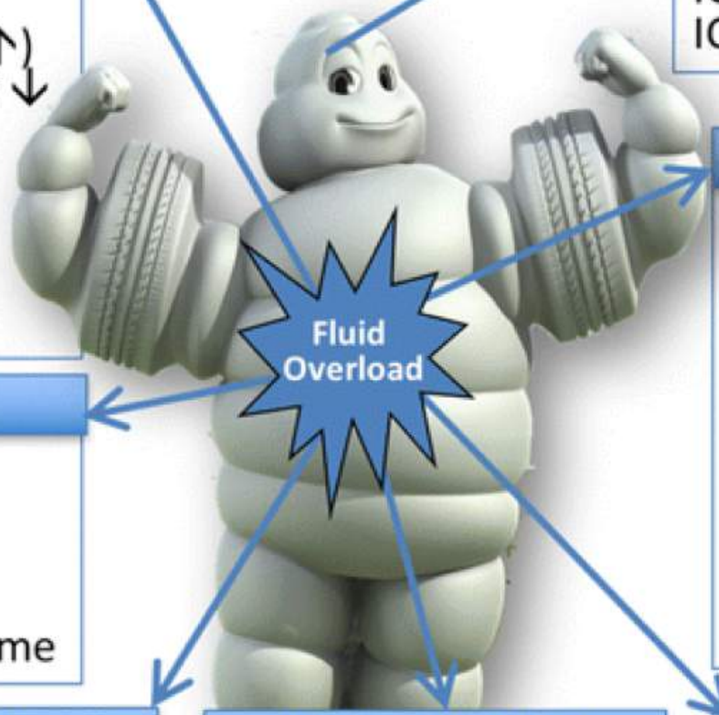
Targeting coagulopathy

04

Prevent or Treat Hypothermia

05

Early use of TXA



Respiratory

Pulmonary edema ↑
Pleural effusion ↑
Altered pulmonary and
chest wall elastance (cfr IAP ↑)
paO2 ↓ paCO2 ↑ PaO2/FiO2 ↓
Extra vascular lung water ↗
Lung volumes ↓ (cfr IAP ↑)
Prolonged ventilation ↑
Difficult weaning ↑
Work of breathing↑

Central nervous system

Cerebral edema, impaired
cognition, delirium
ICP↑ CPP↓ IOP↑
ICH, ICS, OCS

Cardiovascular

Myocardial edema ↑
Conduction disturbance
Impaired contractility
Diastolic dysfunction
CVP ↑ and PAOP ↑
Venous return ↓
SV ↓ and CO ↓
Myocardial depression
Pericardial effusion ↑
GEF ↓ GEDVI ↑ CARS ↑

Hepatic

Hepatic congestion ↑
Impaired synthetic function
Cholestatis ↑
Cytochrome P 450 activity ↓
Hepatic compartment syndrome

Gastrointestinal/visceral

Ascites formation ↑ Gut edema ↑
Malabsorption ↑ Ileus ↑
Bowel contractility ↓
IAP ↑ and APP (=MAP-IAP) ↓
Success enteral feeding ↓
Intestinal permeability ↑
Bacterial translocation ↑
Splanchnic microcirculatory flow ↓
ICG-PDR ↓, pHi ↓

Abdominal Wall

Tissue edema ↑
Poor wound
healing↑
Wound infection↑
Pressure ulcers ↑
Abdominal
compliance ↓

Renal

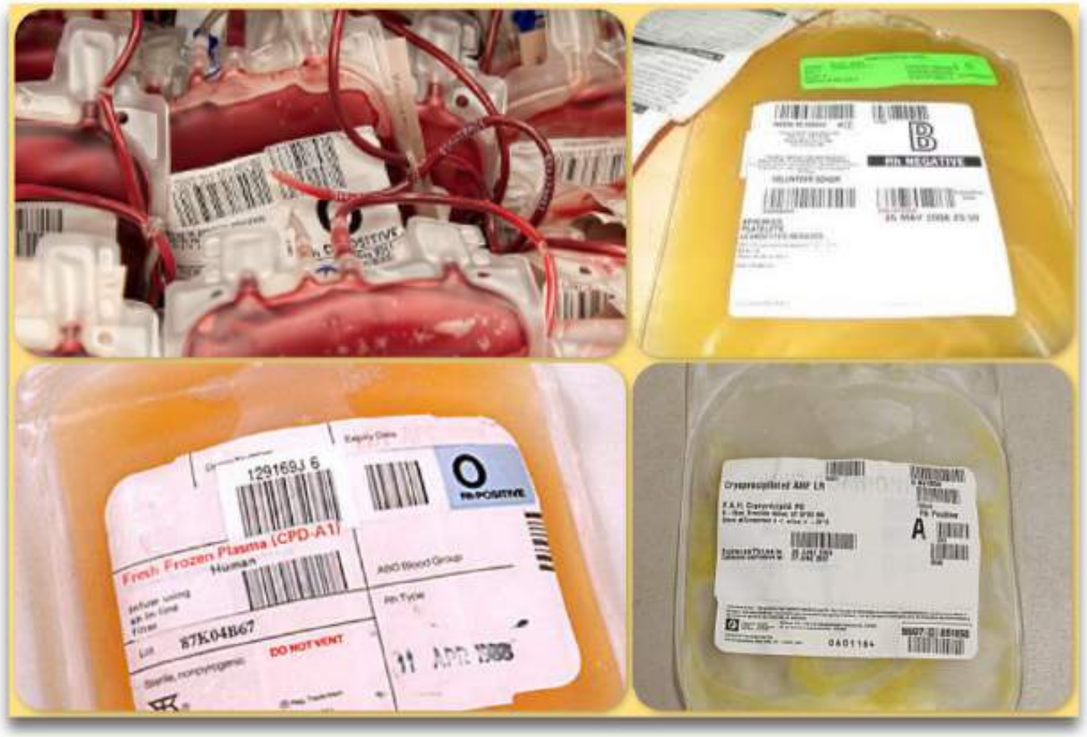
Renal interstitial edema
Renal venous pressure ↑
Renal blood flow ↓
Interstitial pressure ↑
Salt + water retention↑
Uremia ↑ GFR ↓ RVR ↑
Renal CS

Trauma Coagulopathy

Multifactorial:

- Acidosis
- Hypothermia
- Crystalloid / colloid
- Medications
- Genetic
- Acute coagulopathy of trauma

Haemostatic Resuscitation= No Crystalloids. No Colloids



What to do if No Blood or FFP inmediatelly available?

- Permissive hypotension
- Keep emergency Blood always available in your emergency department.
- Bioplasm
- Cell saver
- Auto- transfusion (Re-hang)

Trauma Society of South Africa Protocol

MASSIVE TRANSFUSION / MASSIVE HAEMORRHAGE PROTOCOL

Ongoing haemorrhagic shock despite resuscitation
Ongoing attempts to stop the Bleeding
Already 2 units of packed cells utilized
Anticipated massive transfusion requirements (>50%blood volume to be transfused in 3hrs/ >total volume transfusion in24hrs)
Coagulopathy in trauma

Trauma team leader
Phone blood bank and initiate MTP
Confirm blood cross-match and submission to blood bank
Ensure clotting profile workup
Stop MTP once no longer required

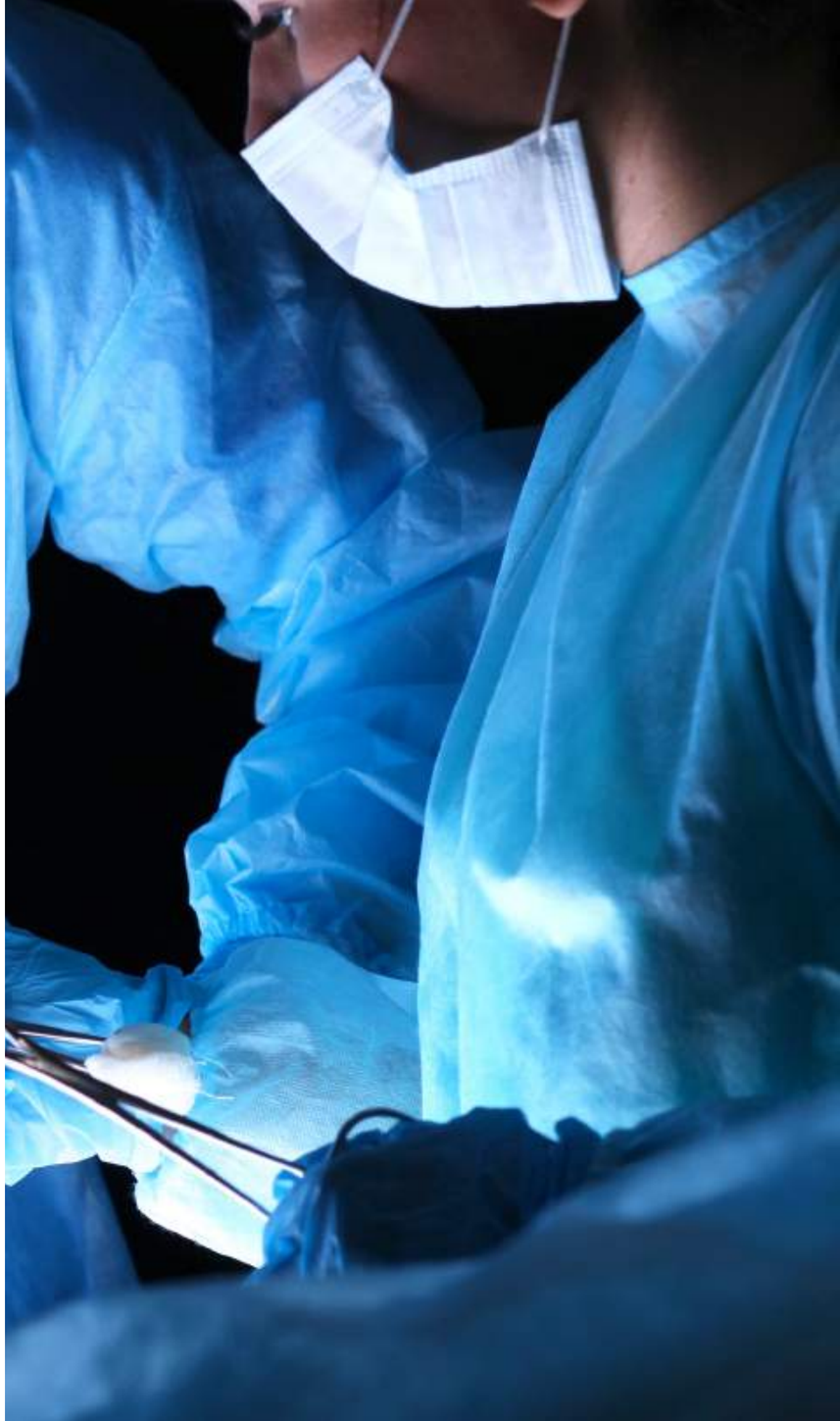
Blood bank
Prepare 6PRBC, 6FFP, and 1 pooled platelets per package issued & prepare for the next package
Initially O negative/positive blood until cross match done
Deliver to the appropriate site
Terminate only when informed by team leader

Initiate MTP with blood bank
Establish good IVI access
Transfuse 1:1:1 for packed cells: FFP: Platelets
Take blood for cross match, ABG, FBC, PI PTT, TEG if available (others U+E/CMP)
Control bleeding (Emergency Room + theatre as necessary)

Continue on clinical grounds if patient unstable with evidence of ongoing bleeding
Aim for Platelets>100 000 with active bleeding, INR<1.5, Hb >9g/dl, Fibrinogen >1 g/L
Modify requirements based on TEG (if available)
Continue observation and supportive care in ICU
Once stable modify according to clotting profile + Hb

Continue resuscitation at 1:1:1 as clinically indicated
Add 6-8units of Cryoprecipitate after 8units of packed cells
Replace Calcium if ionized value less than 1.0mmol/l
Consider Recombinant Factor VIII if available (50-90µg/kg)
Repeat ABG, FBC, PI PTT, TEG (if available)

NB Complications of Transfusions
Transfusion reactions
Inflammatory complications
Immuno-modulatory effects
Infection transmissions
Metabolic effects



The 1:1:1 Aproach

JAMA. 2015 Feb 3;313(5):471-82. doi: 10.1001/jama.2015.12.

Transfusion of plasma, platelets, and red blood cells in a 1:1:1 vs a 1:1:2 ratio and mortality in patients with severe trauma: the PROPPR randomized clinical trial.

Holcomb JB[1], Tilley BC[2], Baraniuk S[2], Fox EE[1], Wade CE[1], Podbielski JM[1], del Junco DJ[1], Brasel KJ[3], Bulger EM[4], Callcut RA[5], Cohen MJ[5], Cotton BA[1], Fabian TC[6], Inaba K[7], Kerby JD[8], Muskat P[9], O'Keeffe T[10], Rizoli S[11], Robinson BR[12], Scalea TM[13], Schreiber MA[14], Stein DM[13], Weinberg JA[6], Callum JL[15], Hess JR[16], Matijevic N[1], Miller CN[17], Pittet JF[18], Hoyt DB[19], Pearson GD[20], Leroux B[21], van Belle G[22]; PROPPR Study Group.

⊕ Collaborators (147)

⊕ Author information

Abstract

IMPORTANCE: Severely injured patients experiencing hemorrhagic shock often require massive transfusion. Earlier transfusion with higher blood product ratios (plasma, platelets, and red blood cells), defined as damage control resuscitation, has been associated with improved outcomes; however, there have been no large multicenter clinical trials.

OBJECTIVE: To determine the effectiveness and safety of transfusing patients with severe trauma and major bleeding using plasma, platelets, and red blood cells in a 1:1:1 ratio compared with a 1:1:2 ratio.

DESIGN, SETTING, AND PARTICIPANTS: Pragmatic, phase 3, multisite, randomized clinical trial of 680 severely injured patients who arrived at 1 of 12 level I trauma centers in North America directly from the scene and were predicted to require massive transfusion between August 2012 and December 2013.

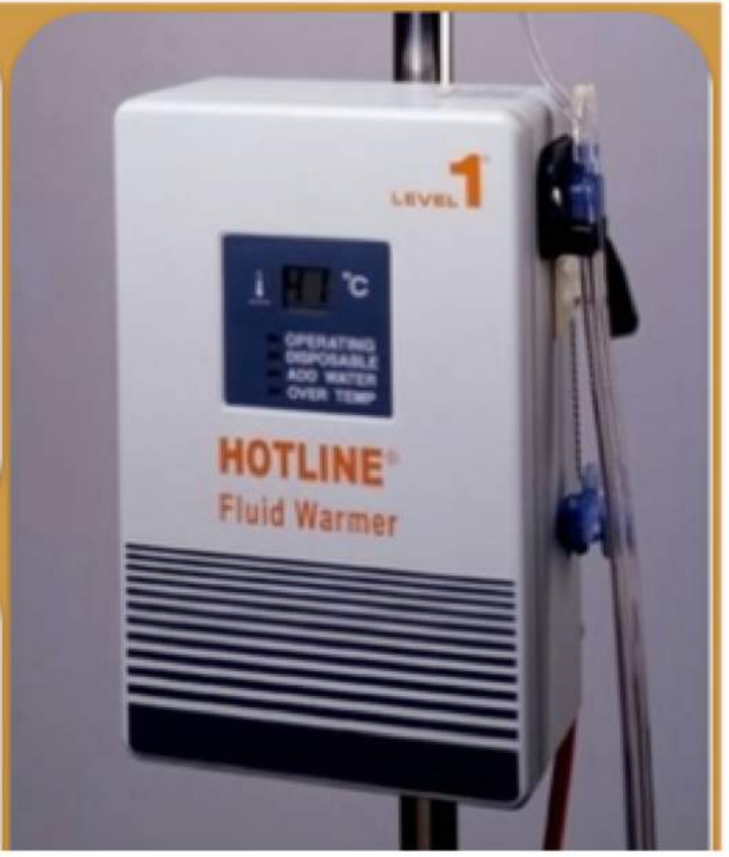
INTERVENTIONS: Blood product ratios of 1:1:1 (338 patients) vs 1:1:2 (342 patients) during active resuscitation in addition to all local standard-of-care interventions (uncontrolled).

MAIN OUTCOMES AND MEASURES: Primary outcomes were 24-hour and 30-day all-cause mortality. Prespecified ancillary outcomes included time to hemostasis, blood product volumes transfused, complications, incidence of surgical procedures, and functional status.

RESULTS: No significant differences were detected in mortality at 24 hours (12.7% in 1:1:1 group vs 17.0% in 1:1:2 group; difference, -4.2% [95% CI, -9.6% to 1.1%]; P = .12) or at 30 days (22.4% vs 26.1%, respectively; difference, -3.7% [95% CI, -10.2% to 2.7%]; P = .26).

Hypothermia

Keep OR temperature > 26°C
Warm all irrigation and IV fluids



Tranexamic Acid

Tranexamic acid improves survival when **administered early** in trauma with known or suspected significant haemorrhage