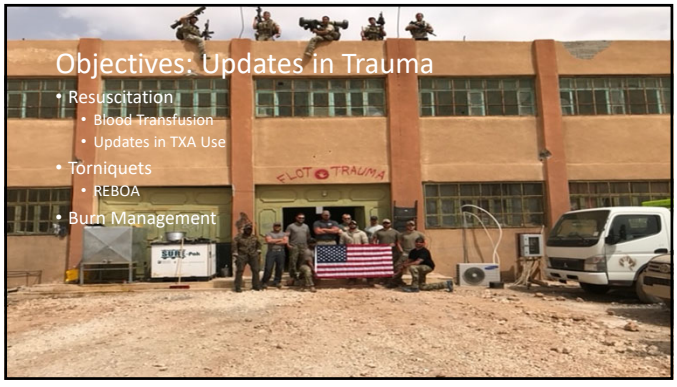
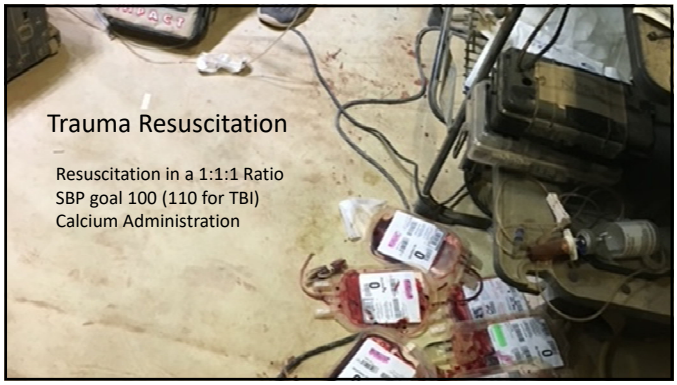
Disclaimer

No conflicts of Interest

The opinions expressed do not represent official positions from the Department of Defense



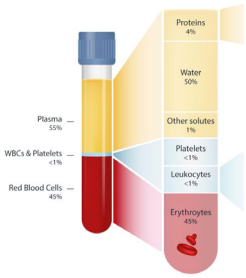


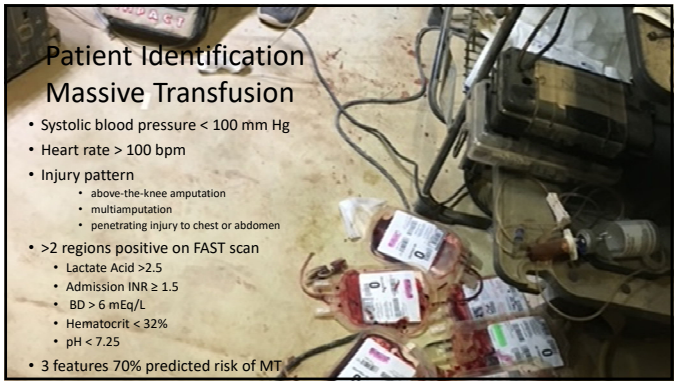
Loss More than RBCs

- What is Blood?
- 1 unit of PRBCs
- 1 unit of FFP
- 1 unit of platelets

- Low Titer Whole Blood
  - 0+ Blood
    - Low Amounts of Anti A/B Antibodies
  - Contains about 400-500cc

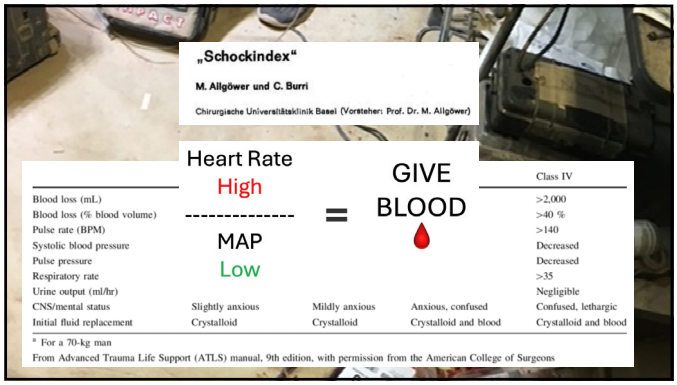
- Transfuse to Hemodynamic Markers
- No Lactate Ringers or Normal Saline
  - 1.5L is associated with higher mortality





Patient Identification Massive Transfusion

- Systolic blood pressure < 100 mm Hg
- Heart rate > 100 bpm
- Injury pattern
  - above-the-knee amputation
  - multiamputation
  - penetrating injury to chest or abdomen
- >2 regions positive on FAST scan
  - Lactate Acid >2.5
  - Admission INR ≥ 1.5
  - BD > 6 mEq/L
  - Hematocrit < 32%
  - pH < 7.25
- 3 features 70% predicted risk of MT



„Schockindex"

M. Allgöwer und C. Burri

Chirurgische Universitätsklinik Basel (Vorsteher: Prof. Dr. M. Allgöwer)

Heart Rate
High

MAP
Low
=
GIVE BLOOD

				Class IV
Blood loss (mL)				>2,000
Blood loss (% blood volume)				>40 %
Pulse rate (BPM)				>140
Systolic blood pressure				Decreased
Pulse pressure				Decreased
Respiratory rate				>35
Urine output (ml/hr)				Negligible
CNS/mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic
Initial fluid replacement	Crystalloid	Crystalloid	Crystalloid and blood	Crystalloid and blood

[a] For a 70-kg man

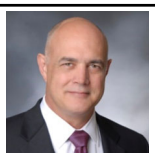
From Advanced Trauma Life Support (ATLS) manual, 9th edition, with permission from the American College of Surgeons

Blood Early and Often

Death on the battlefield (2001–2011): Implications for the future of combat casualty care

Brian J. Eastridge, MD, Robert L. Mabry, MD, Peter Seguin, MD, Joyce Cantrell, MD, Terrill Tops, MD,

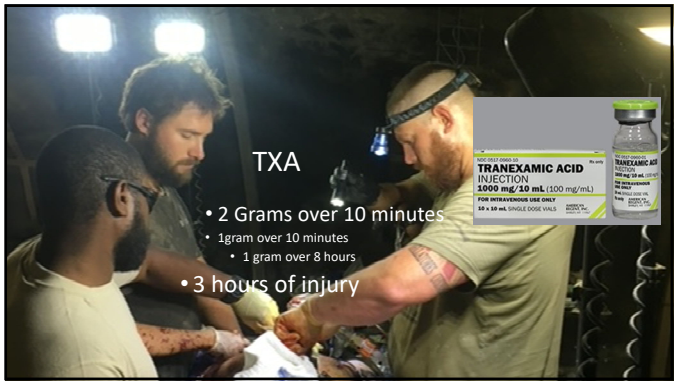
- ~1000 Survivable
  - 90% from uncontrolled (treatable) Hemorrhage



Association of Prehospital Blood Product Transfusion During Medical Evacuation of Combat Casualties in Afghanistan With Acute and 30-Day Survival

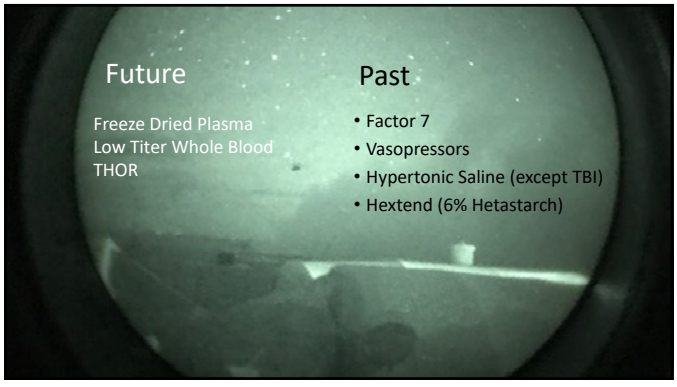
Stacy A Shackelford [1], Deborah J Del Junco [1] [2], Nicole Powell-Dunford [3],

- Blood ASAP after trauma injury (prehospital)
  - Improved 24Hr and 30 day mortality



Calcium

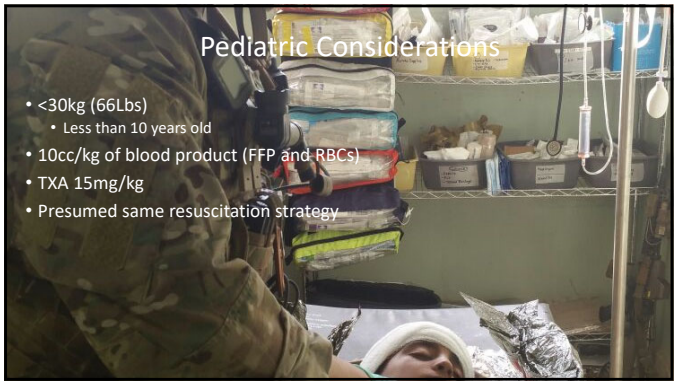
- Reduces in Massive Hemorrhage
- Addition of Citrate from blood collection
- 1 Gram with first unit
- 1 Gram with every 4 units
- Ionized Calcium 1.2mmol/L



Massive Transfusion Check List

- Initiate MT procedure if patient has received 4u RBC/4u FFP
- Massive Transfusion Pack:
  - 6u RBC
  - 6u FFP
  - 1u platelets
  - 5-unit bags of cryo.
- Give 1g calcium after first blood product
- 1g after every four units of blood product.

Pediatric Considerations



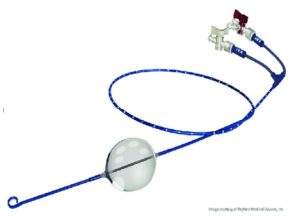
- <30kg (66Lbs)
  - Less than 10 years old
- 10cc/kg of blood product (FFP and RBCs)
- TXA 15mg/kg
- Presumed same resuscitation strategy

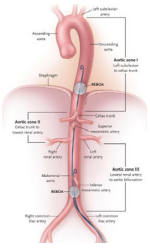
Torniquets

- Full Circle
- Good WWII
- Bad Vietnam
- Good Again in OIF

REBOA

- Resuscitative Endovascular Balloon Occlusion of the aorta
- Non compressible Torso Hemorrhage
- Placenta Emergency
- Ruptured Intraabdominal Aneurysm

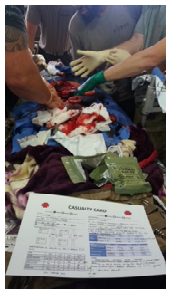




- 30 mins for Zone 1
- 60 minutes for Zone 3

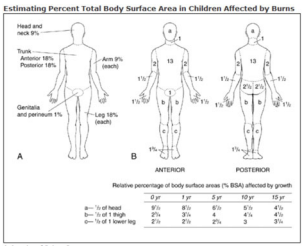
The UK-REBOA Randomized Clinical Trial

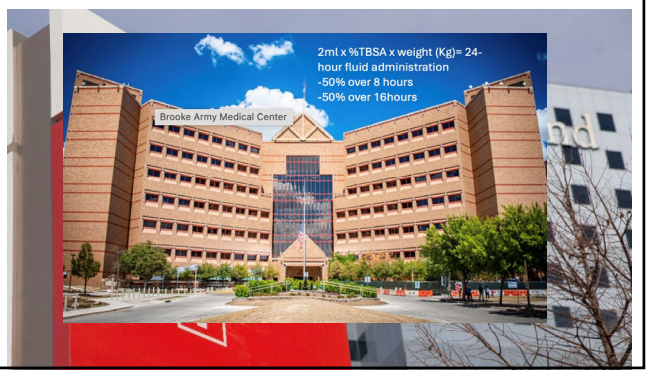
- 90 Patients
- 45 in the treatment group
  - 50:50 zone 1
- Mostly Blunt
- 23% received CPR



Burn Management

- Estimation
  - Rule of 9's
    - Palm of hand 1%
  - Lundon-Browder Chart
  - 2nd Degree
    - moist and sensate, blister, and blanch
  - 3rd Degree
    - leathery, dry, non-blanching, are **insensate**





Rule of 10s

- 10 mL/hr x %TBSA)
  - IE 50% burn=500cc/hr
- Lactated Ringer's, PlasmaLyte A
  - Avoid Normal Saline
- Do NOT BOLUS FLUID
- 80 kg, add 100 mL/hr to IV fluid rate for ever 10 kg
  - 100kg 800cc/hr
- Urine output of 30-50mL/hr
  - Decrease or increase the fluid rate by approximately 20-25% per hour

Protein and Pressors

- Start albumin if
  - 25L in 24 hours (100kg) (1L/HR)
  - 1500cc/hr
- Hypotension
  - 1st Vasopressin 0.04 Units/min
    - do not titrate
  - 2nd Norepinephrine

5% Albumin Infusion (ml/hr)	30-49%TBSA	50-69% TBSA	70-100% TBSA
<70 kg	30	70	110
70-90 kg	40	80	140
>90 kg	50	90	160

Inhalation Injury

- 8.0 Endotracheal tube (Cotton umbilical, no tube holder)
  - Nebulized Heparin 5000 units every 4 hours;
    - mix with albuterol
- Carbon Monoxide
  - 100% Oxygen, +/- Hyperbaric 02
- Cyanide
  - Lactic Acidosis (>8)
  - Rx: hydroxocobalamin (B-12)
- Hydrogen fluoride (HF)
  - byproduct of fire suppression system
  - Hypocalcemia
  - Nebulized Calcium

Skin Management

- Face: Bacitracin
- Eye: Bacitracin Ophthalmic
- Body: Antimicrobial Foam Dressing with Silver
  - Mepilex® AG (last up to 7 days)
  - Aquacel® AG
  - Silver Sulfadiazine Cream