New Standards For Massive Transfusion

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Overview

- Breaking traditions
- Stop the Bleeding
- Massive Transfusion Protocols
- Switching Gears
- Future Directions

MT: Traditional Definition

≥ 10 units of blood
transfused within 24 hrs
(loss of ≥ one blood volume)
Traditional Approach
Note bleeding
Start IV fluids
Monitor and Make preparations
Treat any signs of hypovolemia
- Hypotension
- Tachycardia
- EBL

Traditional Treatment
Replace lost blood volume with:
1. Crystalloid or Colloid
2. RBCs, X-matched if possible
3. If abnormal bleeding AND:
   - coag tests >1.5 normal, give FFP
   - fibrinogen < 100 mg/dL, give cryo
   - platelet < 75-100K, give platelets

The MT “Triad of Death”

**Greater Civilian Survival Associated With Higher FFP:PRBC ratio**

- NPSA ≥ 1:1
- "Glue grant" ≥ 1:1.5
- Denver & LA ≥ 1:1.5
- Nashville ≥ 1:1.5

- Cotton et al. J Trauma 2008; 65:261
- Kashuk et al. J Trauma 2008; 65:261
- Sperry et al. J Trauma 2008; 65:986

**Adopting New Protocols**

**Damage Control Resuscitation: Directly Addressing the Early Coagulopathy of Trauma**

**US Military protocol changes**

- "Primary fluid": FFP & PRBCs (1:1 or 1:2 ratio)
- Also: SBP ≤ 90, limit crystalloid, THAM, use of rFVIIa, whole blood

- Pre-defined "MT Packs":
  - 6 units FFP
  - 6 units PRBC
  - "6-pack" of platelets
  - "10 units" of cryoprecipitate (Ratio of 1:1:1:1.7)

"the lack of intraoperative coagulopathic bleeding has been remarkable"

"arrive in the ICU warm ...non-acidotic, ...normal INR and minimal edema.

"appear to be easily ventilated and more quickly extubated"

Impact of Massive Transfusion Protocols

- Multi-organ failure
- Infection
- Abdominal compartment syndrome
- Time on ventilator
- Mortality

MTPs Decrease Mortality

- Timing of blood products
- Early coagulopathy
- Crystalloid usage
- Independent of F:P ratio
- Reported experiences:
  - Emory: 36% -> 17%
  - Stanford: 45% -> 19%

Treat It Like It’s a Trauma

- Intra-abdominal bleeding (48%)
- GI Bleeding (21-43%)
- Vascular, e.g. AAA (14-33%)
- Other: cardiac, liver, obstetrics
- 1% of patients, 10% of products


Obstetric hemorrhage

EDITORIAL

Control of massive hemorrhage
Lessons from Iraq reach the US labor and delivery suite
Translation management of massive hemorrhage has been weighted by military trauma care in war

Obstetric hemorrhage protocols (including California Maternal Guidelines (cmqcc.org)) are being established worldwide
Recommend FFP:PRBC 1:1 or 1:2

Ruptured Aortic Aneurysm

- Univ. of Copenhagen, 150 pts
- Protocol: 2 u Plts + 1:1 F:P ratio
- Decreased coagulopathy
- Decreased ICU and hospital stay
- Decreased 30-day Mortality: 56% to 33%

Transfusion 2007;47:593-8
Know When to Shift Gears

- No improvement in mortality in non-massive transfusion (Inaba et al., J Am Coll Surg 2010)
- 1:1 may not be better than 1:2 or 3:4 (Kashuk et al., J Trauma 2008, Davenport et al., J Trauma 2011)
- Increases ARDS, MODS, PNA, sepsis
- Survival bias

Summary

- Skip tradition if your patient has massive hemorrhage
- Adopt new practice standards
- Know your MTP
- Shift gears when bleeding stops
- More changes to come

Questions?
SFGH's Massive Transfusion Protocol (MTP)

Step 1: Fluid Resuscitation

Step 2: 2-4 units emergency RBC Type O pax for male patients, O neg for females of any age

Step 3: MT Pack (Type-Specific)
- CRI: 4 units FFP, 6 units RBC
- All other sites: 4 FFP, 4 RBC

Step 4: MT Pack (Type-Specific)
- In addition to MT, in addition to MT: 1 unit PLT (if PLT < 100k)
- 2 pools CRYO (IF FIBR < 100)

Repeat Step 4 until bleeding controlled

*MT Packs are automatically released upon MT activation. PLT, CPKO must be ordered first.