



JOHNS HOPKINS
M E D I C I N E

Massive Transfusion & the 6 W's

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Financial Conflicts of Interest

None



Learning Objectives

- Define massive transfusion
- Identify patient criteria most appropriate for activating a massive transfusion protocol (MTP)
- Describe reasons patient outcomes are improved when an MTP is available

The 6 W's

- Who
- What
- When
- Where
- How
- Why

Massive Transfusion



- >10u PRBC in <24h
- typically rapid
- less testing/triggers

Are we there yet?

- Start when bleeding identified?
- Start at a Hgb of y ?
- Start after x units?

Choosing the Patient

- scoring: ABC
 - Assessment of Blood Consumption
 - SBP < 90
 - HR > 120
 - penentrance
 - +FAST
 - x / 36% / 45% / 100% need for MTP
- probably no better than clinician judgment

Massive 2010, Elmer 2013

So, just RBCs, then...

- maybe some plasma...
- and a few platelets...
- whole blood?
 - unavailability?
 - Wiggers' prep

What's a unit?

- PRBC:
 - ~200cc RBC
 - + plasma, nutrients, & preservatives (incl citrate)
- FFP
 - ~250cc plasma
 - all coag factors, decr V & VIII if thawed
- Platelets
 - ~300cc platelets
 - from 4-6 units whole blood or one apheresis

Gernsheimer 2012

What's the ratio?

- PRBC:FFP
 - 1:1
 - better than 2:1 (probably)
 - *aim* for 1:1
- platelets?
 - 1:1:1 (4:4:1)
 - maybe not...
 - ~2:2:1
- survivor bias

Mercer 2013, Young 2011, Holcomb 2015



Protocols Matter

- specific protocols highly variable
 - initiation
 - testing
 - ratios
- *Presence* of a protocol improves outcomes.
 - 80% not perfectly followed
 - just a better center?

Young 2011, Inaba 2012, Massive 2010, Blood 2010, Mercer 2013

But what *else*?

- K^+
- Ca^{++}
- H^+
- T
- coags

Mercer 2013

Cryo

- Factors VIII & XIII
- vWF
- fibrinogen & fibronectin
- 1u = 350mg fib'gen; 1 dose = 6u \approx 45mg/dL incr

Gernsheimer 2012, Young 2011

Factor VIIa

- randomized, controlled study
 - reduction in transfusion requirement
 - no reduction in M&M
- later large study found incr MI risk
- variably recommended

Elmer 2013

TXA

- inhibits fibrinolysis
- *may* reduce mortality
- controversial study; no decrease in transfusion

Inaba 2012, Elmer 2013

How's it going?

- labs
- TEG or ROTEM
- having the discussion
- Most important? Bleeding controlled.

Mercer 2013, Massive 2010

In the Pipe

- PCC & other concentrates
- monitoring TEG or ROTEM
- Hgb or RBC substitutes

Mercer 2011, Elmer 2013, Krausz 2006

Still more to come...

- TRALI
- infection
- ischemia & reperfusion
- everything else...

Elmer 2013, Krausz 2006

Let me sum up.

- Who
- What
- When
- Where
- How
- Why

Thanks.



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