

Going into 2013

MASSIVE TRANSFUSION PROTOCOL

Introduction

- Accidental injury – leading cause of death ages 1-44 years in U.S.
 - CNS trauma
 - hemorrhage
- U.S. military – 15-20% of traumatic deaths potentially preventable
 - Of these, 66-80% from hemorrhage

CDC Website, 2013

Spinella and Holcomb, 2009

Massive transfusion

- Replacement of patient's blood volume
- ≥ 10 units in 24 hours
- ≥ 5 units in 3-4 hours
- Bleeding at a rate > 150 ml/hour

ABC score-assessment of blood consumption

- Criteria
 - Penetrating mechanism of injury – 1 point
 - Positive focused assessment sonography for trauma (FAST) – 1 point
 - Arrival systolic [Blood Pressure](#) of 90 mm Hg or less – 1 point
 - Arrival [Heart Rate](#) $>$ or $= 120$ bpm – 1 point
- Interpretation
 - Score 0-1: Massive transfusion unlikely
 - Score 3: Massive transfusion likely
 - Score 4: Massive transfusion will be needed
- References
 - [Nunez 2009; J Trauma 66\(2\): 346-52](#) (75% sensitivity and 86% specificity)

Transfusion of at least 1 unit prior to increase sensitivity



What is the optimal management?

There may be benefit in survival when hemostatic resuscitation is managed with higher ratios of plasma to RBCs and platelets to RBCs than was recommended in the past

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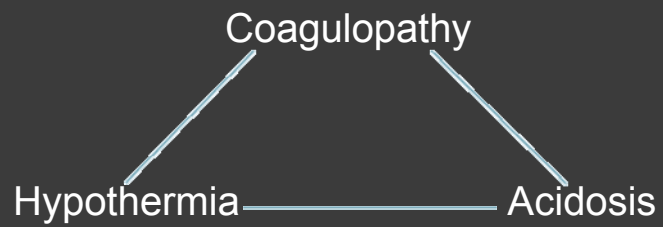
14 Retrospective studies Johansson

2010

- Total 4594 patients
 - Six: plasma-to-RBC ratio
 - Five: plasma and platelet-to-RBC ratios
 - Two: protocols with plasma and platelets early
 - One: used TEG to guide treatment
- Conclusion: high plasma and platelet-to-RBC ratios seem to improve survival

Survivorship bias

Trauma lethal triad



Approach – hemostatic resuscitation

- ◉ The rational use of blood products
 - Contribution of each component
- ◉ Definition of rational use
- ◉ Identifying what is possible



Component Therapy

Hematocrit: 29-30%

Coagulation Factor activity:
60-62%

Platelet count: 80,000-
85,000

Components and Ratios

RBC:Plasma

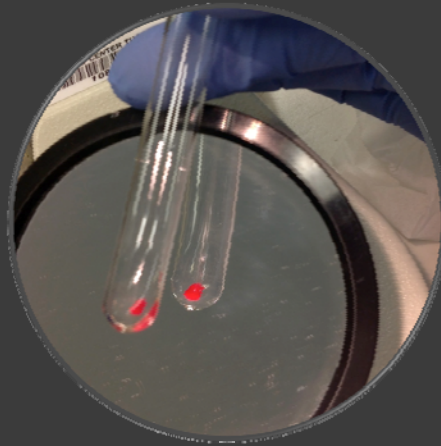
- 1:3
- 1:2
- 1:1

Platelets

- 1:1 = 6 units RBC:1 unit apheresis platelets
- 1:2 = 12 units RBC: 1 units apheresis platelets
- Platelet at start or in the middle of 12 units

Blood Bank

- ⦿ Emergency Release
- ⦿ Order for Massive Transfusion Protocol
- ⦿ No type
 - Blood type O RBCs
 - AB plasma
 - TRALI
- ⦿ Type and Screen to the Blood Bank ASAP
 - Inventory considerations



Laboratory Testing

Results

Laboratory testing

- Hemoglobin/Hematocrit
- Protime/INR
- activated Partial Thromboplastin Time
- Platelet Count
- Fibrinogen
- Ionized calcium
 - Magnesium
- Arterial blood gases

Thromboelastography (TEG)

- 1948
- Diagnosing coagulopathy
- Guiding transfusion
 - Associated with decreased blood usage
 - Associated with improved outcomes
- Prognosis
- Performed on whole blood
 - Point of care or laboratory test

Serious Hazards of Transfusion

- Transfusion reactions: volume overload, allergic, TRALI, hemolysis, citrate toxicity
- Potential transmission of viral infections
- Transfusion-related immune modulation
- Multiorgan failure
- Stored red blood cells have a decreased ability to transport, release, or deliver oxygen



Protocol design

- Target patient
- Automaticity
- Ratio for each delivery
 - Number system
- Testing or predefined ratios
 - Larger number to prepare, longer to prepare

Set-up

- Personnel to be trained
- Initiation
- Thawed plasma
- Non-computer generated unit tags
- Transport
- Discontinuation

Non-trauma protocols

- ◉ Obstetrics
- ◉ Severe gastrointestinal bleeding
- ◉ AAA

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