

Massive Transfusion and Hemorrhagic Shock

Intraoperative teaching · CA-2

THE QUESTION

Where the evidence disagrees

Current massive transfusion protocols should utilize between 1:1:1 and 1:1:2 ratios of plasma, platelets, and red blood cells.

THE EVIDENCE

What each source contributes, and how strong it is

Study design first — a cohort and a randomised trial do not carry the same weight.

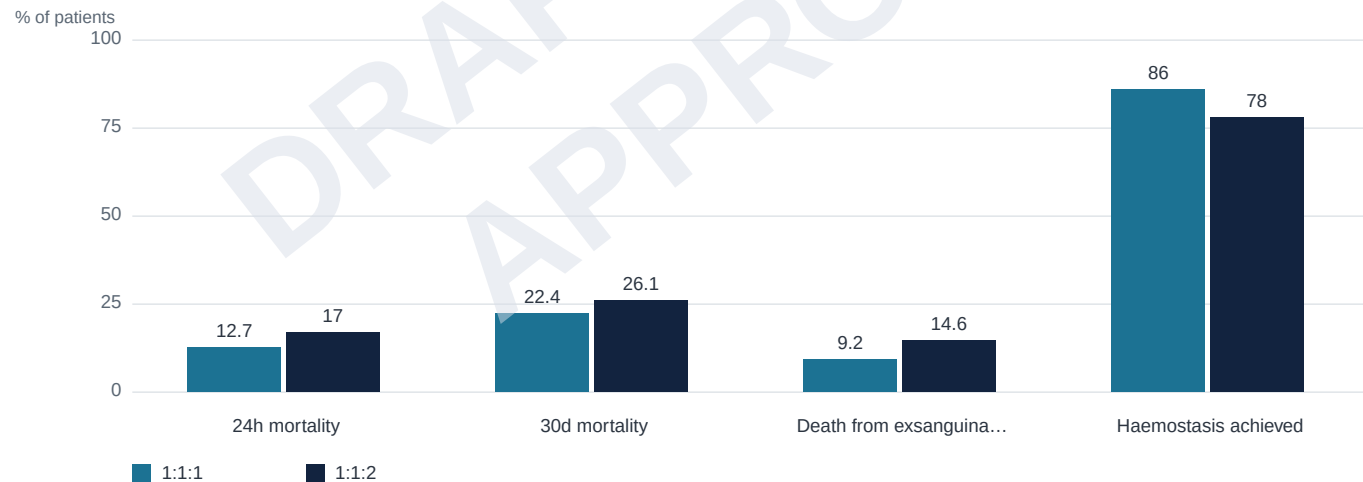
Design	Year	Journal	What it found
Other	2020	The American journal of emergency	Massive transfusion: Use 1:1:1 to 1:1:2 ratios
Other	2016	England)	Confirm tube position bronchoscopically
Other	2024	The Medical journal of Australia	Massive transfusion: FFP "e 4U & Plt "e 1U per 8U RBC
Other	2013	Annales francaises d'anesthesie et	Massive transfusion protocols key in trauma coagulopathy

4 resolved citations behind this deck; every point above traces to one of them.

THE NUMBERS

The ratio moved haemostasis and exsanguination, not overall mortality

Say this while the cooler is on its way.



Neither mortality endpoint reached significance. Exsanguination death and haemostasis did — which is the part of the trial worth teaching.

IN PRACTICE

What the cohorts and reviews add

4 findings, each on the slide that follows.

THE AMERICAN JOURNAL OF EMERGENCY MEDICINE 2020

Massive transfusion: Use 1:1:1 to 1:1:2 ratios

Current massive transfusion protocols should utilize between 1:1:1 and 1:1:2 ratios of plasma, platelets

ENGLAND) 2016

Confirm tube position bronchoscopically

The provided text is an abstract list from a conference, not a paper detailing massive transfusion protocols or hemorrhagic shock management....

THE MEDICAL JOURNAL OF AUSTRALIA 2024

Massive transfusion: FFP "e 4U & Plt "e 1U per 8U RBC

In major hemorrhage protocols, give no fewer than four units of fresh frozen plasma and one unit of platelets for every eight units of red blood...

ANNALES FRANCAISES D'ANESTHESIE ET DE REANIMATION 2013

Massive transfusion protocols key in trauma coagulopathy

Early activation of massive transfusion protocols with high ratios (RBC:FFP:Platelets) is key in trauma-induced coagulopathy for hemostatic...

IN PRACTICE

Massive transfusion: Use 1:1:1 to 1:1:2 ratios

Other · The American journal of emergency

Current massive transfusion protocols should utilize between 1:1:1 and 1:1:2 ratios of plasma, platelets, and red blood cells.

Massive transfusion protocol in adult trauma population, The American journal of emergency medicine 2020 · PMID 33071074

IN PRACTICE

Confirm tube position bronchoscopically

Other · England)

The provided text is an abstract list from a conference, not a paper detailing massive transfusion protocols or hemorrhagic shock management. Therefore, I cannot extract a specific, actionable teaching point related to that topic from this source.

36th International Symposium on Intensive Care and Emergency Medicine : Brussels, Belgium. 15-18 March 2016, Critical care (London, England) 2016 · PMID 27885969

IN PRACTICE

Massive transfusion: FFP "e 4U & Plt "e 1U per 8U RBC

Other · The Medical journal of Australia

In major hemorrhage protocols, give no fewer than four units of fresh frozen plasma and one unit of platelets for every eight units of red blood cells.

Patient blood management guideline for adults with critical bleeding, The Medical journal of Australia 2024 · PMID 38282333

IN PRACTICE

Massive transfusion protocols key in trauma coagulopathy

Other · Annales francaises d'anesthesie et

Early activation of massive transfusion protocols with high ratios (RBC:FFP:Platelets) is key in trauma-induced coagulopathy for hemostatic resuscitation.

Trauma-induced coagulopathy, Annales francaises d'anesthesie et de reanimation 2013 · PMID 23916515

IN THE ROOM

What this changes about the next case

Colour is the strength of the evidence behind each step, not the urgency.

1

1

Current massive transfusion protocols should utilize between 1:1:1 and 1:1:2 ratios of plasma, platelets, and red blood cells.

2

2

The provided text is an abstract list from a conference, not a paper detailing massive transfusion protocols or hemorrhagic shock management. Therefore, I cannot extract a specific, actionable teaching point related to that topic from this source.

3

In major hemorrhage protocols, give no fewer than four units of fresh frozen plasma and one unit of platelets for every eight units of red blood cells.

4

Early activation of massive transfusion protocols with high ratios (RBC:FFP:Platelets) is key in trauma-induced coagulopathy for hemostatic resuscitation.

KEY TAKEAWAYS

What to carry into the next case

Massive transfusion: Use 1:1:1 to 1:1:2 ratios

The American journal of emergency medicine 2020

Confirm tube position bronchoscopically

England) 2016

Massive transfusion: FFP "e 4U & Plt "e 1U per 8U RBC

The Medical journal of Australia 2024

Massive transfusion protocols key in trauma coagulopathy

Annales francaises d'anesthesie et de reanimation 2013

Activate massive transfusion early using RBC:FFP:Platelet ratios of 1:1:1 to 1:1:2 for optimal hemostasis in hemorrhagic shock.

QUESTIONS I'LL ASK YOU IN THE ROOM

1. What is the most common cause of death in patients receiving massive transfusions?
2. How does citrate toxicity manifest and what factors increase its risk?
3. What laboratory values are most useful for guiding transfusion therapy in a patient with massive hemorrhage?
4. Besides packed red blood cells, what other blood products should be considered early in massive transfusion protocols?

ORAL BOARDS STEM

A 24-year-old arrives after a motorcycle collision with a positive FAST, systolic pressure of 70, and a hemoglobin of 6.2 after two litres of crystalloid.

BOARD QUESTIONS

1. In PROPPR, roughly how many units of plasma and platelets did the 1:1:1 group receive in the first 24 hours compared with 1:1:2, and did red cell use differ?
2. In the PROPPR trial comparing 1:1:1 with 1:1:2 plasma:platelet:red cell ratios in severe trauma, which endpoints differed significantly between the groups?
 - A. Death from exsanguination at 24 hours and achievement of haemostasis
 - B. All-cause mortality at both 24 hours and 30 days
 - C. Acute respiratory distress syndrome and multiple organ failure
 - D. No endpoint differed significantly
3. A colleague argues PROPPR proves a 1:1:1 ratio saves lives in major trauma haemorrhage. What is the precise problem with that claim, and what can you legitimately say the trial supports?

ANSWER KEY

1. **The 1:1:1 group received more plasma (median 7 units versus 5) and considerably more platelets (12 units versus 6), while red cell volumes were similar at about 9 units in both groups. So the ratio strategy changes what comes out of the cooler alongside the red cells, not how much red cell is given.**

The intervention is plasma and platelets, delivered early. Knowing the actual unit counts makes the logistics of activating the protocol concrete.

PROPPR trial, JAMA 2015 · PMID 25647203

2. **A. Death from exsanguination at 24 hours and achievement of haemostasis**

Neither mortality endpoint reached significance (12.7% vs 17.0% at 24h; 22.4% vs 26.1% at 30d). Exsanguination death fell from 14.6% to 9.2% and haemostasis rose from 78% to 86%. The trial is usually quoted as showing 1:1:1 works — what it showed is narrower and more interesting than that.

PROPPR trial, JAMA 2015 · PMID 25647203

3. **PROPPR's primary outcomes were 24-hour and 30-day all-cause mortality, and neither reached statistical significance — 12.7% versus 17.0%, and 22.4% versus 26.1%. So it did not demonstrate a mortality benefit. What it did show, in prespecified ancillary outcomes, was less death from exsanguination (9.2% vs 14.6%) and more patients achieving haemostasis (86% vs 78%), without an increase in any of 23 prespecified complications. The defensible statement is that 1:1:1 increased the proportion of patients achieving haemostasis and reduced deaths from exsanguination, at no**

measured safety cost.

Ancillary outcomes can be real and useful without converting a negative primary outcome into a positive trial. Say what the trial measured.

PROPPR trial, JAMA 2015 · PMID 25647203

Activate massive transfusion early using RBC:FFP:Platelet ratios of 1:1:1 to 1:1:2 for optimal hemostasis in hemorrhagic shock.

SOURCES

- [1] Massive transfusion protocol in adult trauma population, The American journal of emergency medicine 2020 · PMID 33071074
- [2] 36th International Symposium on Intensive Care and Emergency Medicine : Brussels, Belgium. 15-18 March 2016, Critical care (London, England) 2016 · PMID 27885969
- [3] Patient blood management guideline for adults with critical bleeding, The Medical journal of Australia 2024 · PMID 38282333
- [4] Trauma-induced coagulopathy, Annales francaises d'anesthesie et de reanimation 2013 · PMID 23916515
- [5] PROPPR, JAMA 2015 · PMID 25647203

DRAFT — NOT
APPROVED