

# Balanced Resuscitation in Trauma Management

Paul M. Cattle, MD, MBT, FRCSC, Bryan A. Cotton, MD, MPH, FACS\*

## KEYWORDS

- Balanced resuscitation • Trauma • Coagulopathy • Hemorrhagic shock
- Damage control

## KEY POINTS

- Crystalloid, once considered central to the resuscitation of traumatic hemorrhagic shock, leads to numerous complications and increases patient morbidity and mortality.
- Trauma-induced coagulopathy is frequent in injured patients at the time of hospital presentation and is worsened by aggressive crystalloid use.
- Balanced resuscitation minimizes coagulopathy through permissive hypotension, restrictive crystalloid use, and high ratios of plasma and platelet to red blood cell transfusion.
- Balanced resuscitation with plasma, platelets, and red blood cells in a 1:1:1 ratio improves outcomes and should be initiated early, including prehospital, when possible.
- Balanced resuscitation can be achieved through the use of preplanned, matured massive transfusion protocols, specifically designed to be continued until actively turned off.

## INTRODUCTION

As the leading global cause of death among youth and young adults, the impact of trauma on years of productive life lost cannot be overstated.<sup>1</sup> With only brain injury as a larger cause of overall mortality, hemorrhage is the leading cause of preventable trauma death.<sup>2–6</sup> Rates of mortality in injured patients requiring a massive blood transfusion in the late 1980s were greater than 80%. Prehospital strategies considered standard of care at the time included early intravenous (IV) access with 2 large-bore cannulas and aggressive administration of crystalloid, regardless of patient physiology. In the civilian setting, in which blunt trauma predominates, paramedical, emergency, and surgical trauma providers loyally performed these same resuscitation strategies for several decades. Until recently, they continued to be taught on a global scale. The Advanced Trauma Life Support Course, used as a benchmark international trauma reference and teaching tool, and last updated in 2012, still promotes these

---

Disclosures: Nothing to disclose.

Division of Acute Care Surgery, Department of Surgery, McGovern Medical School, University Professional Building, Memorial Hermann Hospital, University of Texas, at Houston, 6431 Fannin, MSB 4.286 Houston, TX 77030, USA

\* Corresponding author.

E-mail address: [Bryan.A.Cotton@uth.tmc.edu](mailto:Bryan.A.Cotton@uth.tmc.edu)

Surg Clin N Am ■ (2017) ■–■

<http://dx.doi.org/10.1016/j.suc.2017.06.002>

0039-6109/17/© 2017 Elsevier Inc. All rights reserved.

[surgical.theclinics.com](http://surgical.theclinics.com)

resuscitation strategies.<sup>7,8</sup> As a result, over the last 30 years, the initial resuscitation of patients with trauma had changed very little. At the start of the new millennium, despite many significant advances, those patients with significant hemorrhage continued to have a mortality of more than 50%.<sup>9</sup>

However, the last decade has witnessed the birth of a new paradigm in early trauma resuscitation. This radical shift emphasizes balanced resuscitation, using ratios of plasma, platelets, and red blood cells (RBCs) that approximate whole blood as early as possible in a patient's care. It has become understood that aggressive crystalloid resuscitation worsens coagulopathy through dilution, contributes to acidosis through pH alteration, and exacerbates hypothermia via infusion of large volumes of cold solution. To address this, a central tenet of balanced resuscitation is to limit early crystalloid use in an attempt to attenuate the predictable metabolic derangements that are associated with this traditional approach. With the addition of permissive hypotension, the third pillar of balanced resuscitation, current mortalities in hemorrhaging patients have decreased to as low as 20% (Fig. 1).<sup>10</sup> This article focuses on the balanced resuscitation portion of trauma management. The aim is to understand the motives behind the long-standing use of crystalloid resuscitation, review the advantages and disadvantages of various resuscitative agents, and present the compelling evidence that exists for balanced resuscitation in the management of trauma.

### THE HISTORY OF WHOLE-BLOOD AND COMPONENT THERAPY

At the outset of World War 1 (WW1), the British military thought that blood transfusions caused harm and were instead focused on using crystalloids for resuscitation.<sup>11</sup> Concurrently, significant advancements in the tools and techniques necessary for blood typing, anticoagulation, and storage were being made. As a result, by the end of WW1, many casualties were being resuscitated with whole blood and this quickly became the standard of care in several military hospitals. Knowledge of whole blood-based resuscitation continued to evolve during both World War II (WWII) and the Korean War. The British had a functional blood transfusion system in place at the outset of WWII and the United States military shortly followed suit. By the end of WWII, the American military was mobilizing massive volumes of blood for transfusion. The American Red Cross drew more than 13 million units of whole blood from

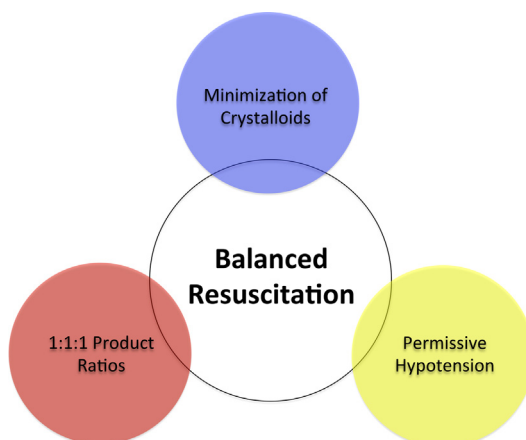


Fig. 1. The 3 tenets of balanced resuscitation.

Download English Version:

<https://daneshyari.com/en/article/5734923>

Download Persian Version:

<https://daneshyari.com/article/5734923>

[Daneshyari.com](https://daneshyari.com)