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A major haemorrhage protocol improves the delivery of blood component therapy and reduces waste in trauma massive transfusion

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ABSTRACT

Background: Major haemorrhage protocols (MHP) are required as part of damage control resuscitation regimens in modern trauma care. The primary objectives of this study were to ascertain whether a MHP improved blood product administration and reduced waste compared to traditional massive transfusion protocols (MTP).
Methods: Datasets on adult trauma admissions 1 year prior and 1 year post implementation of a MHP at a Level 1 trauma centre were obtained from the trauma registry. Demographic and clinical data were collected prospectively including mechanism of injury, physiological observations, ICU admission and length of stay. The volume of blood components (packed red blood cells, platelets, cryoprecipitate and fresh frozen plasma) issued, transfused, returned to stock and wasted within the first 24 h was gathered retrospectively.
Results: Over the 2-year study period 2986 patient records were available for analysis. 40 patients required a 10+ Units of packed red blood ells transfusion in the MTP group vs. 56 patients post MHP implementation. The administration of blood component therapy improved significantly post MHP implementation. FFP:PRBC transfusion improved from 1:3 to 1:2 ($p < 0.01$) and CRYO:PRBC improved from 1:10 to 1:7 ($p < 0.05$). We reported a significant reduction in the waste of platelets from 14% to 2% ($p < 0.01$). Outcomes had improved: Median hospital length of stay was reduced from 54 days to 26 days ($p < 0.05$).
Conclusion: Implementation of a MHP results in improved delivery of blood components and a reduction in the waste of blood products compared to the older model of MTP. In combination with educational programmes MHP can significantly improve blood product administration and patient outcomes in trauma haemorrhage.
Level of evidence: Level III diagnostic test study.

Introduction

Background

Death due to traumatic injury is the leading cause of life years lost throughout the world.[1] Haemorrhage accounts for almost 50% of deaths and the majority of these occur in the first 24 h.[2] Up to 15% of patients in major trauma centres receive a massive transfusion and over 25% of these will die, most within 6 h of injury.[3] Patients who survive a massive transfusion have an increased incidence of sepsis, multi-organ failure, longer hospital stays and higher healthcare costs.[4,5]

The concept of massive transfusion was originally introduced to highlight the complications that result from large volume PRBC infusion – principally late dilutional coagulopathy.[6] Massive transfusion protocols (MTPs) therefore delivered PRBCs initially and provided relatively small volumes of blood component therapy (plasma, platelets and cryoprecipitate) only after sufficient units of PRBC had been transfused to cause dilutional coagulation dysfunction.[3,7] MTPs may therefore be considered reactionary to large volume blood product replacement in comparison to major haemorrhage protocols (MHP). The discovery of acute traumatic

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coagulopathy (ATC)[8] suggests this coagulopathy is established rapidly after injury and is best treated much earlier in the clinical course.[3,9] There is no consensus in the definition of massive transfusion, and the clinical identification of patients who will require more than a set number of PRBC units is difficult.[3] Additionally traditional MTPs have been shown to be ineffective in treating ATC and reducing blood transfusion requirements.[10] Massive transfusion may therefore be an outdated concept in the management of trauma haemorrhage. Newer strategies that directly target ATC such as damage control resuscitation[11] require protocols that rapidly identify bleeding patients and deliver high dose coagulation therapy. These MHPs must also avoid over-provision, over-transfusion or waste of blood products which is a significant issue with existing transfusion therapy in trauma.[4,5]

Goal of this investigation

The overall objective of this study was to ascertain whether a MHP improved blood product administration and reduced waste compared to traditional MTPs. The first aim of this study was to ascertain if a MHP could appropriately identify patients who were bleeding and would need a ≥10 U PRBC transfusion. Second, we wished to determine whether the MHP activation criteria could be correctly initiated by the trauma team leader. Third, we wished to ascertain whether there was any improvement in the administration of blood components and fourth, to establish if there was a reduction in the waste of blood components. Finally we also wished to determine whether there was an improvement in patient outcomes with a MHP. We conducted a retrospective 1 year before and after study of all adult trauma patients after implementation of a MHP at a major trauma centre.

Methods

Study setting

In September 2008 a Level 1 trauma centre switched from a standard MTP to a newer MHP. The previous MTP was broadly based on previous British Committee for Standards in Haematology guidelines (Fig. 1A).[12] There was no predefined triggering criteria and the Massive Transfusion Clotting Pack of products may only be requested on the instructions of a senior doctor (registrar or consultant) directly in charge of the patient. The new MHP on the other hand was developed by a multidisciplinary team which included pre-hospital physicians, trauma surgeons, emergency physicians, haematologists and the blood transfusion laboratory (Fig. 1B). The MHP has strict activation criteria and can be initiated by prehospital teams, or by emergency department or operating room staff. When activated, transfusion begins with PRBCs that are held in a blood fridge within the emergency department. The first pack from the blood bank (Pack A) contains 6 PRBC and 4 fresh frozen plasma (FFP) Units. If bleeding persists, a Pack B containing 6 PRBC, 4 FFP, 1 pool of platelets (PLT) and 2 pools of cryoprecipitate (CRYO) is ordered from the blood bank. Pack B is issued repeatedly until the bleeding is controlled. Antifibrinolytics, recombinant factor VIIa or other procoagulants were not used routinely during the period of study.

Participants

We analysed two 12-month time periods before (MTP: September 2007–August 2008) and after (MHP: September 2008–August 2009) the new protocol implementation. In order

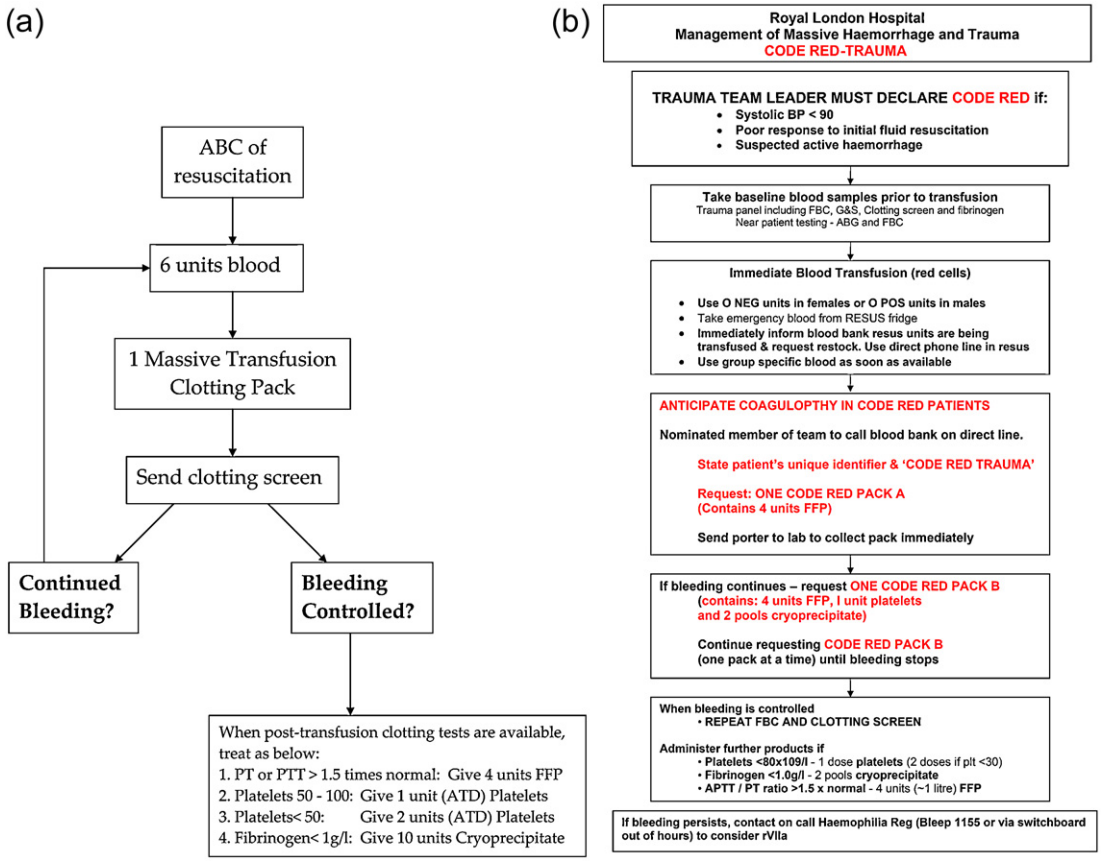

Fig. 1. (A) The Royal London Hospital Massive Transfusion Protocol/Guideline. Pre September 2008. (B) The Royal London Hospital Major Haemorrhage Protocol (Code Red Policy).