

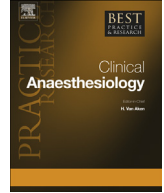


ELSEVIER

Contents lists available at [ScienceDirect](#)

## Best Practice & Research Clinical Anaesthesiology

journal homepage: [www.elsevier.com/locate/bean](http://www.elsevier.com/locate/bean)



5

### Perioperative blood conservation strategies for major spine surgery



Oliver M. Theusinger, M.D., Staff member <sup>\*</sup>,  
Donat R. Spahn, M.D., F.R.C.A., Professor and Chairman

*Institute of Anesthesiology, University and University Hospital of Zurich, Zurich, Switzerland*

**Keywords:**

spine surgery  
goal-directed transfusions  
ROTEM<sup>®</sup>  
thrombelastometry  
transfusion management  
Patient Blood Management  
spinal deformity surgery

**Background:** Orthopedic surgery, especially spine and spinal deformity surgery, may be associated with high perioperative blood loss. In order to reduce the risk of excessive blood loss and unnecessary blood transfusions, strategies such as Patient Blood Management including goal-directed coagulation management have been developed.

**Recent findings:** Adverse effects of allogeneic blood transfusions have been shown for most surgical fields including orthopedic surgery. Several efforts have been made to increase the preoperative red blood cell (RBC) mass, to reduce the intraoperative blood loss, and to use restrictive transfusion triggers in order to minimize or avoid RBC transfusions. Measures to reduce intraoperative blood loss include new surgical techniques, use of cell salvage where possible, bedside coagulation management with point-of-care devices, substitution of coagulation factors, antifibrinolytic agents, and desmopressin, induced hypotension, and avoidance of hypothermia.

**Summary:** Blood conservation in spinal surgery is a multidisciplinary approach and the efficacy of most single measures has been shown. Cost-effectiveness and the benefits of long-term patient outcomes are the subjects of current and future research.

© 2015 Elsevier Ltd. All rights reserved.

<sup>\*</sup> Corresponding author. Institute of Anesthesiology, University Hospital and University of Zurich, Rämistrasse 100, CH-8091 Zurich, Switzerland. Tel.: +41 44 255 27 10; Fax: +41 44 255 44 09.

E-mail address: [oliver@theusinger.de](mailto:oliver@theusinger.de) (O.M. Theusinger).

## Introduction

Blood loss remains a major concern in spine surgery [1]. Increasing awareness and evidence regarding adverse outcomes of allogeneic blood transfusion [2] mandates measures to minimize blood loss during major spine procedures. Achieving this goal requires a concerted effort from general practitioners, spine surgeons, and anesthesiologists. Since 2010, the World Health Organization (WHO) urges its member states [3] to use transfusion alternatives and develop individualized Patient Blood Management programs in order to reduce transfusion needs. The three pillars of Patient Blood Management are “1) detection and treatment of preoperative anemia, 2) reduction of perioperative red blood cell (RBC) loss, and 3) harnessing and optimizing the patient-specific physiological reserve of anemia (including restrictive hemoglobin transfusion triggers).” [4–8].

Standard coagulation tests are used widely to identify coagulopathy in the intraoperative period, but the value of these tests in an actively bleeding patient is questionable [9]. Routine coagulation tests were not developed to monitor bleeding patients in the operating room. For this reason, point-of-care devices such as rotational thromboelastometry (ROTEM<sup>®</sup>, TEM Innovations GmbH, Munich, Germany), thrombelastography (TEG<sup>®</sup>, Haemonetics Corp, Niles, IL, USA), or platelet mapping are used increasingly to treat bleeding in surgery and are actually recommended to assist in characterizing the coagulopathy and in guiding hemostatic therapy [10–12].

The purpose of this review is to highlight the significance of Patient Blood Management, the use of antifibrinolytic drugs, point-of-care testing, and algorithm-based treatment with factor concentrates to reduce blood loss and transfusion requirements in order to improve outcome. In addition, the management of patients on anticoagulant drugs, the tolerance of relatively low hemoglobin levels, topical hemostatic agents and cell salvage in the context of elective spine surgery will be discussed.

### *Patient Blood Management: the first pillar*

In orthopedic surgery, the prevalence of preoperative anemia as defined by the WHO ( $\leq 12$  g/dL in women and  $\leq 13$  g/dL in men) varies from 20% to 50% in the literature [13]. Preoperative anemia is an independent risk factor for increased 30-day mortality and morbidity in all surgical patients [14,15]. Up to one third of these patients have iron deficiency as cause of their anemia [16] – the goal is to detect these patients as early as possible before their scheduled surgery in order to correct anemia. In order to achieve optimal results, treatment should start at least 4 weeks prior to surgery. Optimizing the RBC mass before spinal surgery as the first pillar of the Patient Blood Management Program is crucial as this is associated with improved outcomes after 90 days [17].

A recent study by Theusinger et al. conducted at the Orthopedic Balgrist University Hospital, Zurich, Switzerland showed that this procedure is feasible [18]. Patients scheduled for elective surgery (hip, knee, and spine) were screened for hemoglobin and ferritin levels by their general practitioner. In case of anemia, surgery should be postponed, and further evaluations are needed to determine its cause, for example, tumors, gastrointestinal bleeding, etc. Treatment with intravenous iron, vitamin B12, folic acid, and erythropoietin was started, and the effect was examined 2 weeks later. A single treatment was sufficient in most patients [18]. The results shown by Theusinger et al. [18] are in accordance with those of Rosencher et al. (2005) [19], where in one to two doses of erythropoietin were sufficient to increase hemoglobin to non-anemic levels. Although the treatments mentioned seem to be simple, they require close collaboration between surgeons, anesthesiologists, and general practitioners. The approximate cost of administering one unit of RBCs is US\$ 700–1200, and treatment of the associated side effects may additionally cost up to US\$ 1000 [20,21]. The major cost drivers are composite morbidity (34%), return to the odds ratio (OR) (12.3%), sepsis (10.5%), pulmonary problems (15.7%), and wound problems (11.2%) [21].

Compared to this, the proposed treatment with 40.000 IU of erythropoietin alpha, 1 g of intravenous iron, vitamin B12 sc. and folic acid is around US\$ 850 and thus is the clearly favorable approach as this is still cheaper than one unit of RBC and its side effects [18].

Similar results regarding Patient Blood Management have been recently published by Mehra et al. where within one year the transfusions of all allogeneic blood products per 1000 patients was reduced by 27% leading to a cost reduction of over 2 million US\$ on a hospital level [22]. The types of surgeries

Download English Version:

<https://daneshyari.com/en/article/2748329>

Download Persian Version:

<https://daneshyari.com/article/2748329>

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