Patient Blood Management (PBM) in specific patients and situations

Moderators: Sigismond Lasocki

Monday, June 08, 2026

1. PBM IN INTENSIVE CARE PATIENTS

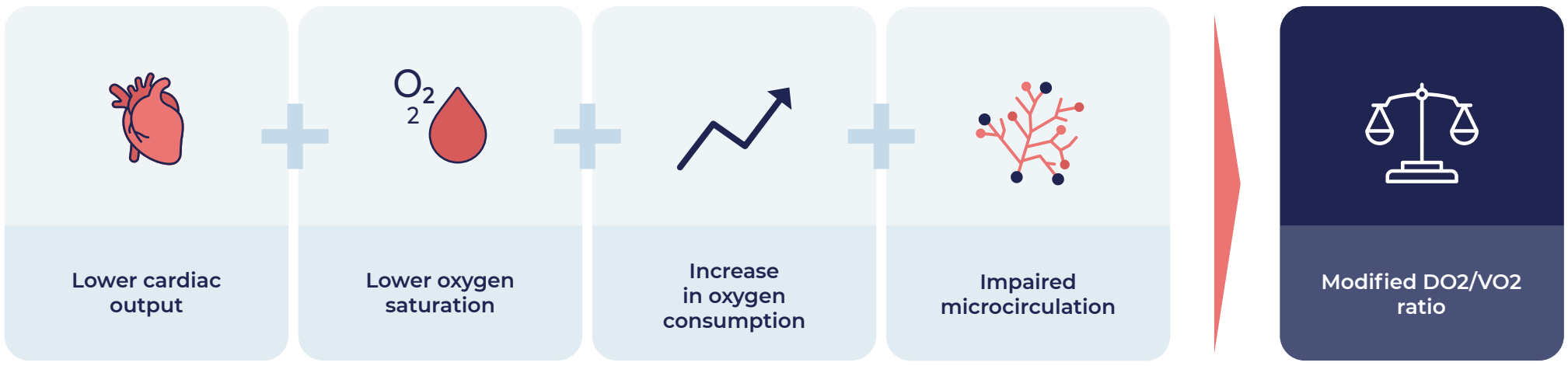
Ecaterina Scarlatescu

Anaemia is a common problem in critical patients[1–6]:

- Between 60 % and 80 % of patients are admitted to the ICU with Hb < 12 g/dL.
- Upon admission, 26% of patients have Hb < 9 g/dL. This figure goes up to 44% during the stay in hospital.
- 97% of patients develop anaemia within a week of admission.
- Roughly one in four patients receives a transfusion of packed red blood cells.

Furthermore, repeated blood samples for diagnostic tests significantly contribute to the development of anaemia.

Haemoglobin is the main factor determining oxygen transport in the body. Therefore, a decrease in haemoglobin reduces the supply of oxygen to the tissues and contributes to organ dysfunction. In critical patients, oxygen supply may be further reduced due to other factors.



In critical patients, it must be taken into account that markers to diagnose iron deficiency may change—inflammation may alter the levels of serum iron, ferritin, reticulocyte haemoglobin, transferrin, transferrin saturation (TSAT), soluble transferrin receptor or hepcidin[7–10].

As for the treatment of anaemia, the transfusion should be based on restrictive strategies. However, the wide heterogeneity of this population makes it difficult to establish universal transfusion thresholds applicable to all patients[11], and several factors must be considered before the transfusion and treatment personalisation.

Anaemia in critical patients should be managed applying packages of measures that favour blood conservation. The approach evaluated by Riessen et al. was able to reduce the blood loss associated with the diagnosis and the number of patients requiring transfusions through some simple measures—a closed-system arterial blood sampling method, lower-volume tubes, less frequent blood draws, and a smaller number of samples[12].

PHARMACOLOGICAL TREATMENT OF ANAEMIA

IRON

The package of measures evaluated by Warner et al., which included measures to conserve blood and to treat anaemia, supports clinical decision-making and the pharmacological treatment of anaemia with intravenous iron, which has proven to be feasible and well-tolerated, and to improve haemoglobin concentrations at one month and three months[13].

At the same time, according to a meta-analysis that included all kinds of patients, the risk of infection is higher in patients receiving intravenous iron than in those receiving it orally or not at all. However, when evaluating the 6 trials including patients admitted to the ICU, no significant increase in the risk of infection associated with intravenous iron was observed[14].

ERYTHROPOIESIS-STIMULATING AGENTS

Epoetin alfa slightly reduces the need for transfusions and minimally increases haemoglobin concentration, but no clinically relevant benefits or effects on mortality or adverse events have been observed. Nevertheless, a decrease in mortality was observed in patients with non-traumatic brain injury[15].

A recent meta-analysis has reported that iron an epoetin are the only pharmacological interventions to manage iron deficiency that are capable of reducing the incidence of transfusions without increasing the risk of venous thromboembolism or infection[16].

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2. PBM IN OBSTETRICS

Tina Tomic Mahecic

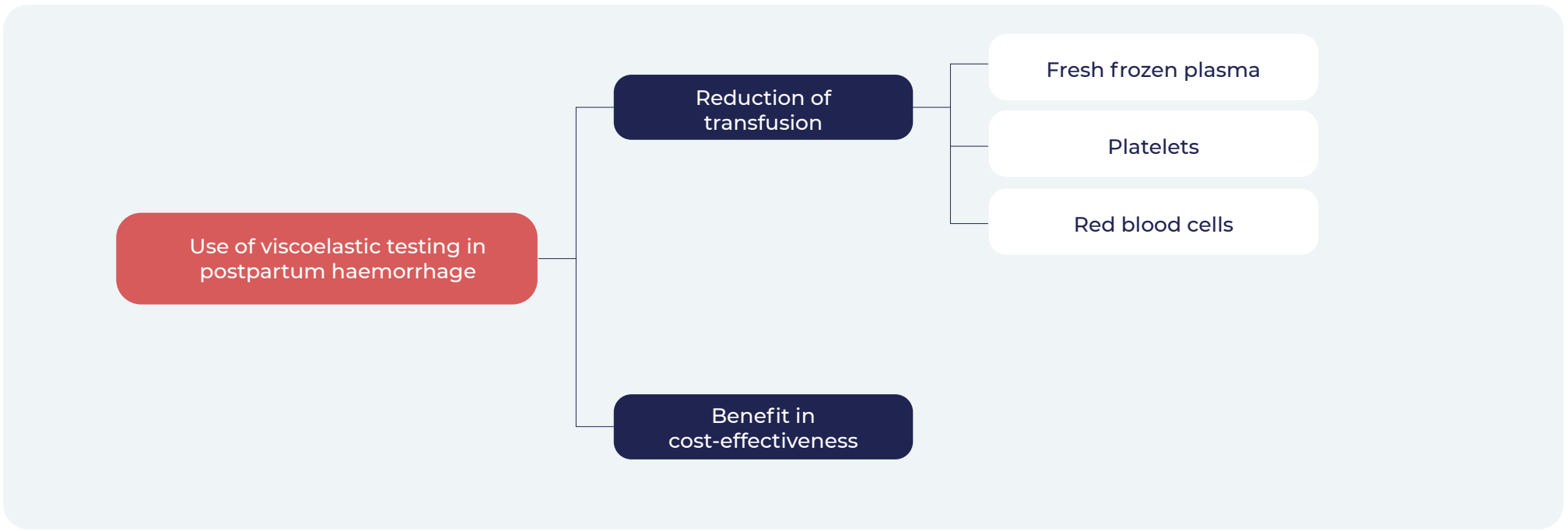
Anaemia is more common in women than men during of childbearing age[17]. In the context of pregnancy, its prevalence is estimated to be as high as 42%; therefore, early detection and treatment are key to reduce the risk of maternal and neonatal complications, as well as complications in the subsequent development of the newborn[18].

Anaemia may be a consequence of postpartum haemorrhage, an obstetric complication associated with poorer clinical outcomes and considered to be the main cause of maternal mortality worldwide. In turn, anaemia is a risk factor for developing postpartum haemorrhage, establishing a bidirectional relationship between both conditions[19].

The implementation of standardises, evidence-based interventions helps to reduce the progression of obstetric haemorrhage. In that regard, the EMOTIVE protocol was shown to improve the detection of postpartum haemorrhage and to reduce by 60% the incidence of the composite outcome of postpartum haemorrhage exceeding 1000 mL, laparotomy and maternal death[20].

Regardless of the original aetiology of the postpartum haemorrhage (uterine atony, genital tract traumatism, retained placenta, placental disorders or coagulopathy), persistent bleeding may lead to the development of an acquired coagulopathy if early and effective treatment is not implemented[21].

During pregnancy, a state of physiological hypercoagulability is developed, characterised by an increase in most coagulation factors, except for factor XIII, as a protective mechanism against childbirth-associated bleeding[22]. Postpartum haemorrhage causes a progressive decline in these factors, the extent of which correlates with the volume of blood lost. In contrast, the levels of factor VIII (FVIII) remain high, which helps to maintain thrombin generation[23]. As a result of these compensatory mechanisms, replacement of coagulation factors may not be necessary in the early stages of bleeding. In this context, viscoelastic tests are a very useful tool for haemostatic monitoring and treatment-related decision-making. A meta-analysis produced the following results [24]:



THERAPEUTIC INTERVENTIONS IN POSTPARTUM HAEMORRHAGE

FACTOR XIII

The role of early administration of factor XIII, the activity of which cannot be evaluated through conventional viscoelastic testing, is being researched in the SWIFT study. The results of this trial may change current recommendations regarding its use in the treatment of postpartum haemorrhage[25].

TRANEXAMIC ACID

The WOMAN trial showed that early administration of tranexamic acid reduces mortality from haemorrhage in women with postpartum haemorrhage, supporting its early use in this clinical setting[26].

INTRAOPERATIVE CELL SALVAGE

Intraoperative cell salvage is a recommended cost-effective strategy for patients with postpartum haemorrhage and massive blood loss. Moreover, when compared to allogenic transfusion, it does not increase the risk of antibody-mediated alloimmunisation[27,28].

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3. PBM IN JEHOVAH'S WITNESSES

Aamer Ahmed

Jehovah's Witnesses constitute the largest group (around 8 million people) of patients who reject blood transfusion and blood products. However, refusal to accept transfusion is not limited to religious grounds. In clinical practice, it is increasingly common to get patients who refuse the administration of blood products for personal, ethical or cultural reasons, as well as for concerns about the risks associated with transfusion.

Furthermore, in the last few years there have been fluctuations in the availability of blood products, exacerbated during the COVID-19 pandemic by a drop in donations and difficulties to maintain blood stocks. This has reinforced the need to optimise the use of this limited resource.

In this context, PBM principles form the basis for perioperative management in these patients, by reducing the need for transfusion and improving clinical outcomes:

- **Optimising erythropoiesis**
- **Minimising blood loss (surgical control) and bleeding (management of coagulopathy)**
- **Optimising physiological tolerance to anaemia**

The implementation of these principles requires painstaking planning of the perioperative process, bearing in mind a number of basic principles applicable to each stage: before, during, and after surgery.

BEFORE SURGERY:

1. Respecting the patient's autonomy, their beliefs and their decisions.

- Perioperative planning should be approached in a multidisciplinary manner, involving, at the very least, the surgeon, the anaesthesiologist and the haematologist, in order to ascertain the patient's preferences and limits with regard to the administration of blood and blood products.
- The blood products accepted or rejected by the patients must be explicitly documented, since some patients may not accept transfusion of blood, platelets or plasma, but may accept the administration of cryoprecipitate, certain coagulation factors or the use of a continuous circuit.
- The anaesthesiologist must clearly inform about the risks and potential clinical consequences of transfusion rejection.
- In some countries, in situations that are life-threatening or could cause serious and irreversible damage to paediatric patients, the protection of the child's health takes precedence over the beliefs or decisions of their legal guardians.
- The administration of a treatment expressly rejected by a competent patient violates the principle of patient autonomy and may entail legal and ethical liabilities.

2. Carrying out the relevant preoperative examination[29,30].

- A haemogram is required, as well as testing for ferritin and transferrin saturation, vitamin B12 and folic acid, together with a coagulation study and fibrinogen test.
- Anaemia should be treated wherever possible before surgery.
- In patients with enough time, treatment with oral iron may be started.
- Intravenous iron may be used when surgery is urgent or the patient does not respond to oral iron.
- In selected patients, recombinant erythropoietin may be used in combination with intravenous iron.

DURING SURGERY:

1. Considering acute normovolaemic haemodilution

- Acute normovolaemic haemodilution involves drawing autologous blood immediately prior to surgery, with simultaneous volume replacement using crystalloid or colloid solutions. The blood collected is reinfused after surgery or when it is clinically necessary, thereby reducing the loss of red blood cells during intraoperative bleeding.
- This procedure must be carried out by teams with experience on adequately selected patients.

2. Implementing intraoperative strategies aimed at minimising blood loss[31–33].

- Minimising blood draws by using paediatric tubes and close-circuit monitoring systems.
- Using viscoelastic monitoring to guide haemostatic treatment where available.
- Considering controlled hypotension.
- Maintaining a normal body temperature.
- Considering the administration of tranexamic acid and intraoperative cell salvage when blood losses above 500 mL are expected.
- In oncological surgery, using leukocyte depletion systems during intraoperative cell salvage.
- Maintaining close monitoring after the release of the tourniquet in surgery, due to the potential for increased bleeding.

3. Considering the use of fractionated blood products and acceptable haemostatic agents for certain Jehova's Witness patients. Some patients may accept the use of cryoprecipitate, prothrombin complex concentrate, fibrinogen concentrate or desmopressin.

AFTER SURGERY:

The goals of postoperative management are to minimise bleeding, optimise haemostasis, correct coagulation disorders, and maintain the right balance between oxygen supply and consumption[34,35]. To this end, the following is recommended:

- Implementing a rational use of laboratory tests.
- Minimising the volume of blood draws by using paediatric tubes and point-of-care tests, where available.
- Considering postoperative cell salvage using drains.
- Considering the administration of 1 g of tranexamic acid in case of postoperative bleeding.

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CSL Behring