SVEIKATOS MOKSLAI /
HEALTH SCIENCES IN EASTERN EUROPE
ISSN 1392-6373 print / 2335-867X online
2022, 32 tomas, Nr.5, p. 167-169
DOI: https://doi.org/10.35988/sm-hs.2022.221

PERIOPERATIVE PATIENT BLOOD MANAGEMENT

Vaiva Cechanovičiūtė[1], Emilija Barauskaitė[1], Inga Cechanovičienė[2]
[1]Lithuanian University of Health Sciences, Faculty of Medicine, Kaunas, Lithuania,
[2]Ministery of Health of the Republic of Lithuania, Vilnius, Lithuania

Keywords: patient blood management, anemia, blood transfusion, perioperative care.

Summary

Anemia and its treatment using red blood cell (RBC) transfusions are known to be the risk factors for postoperative morbidity and mortality. These disadvantages led to the need for an approach that supports the proper and timely evaluation and management of anemia as well as a rational utilization of blood products. In recent decades, the World Health Organization (WHO) advocated Patient Blood Management (PBM), which focuses on the patient's own blood as a resource that should be conserved and managed appropriately, and the avoidance of irrational use of blood transfusions. The implementation of PBM in the perioperative period is based on 3 pillars: 1. the optimization of the erythrocyte volume, through early detection of anemia before surgery, its proper management, and evaluation of applied treatment; 2. minimization of blood loss, by limiting blood drawn for blood testing, adhering to adequate anesthetic principles to maintain hemodynamics, using blood-sparing surgical techniques, implementing viscoelastic methods for the evaluation of blood, and prescribing antifibrinolytics; 3. optimization of the patient's physiological tolerance toward anemia and rational usage of blood transfusion, which can be achieved by ensuring optimized cardiac output, minimized oxygen consumption, and maximized oxygen delivery to tissues as well as following a restrictive RBC transfusion strategy.

Introduction

Anemia is a highly characteristic finding in surgical patients that is also a well-recognized risk factor for poor clinical outcomes [1, 2]. The mainstay of treatment of this condition in patients undergoing surgery is red blood cell (RBC) transfusion. However, it is 1 of the top 5 overused procedures that by itself carries a risk for adverse events, the supply is limited by nature, and it is amongst the most expensive treatments currently in practice [2-4]. In this context, the World Health Organization (WHO) prompted a promising approach named patient blood management (PBM), which is defined as „a set of evidence-based practices to optimize medical and surgical patient outcomes through the preservation of the patient's own blood and by minimizing unnecessary exposure to blood products" [1, 5]. The importance of implementation of PBM raises the need for the proper insight into the principles of PBM.

The aim: to analyze the appropriate key literature published on PBM and overview its principles.

Methods and materials

MEDLINE and Google Scholar databases were used to identify relevant articles on PBM. A total of 11 articles published between 2012 and 2022 were selected and analysed. The following keywords and their combinations were used to identify eligible studies for analysis: „Patient Blood Management" or „elective surgery" or „perioperative" or „anemia" „red blood cell" or „transfusion" or „restrictive transfusion strategy".

Results

The PBM concept for optimal management of patients and transfusion of blood products in a surgical setting was essentially based on 3 pillars: 1. the optimization of the erythrocyte volume, 2. minimization of blood loss, and 3. optimization of the patient's physiological tolerance toward anemia and rational usage of blood transfusion [1, 2, 4].

The optimization of the erythrocyte volume. Preoperative anemia, which occurs in 25 – 75% of the patients, is deemed an important factor increasing the need for RBC transfusion as well as perioperative morbidity and mortality [2, 6]. In regard to this, patients with expected blood loss of >500 ml or ³ 10% probability of RBCs transfusions should be screened for bleeding risk and anemia 3-4 weeks before planned surgery [3, 7, 8]. Iron-deficiency anemia is reported to be the most common type of anemia thus oral or intravenous administration of supplemental iron is conside-

Correspondence to: Vaiva Cechanovičiūtė, e-mail: cechanoviciute.vaiva@gmail.com

red an adequate treatment choice [3, 7]. Conditions such as chronic inflammatory disease or blood disorders may also elicit anemia. In this case, the treatment should target the underlying cause and be coordinated by a specialist physician [2, 6]. Additionally, erythropoiesis may be stimulated under the influence of exogenous erythropoietin for severe preoperative anemia, but since it is not a primary treatment for anemia, a hematologist must be involved in any decision to use erythropoietin [2, 7]. In some cases, preoperative autologous blood donation could be offered, but routine use is not supported [8]. Elective surgery shall be postponed until the outcome of any corrective therapeutic measure can be assessed [2, 8]. For those who undergo non-elective surgery, early preoperative anemia assessment and management are not available, therefore, if RBCs transfusion is necessary, it should be implemented rationally according to the guidelines [9, 10]. Intraoperative principles to prevent anemia include timed surgery and hematological optimization [1, 2]. Blood testing is necessary again in the postoperative period to evaluate whether anemia is present and in case of it follows the anemia treatment principles described before [9]. Drug interactions should be taken into consideration since some of them can aggravate anemia and the reason for observed postoperative anemia [7, 10].

Minimization of blood loss. A blood loss, which can exacerbate existing anemia or cause it after the surgery, may be categorized as iatrogenic- and surgery-related [2, 8]. Since surgical patients are thoroughly evaluated during the entire perioperative period and it results in frequent blood sampling, a reduction of iatrogenic blood loss could be achieved by ordering blood tests only when necessary, and the volume of blood collected should be the minimum required [1, 7]. In the preoperative period, attention focuses on the identification and treatment of hemostasis abnormalities increasing bleeding risk and a temporary cessation of anticoagulant therapy if it is appropriate, as for some patients continuation of drugs is needed due to a high risk of thrombosis and myocardial infarction [8, 9]. The intraoperative approach to PBM is a collaborative effort between the anesthesia, surgery, and transfusion laboratory teams [2]. Anesthetic principles for the maintenance of the hemostasis and hemodynamics include permissive hypotension, avoidance of hypothermia, normovolemic hemodilution, pH > 7.2, and ionized serum calcium of 1.1-1.3 mmol/L [7, 9]. The use of favorable surgical techniques such as minimally invasive or laparoscopic surgery as well as hemostasis management in the surgical area by applying local hemostatic agents or use of electrocautery can reduce intraoperative blood loss [1, 2, 7]. Additionally, recovery of the lost blood during surgery for selected cases could be achieved by the cell salvage technique [1, 7, 9]. Thorough monitoring of blood also plays an important role in the successful implementation of PBM. Viscoelastic point-of-care assays such as rotational thromboelastometry (ROTEM) and thromboelastography (TEG) comprehensively evaluate the blood properties from initial clot formation to clot lysis, therefore are reliable methods for the assessment of hypocoagulation and cause of bleeding. Accurate data provided by these testing allows to choose the adequate bleeding management strategies thus leading to the rational use of blood transfusion [2, 7]. Increased fibrinolytic system activity may facilitate intraoperative blood loss, therefore the prophylactic use of antifibrinolytics, e. g. tranexamic acid is necessary [7, 9]. Accordingly, strategies aiming to maintain optimal hemostasis, normothermia, and prevent bleeding, should be followed in the postoperative period as well as implementation and assessment of antithrombotic prophylaxis and treatment management [2, 10].

Optimization of the patient's physiological tolerance toward anemia and rational usage of blood transfusion. Low hemoglobin concentration with a resultant decreased oxygen-carrying capacity of the blood, occurring in the background of blood loss, creates a functional burden on pulmonary and cardiac systems [2]. A disruptive impact of blood loss could be attenuated if following several steps that focus on the optimization of pulmonary and cardiac function. In the preoperative period, an assessment of the patient's physiological reserve and comparing estimated blood loss with the patient's tolerable blood loss should be taken into consideration. Increased cardiac output before and during the surgical intervention could be achieved through maintenance of normovolemia and rational use of vasopressors for adequate organ perfusion [7, 10]. Optimized minute ventilation and oxygen supply are essential for pulmonary function. Improved oxygen delivery may be made by supplementing the patient with oxygen and thereby increasing the inspired oxygen fraction. Also, lower intraoperative oxygen demand should be tried to achieve by ensuring adequate analgesia (adequate depth and muscle relaxation, tachycardia avoidance), controlling the surgical stress response, reducing possible inflammation, and minimizing the chance of infection [2, 7].

In case RBC transfusions are required within intraoperative and postoperative periods, restrictive strategies should be preferred. A National Institute for Health and Care Excellence (NICE) guidance suggests a hemoglobin threshold of 7 g/dL for use of restrictive RBC transfusions aiming hemoglobin concentration target of 7-9 g/dL after transfusion. However, such restrictive strategy should be avoided in patients having a major hemorrhage, acute coronary syndrome or need regular blood transfusions for chronic anemia. For

patients with acute coronary syndrome, RBC transfusion is prescribed if hemoglobin level is lower than 8 g/dL and a target hemoglobin concentration is 8–10 g/dL. Consider setting individual thresholds and hemoglobin concentration targets for each patient who needs regular blood transfusions for chronic anemia [11]. The recommended dosage for restrictive transfusions is a single-unit RBC transfusion for adults who are hemodynamically stable and not actively bleeding. After every single unit of RBC transfusion, a clinical reassessment should be made and the level of Hb checked to evaluate the appropriateness of further transfusion [4, 11].

Conclusions

1. PBM is a multidisciplinary approach designed to improve patient outcomes through the management of anemia and avoidance of unnecessary exposure to RBC transfusion.

2. The implementation of PBM and achievement of better outcomes require a focus on all three pillars of PBM, that lead to early detection and optimal treatment of anemia, appropriate surgical and anesthetic techniques, and comprehensive blood evaluation within the entire perioperative period.

3. In case RBC transfusion is needed, restrictive hemoglobin thresholds and single-unit dosage should be preferred, however, it should be the last option in the treatment of anemia.

References

1. Shander A, Van Aken H, Colomina MJ, Gombotz H, Hofmann A, Krauspe R, Lasocki S, Richards T, Slappendel R, Spahn DR. Patient blood management in Europe. Br J Anaesth 2012;109(1):55-68. https://doi.org/10.1093/bja/aes139
2. Gombotz H. Patient Blood Management: A Patient-Orientated Approach to Blood Replacement with the Goal of Reducing Anemia, Blood Loss and the Need for Blood Transfusion in Elective Surgery. Transfus Med Hemother 2012;39(2):67-72. https://doi.org/10.1159/000337183
3. Murphy MF, Palmer A. Patient blood management as the standard of care. Hematology. Am Soc Hematol Educ Program 2019;2019(1):583-589. https://doi.org/10.1182/hematology.2019000063
4. Sadana D, Pratzer A, Scher LJ, Saag HS, Adler N, Volpicelli FM, Auron M, Frank SM. Promoting High-Value Practice by Reducing Unnecessary Transfusions With a Patient Blood Management Program. JAMA Intern Med 2018;178(1):116-122. https://doi.org/10.1001/jamainternmed.2017.6369
5. WHO: Global Forum for Blood Safety: Patient Blood Management. https://www.who.int/bloodsafety/events/gfbs_01_pbm_concept_paper.pdf
6. Warner MA, Shore-Lesserson L, Shander A, Patel SY, Perelman SI, Guinn NR. Perioperative Anemia: Prevention, Diagnosis, and Management Throughout the Spectrum of Perioperative Care. Anesth Analg 2020;130(5):1364-1380. https://doi.org/10.1213/ANE.0000000000004727
7. Thakrar SV, Clevenger B, Mallett S. Patient blood management and perioperative anaemia. BJA Education 2017;17(1):28-34. https://doi.org/10.1093/bjaed/mkw061
8. Meybohm P, Froessler B, Goodnough LT, Klein AA, Muñoz M, Murphy MF, et al. "Simplified international recommendations for the implementation of patient blood management" (sir4pbm). Perioperative medicine (London) 2017;6(1):5. https://doi.org/10.1186/s13741-017-0061-8
9. Boettner F, Bou Monsef J. Optimal management of perioperative anemia: current perspectives. International Journal Clinical Transfusion Medicine 2015;3:65-73. https://doi.org/10.2147/IJCTM.S61917
10. Filipescu D, Bănăţeanu R, Beuran M, Burcoş T, Corneci D, Cristian D, et al. Perioperative Patient Blood Management Programme. Multidisciplinary recommendations from the Patient Blood Management Initiative Group. Romanian Journal Anaesthesia Intensive Care 2017;24(2):139-57. https://doi.org/10.21454/rjaic.7518.242.fil
11. NICE guidelines: Blood Transfusion 2015. www.nice.org.uk/guidance/ng24

PACIENTO KRAUJO TAUSOJIMAS PERIOPERACINU LAIKOTARPIU

V. Cechanovičiūtė, E. Barauskaitė, I. Cechanovičienė

Raktažodžiai: paciento kraujo tausojimas, anemija, kraujo transfuzijos, perioperacinė priežiūra.

Santrauka

Anemija ir jos gydymas naudojant raudonųjų kraujo kūnelių (RBC) transfuzijas, yra žinomi pooperacinio sergamumo ir mirštamumo rizikos veiksniai. Dėl šių trūkumų prireikė metodo laiku nustatyti anemiją ir jos tinkamą gydymą, bei racionalų kraujo produktų panaudojimą. Pastaraisais dešimtmečiais Pasaulio sveikatos organizacija (PSO) pasisakė už konceptą, žinomą kaip Paciento kraujo tausojimas (PKT), kuris sutelkia dėmesį į paties paciento kraują kaip išteklių, kurį reikėtų tausoti ir tinkamai valdyti, bei siekį išvengti neracionalaus kraujo perpylimo. PKT perioperaciniu periodu aprėpia: 1) eritrocitų tūrio optimizavimą, nustatant anemiją anksti prieš operaciją, ją tinkamai gydant ir įvertinant gydymo rezultatus; 2) kraujo netekimo mažinimą, ribojant tyrimams imamo kraujo kiekį, vadovaujantis tinkamais anestezijos principais hemodinamikai palaikyti, taikant kraują tausojančius chirurginius metodus, tiriant kraują viskoelastiniais metodais ir skiriant antifibrinolitikus; 3) paciento fiziologinės tolerancijos anemijai optimizavimą, užtikrinant optimalų širdies minutinį tūrį, mažinant deguonies suvartojimą ir maksimaliai didinant deguonies tiekimą į audinius, racionaliai taikant kraujo perpylimą, vadovaujantis restrikcine RBC transfuzijos strategija.

Adresas susirašinėti: cechanoviciute.vaiva@gmail.com

Gauta 2022-04-15