AEJ ANESTHESIA EJOURNAL
Volume 8- No. 3 2020

Patient Blood Management

Brianna Berman, BSN, RN,

Affiliation:
Texas Christian University

Funding/Conflict of Interest Disclosure:
None

Abstract

Patient blood management (PBM) recommendations can help providers manage anemia and assist in transfusion-related decision-making. Patient blood management (PBM) is based on three pillars: treatment of underlying anemia, minimizing blood loss, and the use of transfusion thresholds. Establishing hemoglobin levels that dictate transfusion thresholds can be either restrictive (transfusing at lower thresholds) or liberal (transfusing at higher thresholds). Current literature recommends restrictive transfusion thresholds (hemoglobin less than 7 gm/dL) with consideration for individual patient status. A 56-year old male underwent an emergent exploratory laparotomy to locate a source of bleeding four days after having a hemicolectomy. He received one unit of packed red blood cells (PRBCs) in the intensive care unit overnight and arrived in the operating room (OR) on a phenylephrine drip. After induction, the patient required a vasopressin drip as well. The patient remained hemodynamically unstable and his hemoglobin was 9.8 g/dL, thus, the decision was made to administer one unit of PRBCs in the OR. The patient remained unstable throughout the case and a hemoglobin recheck was 9.5 g/dL, so a second unit of PRBCs was given. The transfusion threshold utilized in this case was liberal (less than 10 g/dL). Utilization of PBM can help guide transfusion decision-making and decrease the number of blood products given without increasing patient morbidity or mortality.

Patient Blood Management

Brianna Berman, BSN, RN, Texas Christian University

Purpose

- The purpose of this case study is to explore patient blood management (PBM) recommendations and transfusion thresholds.

Introduction

- Blood transfusions are often a necessary component of anesthetic management of the operative patient.
- However, transfusions can have serious potential risks ranging from an allergic rash to a hemolytic reaction, and even death.
- Establishing guidelines for PBM can help mitigate risks and ensure that blood transfusions are appropriate.
- PBM is based on 3 "pillars": treatment of underlying anemia, minimizing blood loss, and use of transfusion thresholds.[1]
- PBM helps determine in which patients the benefits of transfusion outweigh the risks.

Literature Search

- A literature search was performed utilizing these databases: MEDLINE, EMBASE, and PubMed.
- Six peer-reviewed articles published within the last eight years fit inclusion criteria and were selected.

Case Study

- 56 year-old male, 157.9 kg, BMI 47.2 presenting for emergent exploratory laparotomy for suspected bleeding after a hemicolectomy 4 days prior
- History: hypertension, hypercholesterolemia, COPD, ADHD, and diabetes
- Patient received 1 unit PRBCs in ICU overnight
- Pre-op VS: See Table 1
- Patient arrived from ICU with a phenylephrine drip at 6 mcg/min
- After induction, the patient's BP dropped to 80/50 and was treated with: 600 mcg phenylephrine, 100 mg calcium chloride, 3 units vasopressin, and 750 ml 5% albumin. Phenylephrine drip was increased to 30 mcg/min and a vasopressin drip at 0.04 units/min was added.
- Initial hemoglobin was < 10gm/dL so 1 unit PRBCs was given as the patient was unstable. Repeat hemoglobin was 9.5 so a second unit was given.
- Hemostasis was obtained and patient was taken to ICU intubated.
- Post-op VS: See Table 1
- The following morning the patient coded, was made a DNR by family, and ultimately passed away.

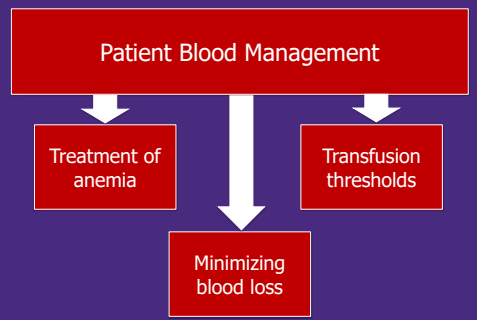

Table 1. Patient Vital Signs

VS	Pre-op	Post-op
HR	125	120
BP	120/75	97/58
SpO2	99% on RA	87% on 100% FiO2
RR	24	14
pH	7.455	7.194
pCO2	18.6	45.1
pO2	77.8	315.6
HCO3-	12.8	17
Base deficit	-8.8	-10.8
Hemoglobin	9.8	9.5

Table 2. Transfusion Recommendations [4]

Hemoglobin	Transfuse?
6 gm/dL or less	Stable patient
7 gm/dL or less	Stable patient
7.5 gm/dL or less	Cardiac surgery
8 gm/dL or less	Cardiac disease
10 gm/dL or greater	Unstable patient, active bleed

Discussion

- Avoiding anemia in surgical patients is important in order to maintain the blood's oxygen carrying capacity and maintain adequate ATP for cellular metabolism, and to ensure toxic waste such as CO2 is removed.
- Major risks of blood transfusions include hemolytic reactions, acute lung injury, volume overload, and deadly infections such as hepatitis and HIV.[2]
- All patients should be screened for anemia and any underlying causes should be treated prior to surgery.[3] Iron supplementation and short-acting erythropoietin are potential treatments.[3]
- Stricter transfusion thresholds (hemoglobin <7 gm/dL) are favorable.[3] Transfusion thresholds increase with cardiac surgery, underlying cardiac disease, active bleeding, and symptomatic anemia.[3,4] (See Table 2)
- If a transfusion is deemed necessary, Sadana et al. recommends the phrase "Why give 2 when 1 will do?".[5] Furthermore, a provider should wait 15 minutes after transfusion to re-check a hemoglobin to assess if further intervention is needed.[2]
- Several anesthesia-specific interventions can be utilized to minimize the need for blood transfusions.[6]
- Coagulation studies such as ROTEM or TEG can guide blood management and determine what type of blood product is needed.[1]
- Cell salvage techniques decrease transfusion needs and avoid potentially creating anemia pre-operatively as autologous transfusions can do.[1]
- Every facility should have a PBM system or transfusion guidelines in place.[5]

Case-Specific Discussion

- In this case, a liberal transfusion threshold was utilized (hemoglobin was less than 10 gm/dL).
- According to PBM guidelines, this was appropriate as the patient was hemodynamically unstable.
- One alternative to giving PRBCs would have been to get coagulation studies first to determine if PRBCs were the best option. Treating acidosis more aggressively may also have helped.

Recommendations

- Transfusion guidelines (see Table 2)
- Controlled hypotension (MAP 50-60 mmHg)[6]
- Goal-directed fluid therapy, fluid bolus pre-op[6]
- Avoid hypothermia and acidosis[6]
- Coagulation studies[1]
- Cell salvage[1]
- Accurate recording of intra-operative blood loss[1]
- Facility-specific PBM[5]
- Clinical decision-making tools incorporated into electronic documentation[5]

Summary

- PBM recommends utilizing strict transfusion thresholds unless the patient is unstable, or they are overtly bleeding.
- Controlled hypotension and goal-directly fluid therapy can decrease the need for transfusion.
- Consider the risks versus benefits of transfusion.
- Adhering to PBM reduces the number of blood products utilized, with no increase in patient morbidity/mortality.[4,5,6]
- Careful consideration of case-specific needs will help guide PBM.

References

1. Zacharowski K, Spahn DR. Patient blood management equals patient safety. *Best Practice & Research Clinical Anaesthesiology*. 2016;30(2):159-169. doi:10.1016/j.bpa.2016.04.008.
2. Gammon R. Clinical Practice Guidelines from the AABB: Red Blood Cell Transfusion Thresholds and Storage. *Blood News*. 2018:1-2. Accessed December 18, 2019. Available from: https://hospitals.vitalant.org/getattachment/Home/2018-01-jan.pdf.aspx?lang=en-US.
3. Mueller MM, Remoortel HV, Meybohm P, et al. Patient Blood Management - Recommendations from the First International Consensus Conference, Frankfurt, Germany. *JAMA*. 2019;134:983-997. doi:10.1182/blood-2019-130601.
4. Carson JL. Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB. *Annals of Internal Medicine*. 2012;157(1):49-58. doi:10.7326/0003-4819-156-12-201206190-00429.
5. Sadana D, Pratzer A, Scher LJ, et al. Promoting High-Value Practice by Reducing Unnecessary Transfusions With a Patient Blood Management Program. *JAMA Internal Medicine*. 2018;178(1):E1-E7. doi:10.1001/jamainternmed.2017.6369.
6. Cinnella G, Pavesi M, Gasperi AD, Ranucci M, Mirabella L. Clinical standards for patient blood management and perioperative hemostasis and coagulation management. Position Paper of the Italian Society of Anesthesia, Analgesia, Resuscitation and Intensive Care (SIAARTI). *Minerva Anestesiologica*. 2019;85(6):635-664. doi:10.23736/s0375-9393.19.12151-7.
7. Bakaeen F. Will You Need a Blood Transfusion After Open Heart Surgery? Health Essentials from Cleveland Clinic. https://health.clevelandclinic.org/blood-transfusions-after-open-heart-surgery/. Published March 28, 2017. Accessed February 19, 2020.