CSL Behring

Patient blood management (pbm): beyond anemia in chronic critical patients

Moderator: Milagros Sancho González

Monday, May 13, 2024

1. PATIENT BLOOD MANAGEMENT (PBM): FROM MYTHOS TO LOGOS

Manuel Quintana Díaz

The introduction of PBM started in 2007-2012 at the University of Western Australia[1].

PBM has shown extensive benefits in terms of patient outcomes and cost reduction1. PBM focuses on patient safety and does not only contemplate blood management, blood being such a scarce resource. Unlike the optimal use of blood, the goal of which was to minimize effective doses of blood products, PBM focuses on improving health outcomes.

PBM is mainly about promoting a (very) good management of patients and donors.

All **three pillars of PBM** lead to the following objectives:

Increasing tolerance to anemia	Optimizing erythropoiesis	Minimizing bleeding and coagulopathy

Plus, all of them entail better clinical outcomes.

PBM responds to **3 WHO challenges**:

- Insufficient supply of safe, effective, transfusion quality blood products.
- Insufficient availability of plasma-derived medicinal products.
- Suboptimal clinical practices in blood product transfusion.

These are the **5 reasons to implement PBM**:

SITUATION IN SPAIN

In Spain, there is currently a substantial interregional transfusion variability2, with significant differences in the transfusion rate between regions:

Red blood cells	Platelets	Plasma
> 70%	> 200%	> 300%

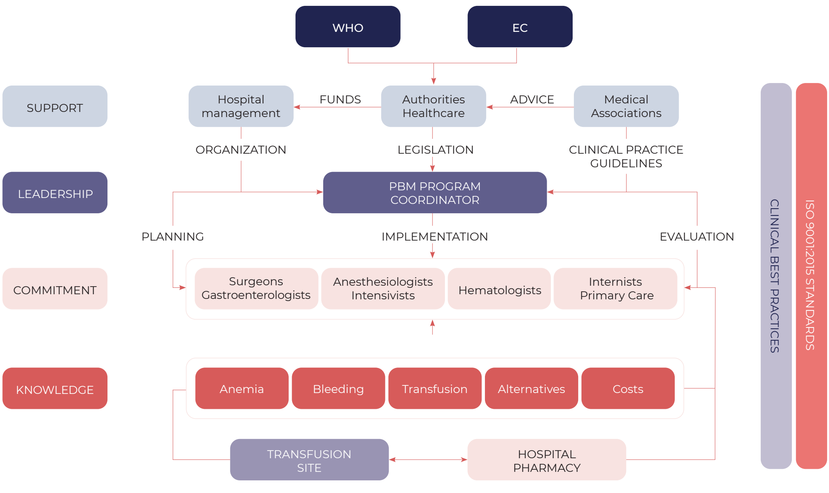
Furthermore, the national survey on PBM in intensive care has revealed that just over 20% of hospitals where the responders were located have implemented PBM programs.

In Spain, anesthesiologists are the main players in the development of PBM programs, given their application in surgical patients. Nevertheless, PBM is also applicable to another type of patients, namely, critical patients, and intensivists need to be involved. In fact, according to the WHO, healthcare services should implement Multidisciplinary and Multimodal programs to manage these patients, based on the three pillars of PBM.

In order to start and implement PBM programs, the next steps must be followed[3]:

Obtaining support from people in charge of healthcare systems or institutions, which may come before or after the start of this process.

MULTIDISCIPLINARY ORGANIZATION OF PBM PROGRAMS[4]



It is relevant for intensivists to exercise this leadership as PBM program coordinators.

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2. TRANSFUSION THRESHOLDS: ARE THERE EXCEPTIONS TO THE RESTRICTIVE POLICY? ARE THEY REAL?

Blanca Furquet López

ICU anemia management figures

Patients with anemia on admission	Patients with anemia on the 8th day	Patients receiving transfusions	Average red blood cell units per stay	Transfusions of red blood cells with in o Hb decrease
60%	97%	30-50%	5	40-90%

Currently there is enough evidence to assure that restrictive transfusion strategies are safe in critical patients with anemia[5]. According to a survey that determined transfusion habits in several countries, most participants considered transfusion in critical patients if hemoglobin was below 7 g/dL[6].

However, there are doubts in patients with the following conditions:

- Acute myocardial infarction
- Cardiovascular disease
- Heart surgery
- Major vascular surgery
- Neurocritical patients

These exceptions to a restrictive transfusion policy are real and they are found in a high proportion of clinical settings.

ACUTE CORONARY SYNDROME

There is an insufficient delivery of O_2 to the myocardium (due to thrombosis or stenosis) ➡ DO_2 supply/demand unbalance.

- Overtransfusion can worsen the extraction of O_2 ➡ SHUNT.
- Transfusion can lead to heart failure due to volume overload.
- Anemia is a risk factor independent from adverse cardiovascular events.

Guidelines recommend a liberal strategy (9-10 g/dL)[5] or do not lean towards any of the options[7].

Available evidence from RCTs:	
Carson et al, NEJM, 2023[8]	Liberal strategy versus restrictive strategy: · No reduction of risk of reinfarction or death within 30 days. · Lower mortality for cardiac causes. · Higher clinical benefit.
Ducrocq et al, JAMA, 2021[9]	Restrictive strategy versus liberal strategy: · Major adverse cardiovascular event ratio not lower after 30 days. · Potential clinical damage cannot be ruled out, since this is a non-inferiority study.

STABLE CARDIOVASCULAR DISEASE

An alteration of compensatory mechanisms occurs, to supply O_2 to tissues in case of acute disease or anemia.

Available evidence from meta-analysis:	
Cortés-Puch et al, Transfus Med, 2018[10]	Liberal strategy versus restrictive strategy: · Reduction of relative risk of adverse coronary event, both when CVD is known and when it is not. · Reduction of mortality. · Catheterization or surgery to correct the cardiovascular defect cancel the benefit of the liberal strategy.

HEART SURGERY

Limit cardiac reserve + hemodilution ➡ higher risk of anemia-induced tissue hypoxia.

- Transfusion involves a risk factor of death and worse outcomes.

Guidelines recommend a restrictive strategy (7.5 g/dL)[5].

Available evidence from RCTs:	
Mazer et al, NEJM, 2017[11]	Restrictive strategy versus liberal strategy: · Not inferior in the combined outcome of death by any cause, myocardial infarction, stroke, or outbreak of renal failure with dialysis.
Murphy et al, NEJM, 2015[12]	Restrictive strategy versus liberal strategy: · Not superior in morbidity or costs.
Hajjar et al, JAMA, 2010[13]	Restrictive strategy versus liberal strategy in perioperative setting: · Not inferior in the combined outcome of death by any cause after 30 days and severe morbidity.

MAJOR VASCULAR SURGERY

The ability to fulfill the increased O_2 demand due to surgical trauma depends on the ability to increase the cardiac output.

- Both results and practices in cardiac surgery are extrapolated.

Guidelines recommend a hemoglobin threshold of 7.5-8 g/dL[5].

Available evidence from RCTs:	
Møller et al, NEJM, 2019[14]	Low threshold (<8 g/dL) versus High threshold (< 9.7 g/dL): · Increase in mortality and major vascular complications and lower survival · Worse clinical outcomes

NEUROCRITICAL PATIENTS

There is an inverse relationship between hematocrit and cerebral blood flow (due to increase in viscosity), and the risk of ischemia can be increased.

- It is necessary to maintain an adequate cerebral perfusion with the highest delivery of O2 to the brain tissue (optimal hematocrit)[15].

Guidelines do not take a stance on restrictive or liberal strategies[5].

Available evidence from RCTs:	
Gobatto et al, Crit Care, 2019[16]	Liberal strategy vs. Restrictive strategy: · Lower mortality · Better neurological outcome · Lower incidence of post-traumatic vasospasm
Robertson et al, JAMA, 2014[17]	High target (>10 g/dL) vs. Low target (>7 g/dL) vs.: · Increase in thromboembolic complications

In conclusion:

- A more comprehensive study is needed on subgroups in these exceptions to identify which patients may benefit from more restrictive strategies and which patients are high risk and require higher transfusion thresholds.
- Methods to quantify the demand and release of O^2 in tissues should be improved, in order to identify patients that may better benefit from transfusion.
- Transfusion best practices should be based not only on hemoglobin concentration, but also on considering the signs and symptoms experienced by patients, their comorbidities, the rate of bleeding, and their preferences.
- Transfusion limits in neurocritical patients or with acute coronary syndrome are not clearly established.

LITERATURE

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