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Patient Blood Management (PBM)-An Emerging Paradigm in Blood Transfusion

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Patient Blood Management (PBM) aims to improve clinical outcomes by avoiding unnecessary exposure to blood components.[1] It can be defined as "Timely application of evidence based medical and surgical concepts designed to maintain hemoglobin concentration, optimize haemostasis and minimize blood loss in an effort to improve patients' outcome". [2-5]The term PBM was first coined to advocate shift in transfusion practice from a blood product focus to a patient- centered one. [6-8] Evidence based medicine feels uncomfortable with blood transfusion as life-saving in all circumstances. This led towards an approach to compare "liberal" transfusions against "restrictive" transfusions.[9]

Despite many advances in transfusion medicine, there remains great variability in transfusion practices across institutions and specialties.[3,4]As blood transfusion is not without risks, consideration should be given to the balance of benefits against risks of transfusion. This points towards transfusion of the right number of units of blood products, to the right patient, at the right time, in the right conditions and in accordance to appropriate guidelines.[10] Blood transfusion has a substantial financial impact. Working of blood banks in accordance with standard operative procedures, treatment of adverse transfusion outcomes and expending surveillance systems results in considerable financial burdens for health systems. A cost analysis demonstrates blood transfusion among the expensive treatments.[6-8]Improper use of blood products is substantiated in many studies.[6,8,11]

According to an estimate approximately 1.5 million units of blood are transfused annually all over Pakistan. It is estimated that use of blood components remains inappropriate in an appreciable number of patients, which can best be avoided .In the modern practice of evidence –based medicine attempts should be made to re-examine the ways in which blood is used , so as to reduce allogenic transfusion where possible and seriously considering the alternatives.[12,13] Single unit blood transfusion and arranging blood to combat intraoperative bleed is still a common practice with many clinicians . In our set up units of blood-cross-matched are more than the units of blood infused. This also reflects the advice to arrange blood "prophylactically". The loss of half to one liter of blood does not disturb homoestasis to any appreciable degree and can be managed safely by crystalloids with or without colloids. Then in pregnancy, due to 50% increase in plasma volume and 10% increase in coagulation proteins a patient can withstand a haemorrhage of about 1 liter. The American Association of Blood Banks has commented that request for single unit of blood be taken to indicate the need for the education of requesting physician.[14]

In our set up, most of the times (77% occasions), platelets are transfused prophylactically and in a minority the platelets are given therapeutically to stop minor bleeding episodes. Most of the prophylactic platelet transfusions do not meet the recommended criteria's. In immune thrombocytopenia's, in-vivo production of new and fresh platelets, even in a very small number, can act to maintain normal haemostasis. So, the patients with immune thrombocytopenia do not bleed seriously despite very low platelet counts. In these circumstances, transfused platelets would be destroyed rapidly by antibodies, and they can even aggravate the situation by providing more antigenic meal. In other situations, very liberal platelet transfusions can lead to the problem of platelet refractoriness. [15]

Diseases outbreaks and epidemics can lead to unwarranted and "off label" use of blood products. As witnessed in platelet concentrates and plasma

utilization during Dengue and Corona virus outbreaks, respectively. Studies revealed inappropriate utilization of fresh frozen plasma (FFP) in a high proportion. Conditions where FFP utilization has definitive indications include liver diseases, disseminated intravascular coagulation (DIC), post-op bleeding with deranged coagulation profile, massive transfusion, reversal of warfarin effect and in cases of factor deficiencies. But inappropriate utilization of FFP on a larger scale is not unheard off in different conditions like, surgery with normal coagulation profile, bleeding caused with normal coagulation profile, hypoproteinemia , hypovolemia ,reversal of heparin and many other conditions [11 ,16-20]

Ageing populations and emerging pathogens are leading towards a shrinkage of donors' pool.[21] Increase in population strata above fifty years of age is creating shrinkage in donors' pool. At the same time above fifty years age is the cohort which is held responsible for consuming at least 50% of all blood transfusions.[7,21,22] Unforeseen epidemics and pandemics can hamper blood supply chain, as witnessed in Dengue and COVID-19 out-breaks. In our set up the situation is more urgent due to the fact that there is little volunteer donor base, robust viral screening strategies are lacking and blood banks audit mechanism are not yet placed properly .[5,11]

In the clinical routine, it is a demanding task to identify patients with an increased risk for bleedings on the one hand and on the other hand to plan the optimum treatment strategy, including type and dosage of coagulation products in advance. The platelet count may also be misleading, as the number of platelets does not necessarily correlate with the degree of functionality.[6]

Implementation of PBM needs to embrace eight essential accelerators of Kotter's model: establishing a sense of urgency, creating a guiding coalition, developing a change vision, communicating the vision for buy-in, empowering broad-based action, generating short-term wins, never letting up, and incorporating changes into the culture.[23]

The principles highlighted for a successful PBM program includes anaemia management, blood conservation strategies, optimization of haemostasis and/ or coagulopathies, and patient centered cure. Anaemia management encompasses timely detection of anaemia, determining etiology of anaemia, using pharmacologic agents (e.g., parenteral iron, erythropoietin, etc) to support haematopoiesis. Multidisciplinary blood conservation strategies include performing minimally invasive surgical procedures, minimizing iatrogenic blood loss (e.g., repeated laboratory draws), using surgical techniques that limit blood loss, detecting and halting blood loss as quickly as possible and employing transfusion techniques that minimize allogeneic transfusions (e.g., autologous transfusion techniques, intraoperative red cell salvage, normo-volemic haemodilution. Haemostsis and/or coagulopathy is optimized by appropriately evaluating coagulopathy and treating coagulopathy with targeted therapies. Patients' centered care intends to incorporate the patient's needs and concerns in decision –making process informing the patient about PBM-based treatments, alerting the patient to potential risks/benefits/alternatives of different treatment options.[3,4,23, 27]

Successful PBM implementation witnessed less blood administration without significant impact on clinical outcomes. [3,5] The proportion of elective surgical patients, admitted anaemic, revealed a significant decline.[8] Based on product acquisition cost, a substantial calculated saving is registered , by adopting PBM in its true spirit.[8,16] Available experiences ,with surgical interventions in Johovah's witnesses , to an extent, also substantiates PMB .[6]Shifting the emphasize from product centered transfusion practice to PBM represents a win-win situation i.e., patients get home sooner, hospitals generate cost savings by using fewer resources per patient and physicians get better clinical outcomes.[7,28] An overview of the evidence found that, with high-to-moderate –quality evidence , a "restrictive" transfusion strategy had a similar or superior outcome, compared with a " liberal" transfusion therapy. [29]

Consideration to additional transfusion triggers , like haemodynamic parameters and oxygen transport capacity of the body ,can help in defining transfusion requirements.[7,30] Permissive hypotension, prevention of perioperative hypothermia and normo-volemic haemodilution are some of the proposed measures to reduce blood loss , in selected surgical settings.[10, 31,26] Pharmacologic agents, like Tranexamic acid, has shown to reduce blood loss effectively without increasing the risk of thromboembolic events.[10,32] In order to avoid diagnostic phlebotomy induced blood loss , it is better

to order blood tests when deem necessary and volume of blood collected should be minimum required. [10]

Meticulous surgical techniques such as performing minimally invasive surgery, judicious use of electrocautery, tourniquets, topical haemostatic agents and intra-operative blood salvage can minimize surgery-related blood loss. For operative settings early management of bleeding risks, such as cessation or alteration of antiplatelet therapy are important. In addition, various anaesthetic techniques to minimize blood loss are also helpful.[10,33,34]

Despite compelling evidence, practical guidance for healthcare providers and implementations of PBM is still far behind the expectations for good and safe clinical practices. Global implementation of PBM is still alarmingly slow. Huge inter-center and inter- country transfusion variability indicates that blood utilization is driven by culture and behavior, rather than evidence. The implementation of PBM is hampered by barriers, mostly related to the difficulty of changing traditional physicians' attitudes towards transfusion and transfusion behavior. Even hard –hitting crises such as HIV-pandamic, with tens of thousands infected from contaminated blood, only had a transient impact on changing long standing transfusion practice. "Transfusion alternative strategies", designed at that time, showed compelling results and could have been helpful to reduce overall blood utilization, but went largely unnoticed. Instead, the focus remained solely on improving blood product safety through introducing donor blood testing methods, with huge financial impact. [23,27,35,36]

Blood transfusion should always be performed with a definite object. It is required to decompose the complexity of PBM implementation into concrete measures on each implementation level. It is required to provide guidance for diverse stake holders to design strategies to make PBM a national standard of care, thus closing current practice gaps and matching this unmet public health need. Delaying PBM implementation also means that health care systems forgo savings of macro-economic magnitudes. This is even more alarming in countries striving towards universal health care coverage and with severe resource constraints .[23,24]

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