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Patient Blood Management Minimizes the Risk of Blood Transfusion

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1. Introduction

Blood transfusion are common daily procedures in developed countries and the most overused treatment in modern medicine. Blood transfusion can be harmful to the recipient and unnecessary if decision to transfuse is not considered carefully. Patient Blood Management (PBM) is the main driver to curtail and minimize the risk of blood transfusions. PBM initiative is currently encouraged in all World Health Organisation member states and involves the use of multidisciplinary, multimodal, individualized strategies to minimize blood transfusion while improving patient outcome. This approach is well developed in United States Center and some countries in Europe. There is a need for improvement and total quality management approach as unnecessary transfusion is common in clinical settings.

Clinical studies had shown that there are variability in the use of blood in developed countries. The clinical decision in the use of blood requires further assessment due to the conflicting factors. It is mandatory to consider the risk of the alternative options that would avoid patient been exposed allogeneic transfusion. There are many options which include looking at haemoglobin trigger levels, blood salvage, use of pharmacologic agent and the transfusion of colloids.

2. Patient Blood Management

There is a need to increase awareness of the use of alternative transfusions, high quality data of risk and cost-effectiveness requires further evaluation. Incentives and grants for using this approach in clinical settings might encourage clinical settings to adopt this model.

Iron deficiency anaemia is the principal cause of anaemia globally [1], Studies had found out that 24% of patient's undergoing hip surgery had pre-operative anaemia and 44% with hip fracture had anaemia. These procedures are associated with blood loss (with a mean of 1500ml) [2,3], after operative Total Hip Replacement/ Total Knee Replacement patient were found anaemic. This also applied to surgical patient in a cohort study [4], pre-operative anaemia was common and often cause by chronic diseases. Prospective and retrospective studies had shown this group of patient tend to have shown post-operative outcome compared to non-anemia patients. Blood transfusion may be regarded as a solution, as it is considered effective but do comes with its potential risk, consequently can also contribute to morbidity and mortality of surgical patients [5,6].

There is a recognition of new approaches to the management of patient for planned procedures. Patient with pre-operative anaemia in orthopaedic settings are more likely to receive blood transfusion [7,8] than other types of surgery. The use of allogeneic blood transfusion to correct anaemia is not fully supported by evidence and can be associated with risk factors which includes,Transfusion Transmitted Infections, antibody allo-immunisation, GraftvsHost-Disease, transfusion errors, haemolytic and non-haemolytic reactions and metabolic disturbances [9,10].

However, the relationship between blood transfusion and serious complication is not well established, due to bias and uncounfounding factors [11]. However, allogeneic blood undergoes changes during storages which may affect patient outcome, this impact of storage lesions is a matter of debate and available data do not sup-

port the evidence [12].

Cohort studies have also documented risk of infections complications, delay in wound healing and long hospital stay in transfused patient [13,14]. Adverse transfusion outcome had been documented in critically ill patient, trauma patient, cardiac or colorectal surgery [15]. The risk of using blood is also associated with cost, the demand and supply of blood is also limited by an ageing population and increasing restrictive criteria. The chain of supply can be overwhelmed by disaster events [16]. The increase scarcity of blood and measures to reduce the risk of infection transmission have increase the direct cost transfusion over the years. The overarching suggest a cautious transfusion strategy, hence, Inappropriate blood transfusion may endanger patient's recovery and could be a waste of resources.

The concept of PBM has also been developed to promote appropriate use of blood and avoid unnecessary blood transfusion [17]. PBM relies on three key strategies, optimize patient's own RBC mass, minimize blood loss and harness and optimize physiological tolerance of anaemia [18]. Advance pre-operative assessment involves the risk of bleeding and optimize blood might be considered with pharmacological prophylaxis using established guidelines. Restrictive blood draw might be considered and the use of anti-platelets or anticoagulants [19]. Studies had suggested that haemoglobin levels before elective orthopaedic surgery should be within the normal range and iron supplement can be used to correct iron deficiency anaemia and this will reduce the need for blood transfusion before surgery [20].

Erythropoiesis stimulating agent (ESA) may also be used within PBM strategies, ESA increase haemoglobin levels and reduce the need of blood transfusion in patients undergoing orthopaedic and cardiac surgery [21]. It has also been suggested that ESA should be used in patient whom iron deficiency anaemia has been ruled out or being corrected [22]. Intra-operative measures to prevent blood loss include patient positioning, the use of electrocautery, tourniquent,vasoconstrictors (e.g. tranexamic acid, aprotinin and desmopressin), local haemostatic agents [23,24] and the use of viscoelastic testing devices as a treatment approach to manage perioperative bleeding has been recommended by several international organizations and clinical guidelines. Autologous cell salvage can be useful where there is massive blood loss and patients that object to the use of allogeneic blood transfusion.

Studies had shown that the initial release of LTOWB compared with packed red blood cells (pRBCs) reduced overall blood requirements for patients needing emergency transfusion. Secondary outcomes examined included survival and non-lethal adverse clinical outcomes [25].

Another review showed that studies using WBTs demonstrated non-inferiority or superiority, with variable statistical significance. The use of whole blood as a transfusion product has been shown to be both safe and effective and reduces the incidence of transfusion-induced hypocalcemia compared to citrate-containing blood component therapy(BCT). Additionally, the availability of whole blood products shows reduced mortality in pre-hospital trauma, particularly for those with transport time greater than 30 minutes [26].

A retrospective cohort studies, which included a two prospective cohort studies, and two were randomized control trials collected from single-center Level 1 Trauma Civilian and Military Centers' registries and one retrospective studies collected from the National Trauma Data Bank, showed overall improved 24-hour survival and 30-day survival were seen with clinical significance and statistical significance in multiple studies for patients receiving WBTs, showing potential as a superior transfusion product [27].

Gurney and colleague [28] used the Joint Trauma System Role 2 Database in retrospective cohort analysis to determine how WBT vs. BCT affected six-hour mortality in US military casualties in Afghanistan from 2008 to 2014. They reported a statistically significant reduction in six-hour mortality among the WBT group vs. BCT (OR=0.27, CI=0.13-0.58), with an even further reduction in mortality when adjusting for the aforementioned variables (OR=0.15, p=0.24).

Valleley and colleagues [29] also explained that Fresh Whole Blood (FWB) is beneficial in reducing overall blood products exposures. Their data also suggested that, when an FWB prime and PRBC prime are compared, the majority of the FWB patients (62%) receive only one cumulative blood product exposure compared with 18% of the Packed Red Blood Cells (PRBC) patients ($p < .0001$). The reduction in donor exposures was also found in the <5 kg WB group, finding decreased exposures in the perioperative period and for the culmination of the perioperative and postoperative time periods. Evidence from one recent 5-yr study from Western Australia demonstrated a preoperative PBM clinic was cost effective [30].

3. Conclusion

There is an increase of awareness to integrate PBM within clinical settings in developed countries, PBM is in its early days but have been successful implemented in some centres and hospitals in the USA and Europe. Further data on cost-effectiveness of PBM, trained personnel, expertise on PBM and standardization across establishment need to be established.

PBM is centred on patient safety, more specifically on those who undergo major surgical or major medical procedures that put them at an increased risk of complications or mortality. PBM aims to improve the outcomes of patients at risk through the optimisation of the patient's condition before, during and after the procedure and, only when absolutely needed. The implementation of an effective blood transfusion strategy will subsequently reduce the transfusion of blood components in exchange for better outcomes for patients.

As we all work together in the endless quest toward improving patients' safety, change is inevitable, and it is the responsibility of the healthcare services to adjust itself to the change.

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