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Original research article

Blood and its components used in tertiary care hospitals: An observational study

[1]Kasa Lakshmi, [2]Hemalatha Mummadi, [3]Sunkari Suneetha, [4]Dhanyasi Anitha Rani

[1,2]Associate Professor, Department of Pathology, Government Medical College, Ananthapuramu, Andhra Pradesh, India

[3]Assistant Professor, Department of Pathology, Government Medical College, Kadapa, Andhra Pradesh, India

[4]Assistant Professor, Department of Pathology, Kurnool Medical College, Kurnool, Andhra Pradesh, India

Corresponding Author:

Dhanyasi Anitha Rani

Abstract

Purpose: The administration of blood transfusions is an essential component of patient treatment. The indications for the use of blood must be clear in the minds of the doctors who are ordering it in order to prevent its misuse and also to prevent the patient from being needlessly exposed to donor blood antigens, unpleasant responses, and infections that are transmitted through transfusion.

Methods: During the course of one year, a retrospective pilot study was conducted in which the particulars of whole blood and component transfusions were recorded and correlated with the patient's diagnosis and the reasons for receiving a transfusion.

Results: Whole blood was the product that was utilised the majority of the time, and packed red blood cells were the product that was utilised the second most frequently. The surgical wards were given access to a sufficient quantity of blood at all times. The vast majority of patients who had suffered trauma, then had cancer treatment, and finally undergone surgery required entire blood. The most common reason individuals required blood products was because they were suffering from anaemia.

Conclusions: Reviewing the utilisation of blood components on a periodic basis is highly significant for determining the pattern of blood utilisation in any hospital.

Keywords: Blood usage, blood components, whole blood, periodic review, blood transfusions

Introduction

A variety of therapy methods include the administration of blood transfusions as an essential component. Because blood and its components, like drugs, have the potential to cause adverse effects, such as the introduction of donor antigens into the recipient, transfusion reactions, or exposure to a variety of diseases that can be transmitted through blood transfusions, certain safety precautions have to be taken whenever blood is transfused [1-3]. It is essential for doctors to be aware of the possible dangers that may be posed to patients who are the recipients of blood and blood products. Therefore, the indications for placing a blood order need to be properly justified to prevent the inappropriate usage or excessive use of this valuable resource [4-6]. As a result, a regular assessment of the utilisation of blood components is required in order to evaluate the pattern of blood utilisation in any hospital or other health care setting. Every patient who requires a transfusion should have reliable access to safe blood products, such as whole blood, labile blood components, and medicinal products derived from plasma. These blood products should be appropriate for the patient's clinical needs, delivered on time, and administered in a safe manner. There is a dearth of information regarding the utilisation of blood products; however, research indicate that blood products are frequently overprescribed in both developed and developing nations [6-8].

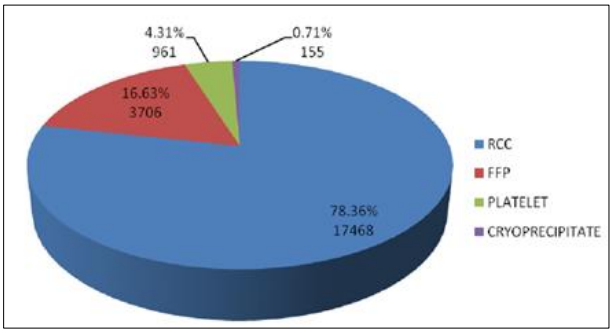

Fig 1: Daily requirement of blood and related components; general consideration

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This refers to the process of isolating specific blood components from whole blood in order to maximize the therapeutic potential of each component based on a solid grasp of physiologic principles and the risks and benefits that are associated with each individual transfusion [9-12]. The clinical practice guidelines for the use of blood components have the following goals: to improve the consistency and appropriateness of transfusion practice; to promote the integration of quality management systems into transfusion practice; to reduce the overall number of complications related to transfusions; to raise consumer awareness of the benefits and risks of blood component therapy; and to conserve a limited resource. When blood is used to its full potential, it not only helps cut down on, or even eliminate, the need for allogenic blood, but it also helps avoid patients from being exposed to the risk of blood-borne endogenous infections unnecessarily [13, 14]. It is imperative that blood and blood components be utilised in an appropriate and reasonable manner in order to guarantee that these vital substances are accessible to patients who are in need of them and to eliminate any unneeded risk of contracting a disease through the process of transfusion [15].
The blood bank of a tertiary health care centre served as the location for the testing of the study's materials and methodology. After keeping track of the total number of whole blood units and blood component donations made over the course of one year, their annual average was computed. As a typical month, we chose the month whose data came the closest to equating to the annual average blood supply over the course of a year [16]. The patients who received blood or blood components during this representative month had their complete medical histories documented, including their ages, genders, addresses, the consultant in charge of their care, the ward or unit in which they were admitted, their diagnoses, and the reasons why they required a transfusion [17]. The patient's history of disease, both past and present, was taken into account, along with any previous transfusions and reactions to transfusions, if any occurred. Reports of important examinations such as haemoglobin (Hb), platelet count, and coagulation profile, etc. were also recorded. Related terms include: Notations were made regarding the present utilization of blood, which included the number and type of components transfused as well as any reactions that may have occurred. The use of various kinds of components was tracked and associated with the patient's diagnosis and the reasons they required a transfusion [18].

Observational Study

In one year, from 1st, June, 2021 to 31st, May, 2022, at department of pathology, Kurnool Medical College, Kurnool. Our blood bank distributed 7962 units of whole blood and its products. Less units were delivered around year ends and a surge was seen in the middle of the year as the supply displayed some seasonal variation (Table 1). The most widely used product, according to a breakdown of the supply of whole blood and its various components, was whole blood, which was subsequently followed by packed red blood cells (RBC), fresh frozen plasma (FFP), and platelet concentrates (Table 1).

Table 1: One year data on utilization of blood and blood components

Sr. No.	Months	RBC (Packed)	FFP	Platelets	Whole blood	Total
1.	June, 2021	85	67	17	265	434
2.	July, 2021	120	110	58	350	638
3.	August, 2021	200	79	52	210	541
4.	Sept, 2021	110	80	80	310	580
5.	Oct, 2021	150	110	85	250	595
6.	Nov, 2021	190	150	96	290	726
7.	Dec. 2021	120	165	100	320	705
8.	Jan. 2022	198	96	86	298	678
9.	Feb. 2022	150	200	110	250	710
10.	March., 2022	210	168	120	310	808
11.	April, 2022	150	158	96	350	754
12.	May, 2022	286	120	101	286	793
Total		2119	1503	1001	3489	7962

RBC = Red blood cell (Packed); FFP = Fresh frozen plasma

Blood was found to be more plentiful in surgical wards, accounting for 65.25% of the total supply, compared to the 32.02% maximum blood requirement for general surgery. 39.23% of all requests were for blood supplies for hospital wards, with general medicine having the highest demand (60.28%). (Table 2).

Table 2: Blood supply to the different wards

Sr. No	Wads	Number	%
1.	Surgical Ward	280	65.25
2.	General surgery	90	32.02
3.	Orthopedics	62	22.1
4.	Cardiology	09	3.4
5.	Gynecology	45	16.8

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6.	Neurology	53	20.32
7.	Others	08	3.1
8.	Medical wards	165	39.23
9.	Nephrology	42	60.2
10.	Pediatrics	22	14.21
11.	General medicine	96	60.28
12.	Others	04	2.1

The youngest blood unit recipient was a 3-month-old boy, and the oldest was a 92-year-old woman. Patients between the ages of 21 and 60 made up the largest population. The patients' male to female ratio was 1.6:1. Trauma was the most frequent reason why patients needed blood transfusions, followed by cancer and elective surgery. Anemia was the most prevalent indication for all blood products combined, followed by elective surgery. Leukemia-related thrombocytopenia was the most typical sign. Five patients had thrombocytopenia at the time of surgery as the cause. Platelet concentrates were administered to three newborn babies, two of whom had septicemia and thrombocytopenia and one of whom was a preterm baby who also had thrombocytopenia.

Discussion

Like in any other organisation, a blood bank's quality control programme is not complete without internal audits. The goal of quality control in this situation is to give patients safe and useful blood products. The Food and Drug Administration (FDA) views whole blood and its constituent parts as medications because their use is intended to provide the patient with therapeutic advantages. By applying pharmaceutical industry standards to the collection, testing, storage, and supply of safe blood, the FDA emphasises the quality of blood and its products. The blood bank must be able to meet the demand for this life-saving product while also evaluating and assessing the current trends in blood ordering. This is crucial to prevent misuse that could result in a shortage of blood supply and the denial of blood to someone facing a life-threatening emergency. Several authors have emphasised the significance of an internal audit and education programmes that emphasise the proper selection of blood components for patients and avoiding their overuse. They did so because they found a significant decrease in inappropriate demands for blood products after such audits were followed by clinician education sessions. Over time, blood use indications have been established. An Hb level less than 10 g/dl due to any cause was a common reason for blood transfusion in the years following World War II. Better recommendations have been proposed and are currently being implemented globally as a result of the use of blood components for individual patient needs. Blood banks are now routinely manufacturing various blood components from donated whole blood units and supplying solely the components to patients in many hospitals. In some circumstances, however, using whole blood is advised rather than replacing lost blood through components. Polytrauma, such as that experienced by victims of auto accidents, is one such circumstance where the use of whole blood is preferred advised. Blood transfusion is advised according to Advanced Trauma Life Support (ATLS) recommendations for people with class III and IV hypovolemia.

Conclusion

Understanding the role that exercise plays in the functioning of the cardiovascular and respiratory systems contributes to the growing awareness of the health benefits of physical activity. This awareness has been further accentuated by the comprehension of the role that exercise plays in the operation of these systems. It is critical to persuade those who lead sedentary lifestyles to engage in regular physical activity on a daily basis. Our study found that a brief bout of exercise had no discernible effect on the respiratory parameters of either exercise-trained or untrained individuals. This was the case for both groups of participants. A training regimen that lasts for three months and consists of exercise can improve respiratory function while having essentially little effect on cardiovascular function. Further investigation is required in order to get at an accurate assessment of the effects that prolonged physical exercise has on the cardiorespiratory system. If more than 25% of the total blood volume is lost, or if the patient is actively bleeding and has already received 4 units of PRBC, then the patient needs to have a transfusion of whole blood. This is because whole blood not only replenishes the blood volume and oxygen-carrying capacity, but it also replenishes coagulation factors and prevents their dilution. In our study, the ratio of whole blood to PRBC was 1.5:1, which differs from studies that show the ratio of whole blood to PRBC in blood usage to be 1:3 or lower. Due to the fact that our hospital is located in a mountainous area along a busy highway, we see a significant number of patients who have been injured in car accidents. According to the results of our research, the condition that required blood transfusion the most frequently was trauma (20.6%), which includes broken bones, brain injuries, and multiple traumas. In accordance with the instructions provided by ATLS, our doctors requested a greater quantity of whole blood units, which contributed to the high whole blood: RBC ratio that was found. The current practice of replacing the volume of blood that has been lost with components rather than a whole blood unit frequently results in scenarios in which one unit of platelet rich plasma (PRBC) is transfused along

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with one unit each of fresh frozen plasma (FFP) and platelet concentrate in order to attempt to recreate whole blood in the recipient's circulatory system [19]. The fact that the recipient receives three different sets of foreign immunological antigens from various donors, which is something that is transfused into them throughout this process, remains unreported. The introduction of foreign antigens from only one donor results in better replenishment of blood volume when whole blood is given. As a result, the immunological danger to the receiver is reduced when whole blood is given. Because of the reduced oxygen-carrying capacity that bleeding causes, between 33 and 62% of all post-trauma transfusions have been shown to be unsuitable. In the blood banks, it should be encouraged to follow a policy of maximum surgical blood order schedule, in which the expected number of units are just grouped and typed, rather than doing comprehensive crossmatches with a variety of donor units. This would save time and resources [20]. According to our research, the diagnosis of cancer was the second most common reason for individuals to require blood transfusions. Because it is the only tertiary care health institution in this area, our hospital sees a disproportionately high number of patients who have been diagnosed with cancer. Anemia as a result of anorexia, cachexia as a result of cancer treatment, bone marrow suppression as a result of leukaemia or chemotherapy, etc. are all factors that can increase the need for blood in these situations. Several studies have indicated a similarly high percentage of blood usage for patients who have been diagnosed with malignancies. The majority of the fresh frozen plasma (FFP) that was administered to patients with an abnormal prothrombin time (PT) or bleeding but no documented coagulation study was due to demands linked to hepatic diseases. Due to the high volume of patients in our hospital's nephrology dialysis unit, the majority of patients who required blood transfusions for renal diseases were individuals who were already receiving renal dialysis. According to the findings of our investigation, anaemia was the most common reason why patients in medical and many surgical wards required blood transfusions. It is of the utmost importance in this situation to take into consideration the trigger values of Hb and hematocrit for blood transfusions in the event that the patient has anaemia and to link those values with the patient's clinical condition. Patients whose haemoglobin or hematocrit can be improved by other means, such as diet or hematinics, can also benefit from avoiding the inappropriate use of PRBC [21]. Another common practice among medical professionals is giving one or two units of blood to moderately to severely anemic patients when this is not necessary because the amount of haemoglobin (Hb) produced by these transfusions does not significantly increase the patient's capacity to transport oxygen. At the same time, it causes the circulation of the recipient's blood to become contaminated with a number of additional foreign antigens. These kinds of incorrect blood transfers need to be discovered, and then efforts should be made to stop them from happening. In a similar vein, blood transfusions are sometimes performed in classes I and II of shock patients, despite the fact that this is not advised by the WHO recommendations. Only patients who have established hypovolemia of class II or above and are showing only temporary or no improvement need to have blood transfused into their bodies. When it comes to FFP, it is recommended that five to six units be transfused in order to cure the hemostatic defect that is caused by a lack of clotting factor. In many cases, only one or two units are exchanged during a transfusion. There are a great number of papers like this that can be found addressing the incorrect transfusion of FFP at various facilities. These findings suggest that 29–40% of FFPs were utilised inappropriately. In point of fact, it ought to be the primary objective of each and every blood bank to attain even better rates of appropriate transfusion of a variety of blood products.

The results of this pilot study provide information regarding the utilisation of blood component products at our tertiary care hospital. It is relevant for quality monitoring of transfusion practice, cost assessments, and for designing local and regional blood donation programmes as it displays the trend of utilisation of blood and blood components. The product that was employed the most was whole blood, followed by platelet concentrates, then packed red blood cells, and finally fresh frozen plasma. It was discovered that the surgical wards had the greatest availability of blood. The diagnosis of trauma was the one that occurred most frequently among patients who need blood, followed by cancer and surgery. In general, anaemia was the most common symptom that was seen. Since our facility treats a high volume of trauma patients, we go through a significant amount of whole blood every day. It is advised that a periodic assessment of blood usage be followed by instructional workshops for doctors in order to prevent the misuse or overuse of blood, either of which could result in a scarcity of accessible blood for someone who is facing a scenario in which their life is in danger.

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