Pattern of Blood Components Utilization in Grande International Hospital: A Tertiary Care Hospital of Nepal

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ABSTRACT

Background

Blood transfusion is an essential therapeutic intervention in modern medicine, crucial for managing anemia, bleeding disorders, trauma, and perioperative blood loss. Despite its life-saving potential, inappropriate transfusion practices can deplete limited blood resources and increase patient risk. Systematic evaluation of transfusion patterns is necessary to promote judicious use and enhance patient safety.

Method

A retrospective observational study was conducted over six months (June to December 2024), including all patients who received blood component transfusions. Data were extracted from blood bank records and patient charts, capturing demographics, type and indication of blood component transfused, and requesting department. Descriptive statistics summarized utilization patterns and departmental distribution.

Result

A total of 1,850 transfusion events involving 3,032 blood components were analyzed. Packed Red Blood Cells (PRBCs) were the most frequently transfused component (1,500 units, 50%), primarily for anemia, surgical support, and critical care. Platelets accounted for 750 units (25%), mainly for thrombocytopenia, gynecological procedures, and critical care. Fresh Frozen Plasma (FFP) comprised 600 units (20%), used for coagulation disorders, major surgeries, and dialysis. Cryoprecipitate was least utilized (150 units, 5%), primarily for hemophilia A and fibrinogen deficiency. Department-wise, dialysis had the highest transfusion demand (50%), followed by the intensive care unit (22%) and orthopedic surgery (12%). Lower utilization was observed in gastroenterology, gynecology, internal medicine, pulmonology, and pediatrics. Out of total component requested only 61% percent is transfused.

Conclusion

PRBCs remain the cornerstone of transfusion therapy, with significant variation in component use across hospital departments. The findings underscore the importance of tailored transfusion strategies and resource allocation, particularly in high-demand areas such as dialysis and critical care. Ongoing evaluation of transfusion appropriateness and outcomes is recommended to further enhance transfusion safety and efficiency.

Keywords: Blood Transfusion; Transfusion Medicine; Fresh Frozen Plasma; Cryoprecipitate

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Received: 19 May 2025
Accepted: 14 June 2025
DOI: https://doi.org/10.3126/gmj.v5i1.82024

Introduction

Blood and its components-packed red blood cells (PRBCs), fresh frozen plasma (FFP), platelets, and cryoprecipitate are indispensable therapeutic resources in modern medicine. They play a crucial role in the management of a wide spectrum of clinical conditions, including severe anemia, coagulation disorders, trauma-related hemorrhage, and perioperative blood loss. The timely and appropriate use of these blood products can be life-saving and significantly improve patient outcomes. However, despite their importance, inappropriate or unnecessary transfusions remain a pervasive challenge globally. Such practices not only deplete scarce blood supplies but also increase the risk of adverse events for recipients, including transfusion reactions, transmission of infections, and immune sensitization leading to alloimmunization.

Grande International Hospital, recognized as a premier tertiary care center, offers comprehensive transfusion services catering to a diverse patient population with complex medical and surgical needs. Although the hospital manages a substantial volume of transfusion events annually, there has been no systematic evaluation of blood component utilization patterns to date. Understanding how blood products are used across different clinical departments and indications is essential for optimizing transfusion practices, enhancing patient safety, and ensuring efficient resource management.

This study is designed to fill this gap by providing a detailed assessment of blood component usage at Grande International Hospital. By analyzing transfusion data, identifying the most commonly transfused components, and examining the clinical contexts in which they are employed, this research aims to inform evidence-based transfusion policies. Ultimately, such insights will support the development of targeted strategies to promote rational blood use, reduce wastage, and improve overall quality of care within the institution.

Material and Methods

This retrospective observational study was conducted at Grande International Hospital, a tertiary care medical center, to evaluate transfusion practices. Data were collected over a six-month period, from June to December 2024. The study population included all patients who received one or more blood component transfusions during this period, encompassing all age groups and clinical departments within the hospital.

Data were sourced from the hospital's blood bank records and individual patient medical charts. The following variables were extracted:

- Patient demographics, specifically age and gender.
- The type of blood component(s) transfused, including Packed Red Blood Cells (PRBC), Fresh Frozen Plasma (FFP), platelets, and cryoprecipitate.
- The documented clinical reason for each transfusion episode.
- The specific hospital department that requested the blood component transfusion.

Descriptive statistical methods were utilized for data analysis, with categorical variables summarized using frequencies and percentages. The proportion of transfusions deemed appropriate versus inappropriate was calculated, and these findings were further categorized by both the type of blood component administered and the requesting hospital department.

Results

This study analyzed 1,850 transfusion events involving a total of 3,000 individual blood components, revealing a clear pattern in the utilization of different blood products. Packed Red Blood Cells (PRBCs) were the most commonly transfused component, accounting for 1,500 units (50% of total transfusions). The main clinical indications for PRBC transfusions included anemia management (600 units), perioperative support during surgical procedures (500 units), and critical care stabilization (400 units). Platelet concentrates were the second most frequently used component, with 750 units administered, representing 25% of the total. Platelet transfusions were primarily given for thrombocytopenia (375 units), gynecological interventions (188 units), and critical care needs (187 units). Fresh Frozen Plasma (FFP) accounted for 600 units or 20% of the transfusions, mainly used to manage coagulation disorders (240 units), support major surgical procedures (200 units), and assist patients undergoing dialysis (160 units). Cryoprecipitate was the least utilized, comprising 150 units (5% of total transfusions), predominantly applied in the treatment of hemophilia A (80 units), fibrinogen deficiency (50 units), and chronic

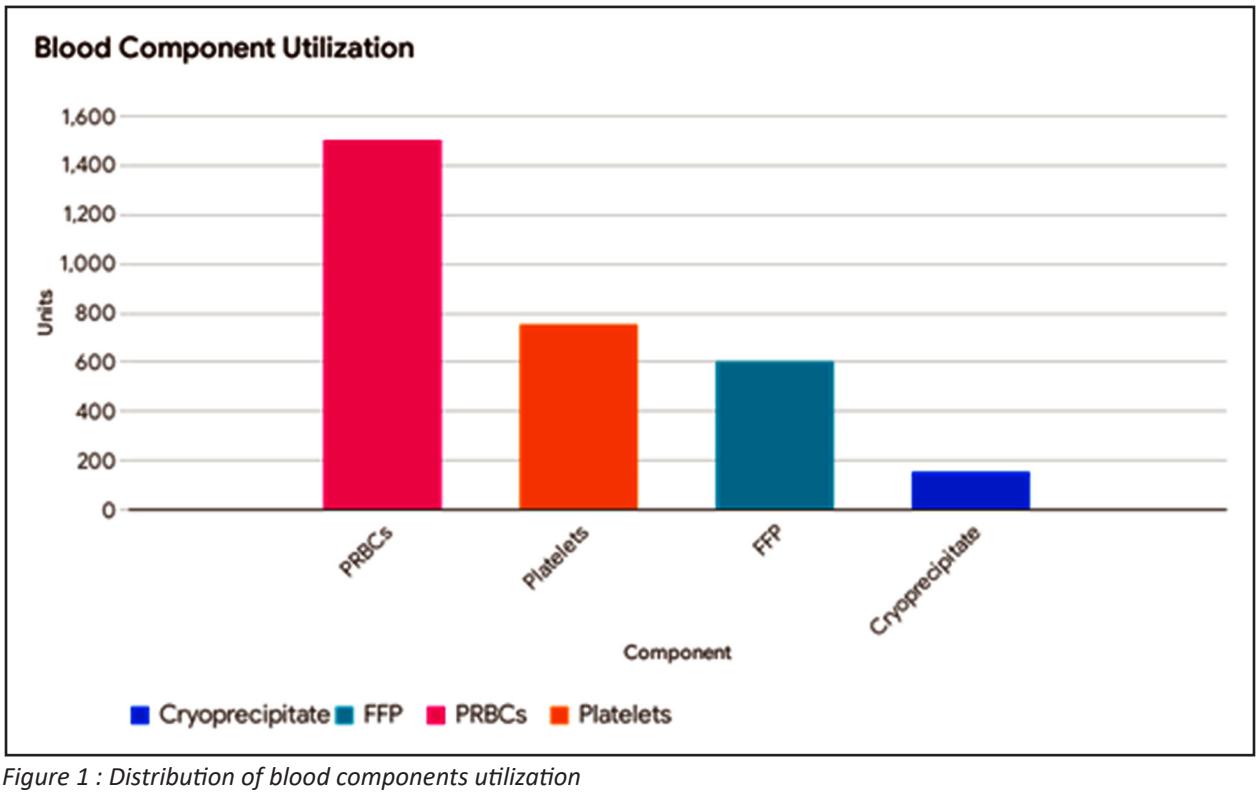

Figure 1 : Distribution of blood components utilization

disease (20 units). Overall, the distribution of blood component use followed a descending order of PRBCs, Platelets, FFP, and Cryoprecipitate, reflecting the clinical priorities and transfusion needs within the study population (Figure 1).

Discussion

The analysis of 1,850 transfusion events involving 3,000 individual blood components in this study highlights a distinct hierarchy in blood product utilization. Packed Red Blood Cells (PRBCs) emerged as the most frequently transfused component, accounting for 50% of total transfusions (1,500 units). This predominance is consistent with their essential role in managing anemia, supporting perioperative blood loss, and stabilizing critically ill patients—clinical indications that accounted for the majority of PRBC use in this cohort. Platelet concentrates were the second most commonly administered product, representing 25% of transfusions (750 units), primarily used to treat thrombocytopenia, support gynecological procedures, and address critical care needs. Fresh Frozen Plasma (FFP) constituted 20% of transfusions (600 units), mainly employed for coagulation disorders, major surgical support, and dialysis-related indications. Cryoprecipitate was the least utilized component, comprising only 5% of transfusions (150 units), predominantly for hemophilia A, fibrinogen deficiency, and other chronic conditions.

An analysis of transfusion utilization across various medical departments (Figure 2), based on a total of 1,850 transfusion events, revealed significant variations in blood product demand. The Dialysis Unit accounted for the highest proportion, with approximately 925 transfusions (50%), reflecting the substantial requirements associated with chronic renal replacement therapy. The Intensive Care Unit (ICU) was the second largest consumer, with around 407 transfusions (22%), consistent with the complex and critical nature of care provided. Orthopedic Surgery followed with 222 transfusions (12%), highlighting the high demand linked to surgical procedures. Moderate usage was observed in Gastroenterology (93 transfusions, 5%), Gynecology (74, 4%), and Internal Medicine (56, 3%). The High Dependency Unit (HDU) contributed 37 transfusions (2%), while Pulmonology and Pediatrics had the lowest utilization, with approximately 28 transfusions each (1.5%).

This distribution illustrates marked differences in transfusion needs, with departments managing chronic conditions, critical care, or major surgeries consuming significantly more blood products than other specialties. Notably, 39% of the total blood requested was not transfused (Figure 3), indicating

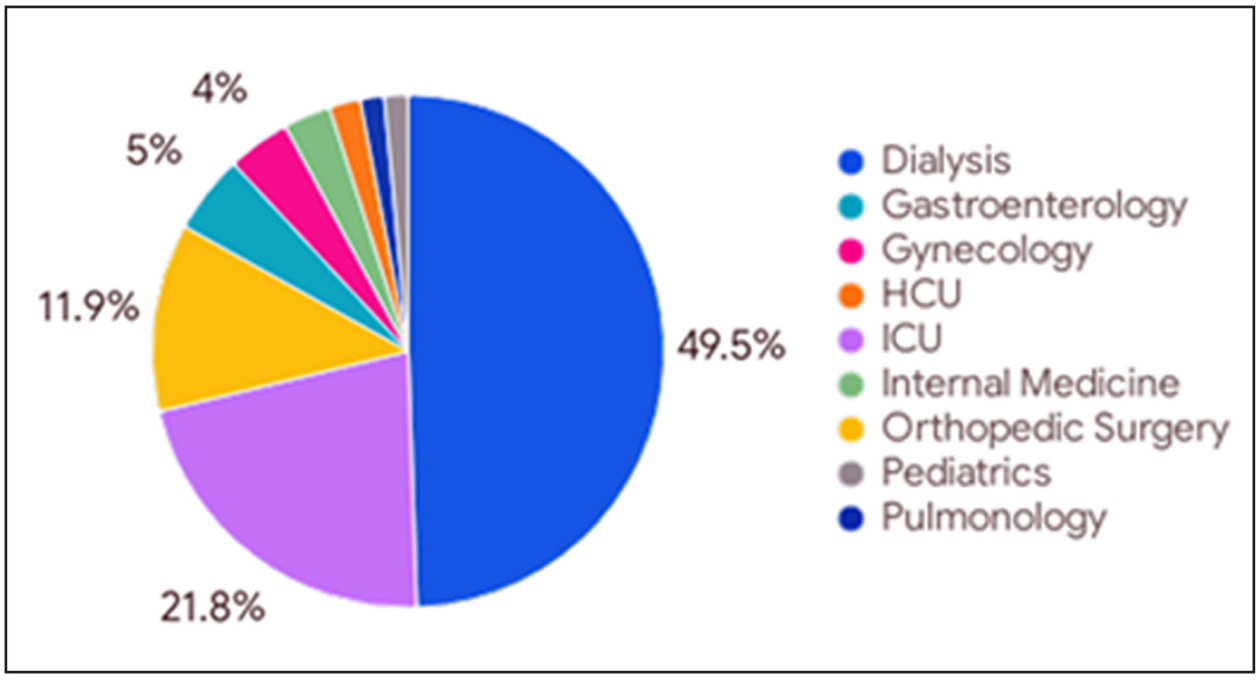

Fig 2: Utilization of blood in different wards.

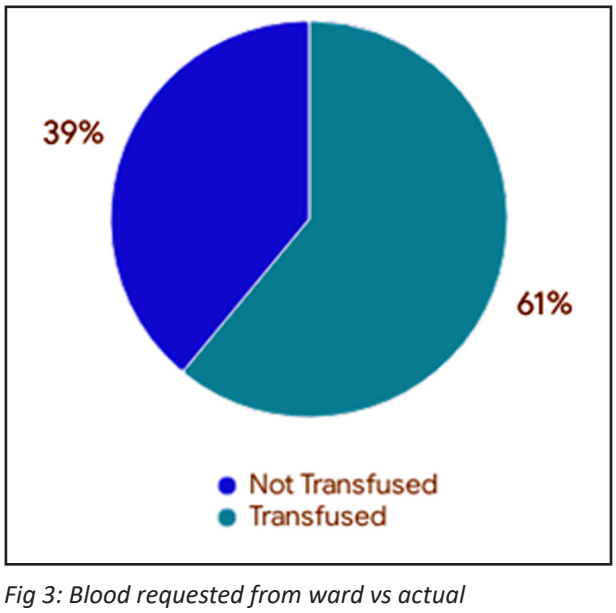

Fig 3: Blood requested from ward vs actual transfusion percentage

potential over-ordering or changes in clinical condition.

The observed pattern of blood component utilization, PRBCs followed by platelets, FFP, and cryoprecipitate mirrors findings from multiple prior studies. For instance, a comprehensive review demonstrated that PRBCs consistently represent the largest proportion of transfused components due to their critical function in oxygen delivery and anemia management across diverse clinical settings[1]. Similarly, a research reported platelet transfusions as the second most common blood product, reflecting their importance in managing thrombocytopenia and bleeding risks in surgical and critical care patients[2]. The relatively lower utilization of FFP and cryoprecipitate aligns with evolving transfusion guidelines that emphasize restrictive and indication-based use of plasma products to minimize risks such as transfusion-related acute lung injury (TRALI) and volume overload[3].

Our data further underscore the clinical prioritization of blood components based on the underlying pathology and procedural requirements. The high volume of PRBC transfusions for anemia and surgery aligns with global transfusion trends while the substantial platelet use in gynecological and critical care settings reflects the specialized needs of these patient populations[4]. The limited use of cryoprecipitate, despite its vital role in specific coagulation disorders, is consistent with its niche application and availability constraints.

In conclusion, the transfusion practices observed in this study are consistent with international standards and published literature, reinforcing the critical role of PRBCs and platelets in contemporary transfusion medicine. Future research should focus on optimizing transfusion strategies to balance efficacy with safety, particularly in the use of plasma products.

The department-wise analysis of transfusion utilization in this study highlights significant variability in blood product demand across clinical

specialties, reflecting the diverse transfusion needs associated with different patient populations and medical conditions. Dialysis emerged as the highest consumer of blood components, accounting for 50% of transfusions. This finding aligns with existing literature emphasizing the high transfusion requirements in patients undergoing chronic renal replacement therapy, who frequently experience anemia and bleeding complications due to uremia and anticoagulation during dialysis sessions[5–6]. The substantial transfusion volume in this group underscores the ongoing challenges in managing anemia and maintaining hemostatic balance in end-stage renal disease patients.

The Intensive Care Unit (ICU) was the second largest user of blood products, comprising 22% of transfusions. This is consistent with prior studies that identify the ICU as a major site of transfusion due to the complexity and severity of critical illnesses, including sepsis, trauma, and multi-organ failure, which often necessitate transfusion support to manage anemia, coagulopathy, and bleeding[7–8]. The high transfusion rates in the ICU reflect the critical role of blood components in stabilizing hemodynamically unstable patients and supporting invasive procedures.

Orthopedic surgery accounted for 12% of transfusions, highlighting the significant blood product requirements associated with major surgical interventions, particularly those involving extensive tissue trauma and blood loss. This finding is in agreement with reports from surgical cohorts where orthopedic procedures, such as joint replacements and fracture repairs, are recognized as common indications for transfusion[4–9]. The moderate transfusion rates observed in Gastroenterology, Gynecology, and Internal Medicine departments reflect their more selective transfusion needs, often related to bleeding disorders, procedural blood loss, or chronic disease management.

Lower transfusion utilization in Pulmonology and Pediatrics (each 1.5%) may be attributed to the nature of diseases managed within these specialties, which generally involve less frequent or less severe bleeding and anemia requiring transfusion support. Similar trends have been reported in previous studies where transfusion demand is closely linked to the clinical acuity and invasiveness of interventions within each department[10,11].

Overall, the observed distribution of transfusion utilization underscores the importance of tailoring blood product management strategies to the specific needs of each clinical setting. Departments managing chronic diseases, critical care patients, and major surgical cases demonstrate markedly higher transfusion demands, emphasizing the need for targeted transfusion protocols and resource allocation. These findings reinforce the value of multidisciplinary approaches to optimize transfusion practices, reduce unnecessary transfusions, and improve patient outcomes[9].

Conclusion

In conclusion, this study reveals that PRBCs are the most utilized blood component, followed by platelets, FFP, and cryoprecipitate, reflecting their importance in managing anemia, surgical blood loss, and critical illness. Transfusion demand varies significantly across hospital departments, with dialysis and ICU exhibiting the highest utilization, underscoring the need for tailored transfusion strategies and resource allocation. Out of total component requested only 61% percent is transfused.

Further research is needed to evaluate the appropriateness of these transfusion practices and their impact on patient outcomes, which represents a significant gap in current understanding.

Acknowledgments

We acknowledge the support of the blood bank and medical records department at Grande International Hospital for providing access to the necessary data.

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