International Journal of Anesthesia and Clinical Medicine
2026, Vol. 14, No. 1, pp. 98–101
https://doi.org/10.11648/j.ijacm.20261401.25

Research Article

# Blood Transfusion Requirements in The Intensive Care Unit at Analankininina University Hospital, Toamasina, Madagascar

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## Abstract

Introduction: Blood transfusion is a common and essential therapeutic intervention in intensive care units (ICUs), particularly for managing anemia and hemorrhagic conditions. This study aimed to evaluate transfusion practices, requirements, and outcomes in the ICU of Analankininina University Hospital, Toamasina, Madagascar. Methods; A monocentric descriptive cross-sectional study was conducted over a 12-month period. All patients who received at least one blood transfusion during their ICU stay were included. Data were collected from medical records and analyzed using standard statistical methods. Results: Among 562 ICU admissions, 11.6% (n=65) of patients received transfusions. The mean age was 40 ± 16.9 years, with a female predominance (sex ratio M: F = 2: 3). Hemorrhagic syndromes were the leading indication (41.5%). A total of 135 blood units were requested, of which 79.3% were available. The mean delay between prescription and transfusion was 1h53 ± 1h42. Adverse reactions occurred in 6.2% of patients. Conclusion: Blood transfusion needs in this setting were moderate but constrained by limited availability. Strengthening coordination with blood banks and promoting voluntary donation could improve transfusion efficiency and patient outcomes.

## Keywords

Adverse Effects, Blood Transfusion, Hemorrhage, Intensive Care Unit

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**Received:** 16 April 2026; **Accepted:** 25 April 2026; **Published:** 11 May 2026

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## 1. Introduction

Blood transfusion is a substitutive therapeutic aiming to compensate one or several blood componens deficit of constitutional or acquired origin [1].

Blood transfusion is a life-saving act that improves patient care. However, blood transfusion is at risk of potential immediate or late complications. Thus, it should only be prescribed out of necessity [1].

Control of the prescription of use of blood products is an essential step of transfusion security, and an assessment of blood products consumption is a mandatory to ensure the quality and reliability of the prescription of use of this precious treatment resource, specifically in the context of intensive care unit (ICU).

Blood transfusion is a very common practice at the ICU of the Analankininina University Hospital, which in consequence leads to difficulties in the management of blood products availability. The current study aimed to assess transfusion practice at the ICU of the Analankininina University Hospital, Toamasina, Madagascar, in order to highlight the potential areas for improvement.

## 2. Materials and Methods

This was a retrospective descriptive cross-sectional study conducted in the intensive care unit of Analankininina University Hospital over an 18-month period (July 2019 to January 2021).

All patients admitted to the ICU who received at least one blood transfusion during their hospitalization were included. Patients who refused transfusion or whose medical records were incomplete were excluded. For patients receiving multiple transfusions, only the first transfusion episode was considered.

Data were collected from medical records using a standardized data extraction form. Variables included demographic characteristics, clinical indications for transfusion, laboratory findings (hemoglobin, hematocrit, platelet count), transfusion type and quantity, delays in transfusion, adverse reactions, and patient outcomes.

Data analysis was performed using Microsoft Excel and Epi Info. Quantitative variables were expressed as means ± standard deviation, and qualitative variables as percentages. Associations between variables were assessed using appropriate statistical tests, with a significance threshold set at $p < 0.05$.

## 3. Results

Among 562 ICU admissions, 65 patients (11.6%) received at least one blood transfusion. The mean age was 40 ± 16.9 years (range: 3–93), with a female predominance.

Indications for blood transfusion therapy were dominated by hemorrhagic syndrome (Table 1).

***Table 1.*** *Indications for blood transfusion.*

| Indication | n | % |
|---|---|---|
| Hemorrhagic syndrome | 27 | 41.5 |
| Postoperative | 15 | 23.1 |
| Medical conditions | 17 | 26.2 |
| Severe anemia | 6 | 9.2 |
| Total | 65 | 100 |

Surgical pathologies [73.85% (n=48)] were predominant among the etiologies, mainly represented by digestive tract hemorrhages. Etiologies of medical origin [26.15% (n=17)] consisted of: sickle cell disease acute crisis, renal failure and severe malaria.

Around 68.08% (n=41) of the population study benefited from a complete blood count (CBC) in addition to ABO-Rh blood group determination. The mean hemoglobin level was 6.33 ± 2.34 g/dL. Most patients had hematocrit levels below 35%. Platelet counts were within normal range in more than half of patients. ABO-Rh blood group determination (Table 2) revealed a distribution of patients, in order of frequency, mainly between O-Rh+, B-Rh+, and A-Rh+ groups.

***Table 2.*** *Distribution of patients according to blood group determination.*

| Blood group | Number (n) | Percentage (%) |
|---|---|---|
| A Rh- | 1 | 1.54 |
| A Rh+ | 14 | 21.54 |
| AB Rh+ | 4 | 6.15 |

| Blood group | Number (n) | Percentage (%) |
|---|---|---|
| B Rh- | 1 | 1.54 |
| B Rh+ | 18 | 27.69 |
| O Rh- | 2 | 3.07 |
| O Rh+ | 25 | 38.46 |
| TOTAL | 65 | 100 |

Analysis of the degree of emergency of the blood transfusion therapy (Table 3) showed that emergency blood transfusion was indicated in 92.31% (n=60) of patients, with 49.23% (n=32) considered as an immediate vital emergency.

***Table 3.*** *Distribution of patients according to the degree of emergency.*

| Type of transfusion | n | % |
|---|---|---|
| Immediate vital emergency | 32 | 49.2 |
| Urgent | 28 | 43.1 |
| Scheduled | 5 | 7.7 |

A total of 135 blood units were requested, of which 107 (79.3%) were provided. The average delay from prescription to transfusion was 1 hour 53 minutes. Emergency transfusions represented 92.3% of cases.

The time to get a blood product after the prescription of a blood transfusion therapy varied greatly from 00h15 minutes to 09h40 minutes, with a mean time of 01h53±102 minutes (Table 4). The time to get a blood product was decreased in the context of scheduled therapy (prescription 1 to 2 days before the transfusion). Duration of transfusion therapy widely varied from 00h20 minutes to 05h05 minutes, with an average duration of 02h27±01h19 minutes.

***Table 4.*** *Transfusion characteristics.*

| Parameter | Value |
|---|---|
| Units requested | 135 |
| Units supplied | 107 (79.3%) |
| Mean delay | 1h53 ± 1h42 |
| Mean transfusion duration | 2h27 ± 1h19 |
| Adverse reactions | 6.2% |

Adverse transfusion reactions were observed in 6.2% of patients and were limited to mild events (chills and urticaria). The overall mortality rate was 21.5%, mainly related to underlying conditions.

## 4. Discussion

This study highlights the challenges of blood transfusion practices in a resource-limited ICU setting. The transfusion rate (11.6%) observed in our study is lower than that reported in some international studies, which may reflect limited availability of blood products rather than a lower clinical need [2, 3].

Hemorrhagic conditions, particularly of gastrointestinal origin, were the main indications for transfusion. This finding is consistent with previous studies conducted in similar settings, where acute bleeding and surgical conditions are main reasons of transfusion requirements [4-6, 10].

The relatively low hemoglobin levels observed before transfusion (mean 6.33 g/dL) are in line with restrictive transfusion strategies recommended in critically ill patients [5, 16]. These strategies aim to reduce unnecessary transfusions while maintaining adequate tissue oxygenation.

One of the major findings of this study is the limited availability of blood products, with only 79.3% of requested units being supplied. This shortage is likely due to insufficient voluntary blood donation, logistical constraints, and reliance on replacement donation systems, as reported in other low-resource settings [7-10].

The delay between prescription and transfusion, although moderate (mean 1h53), may still negatively impact patient outcomes, particularly in emergency situations. Timely transfusion is a critical determinant of survival in hemorrhagic shock and severe anemia [2, 5].

The incidence of adverse transfusion reactions (6.2%) was relatively low and comparable to findings in developing countries, although higher than rates reported in high-income countries, where improved hemovigilance systems are in place [11-13]. Underreporting of minor reactions cannot be excluded.

The mortality rate (21.5%) observed in this study is comparable to other ICU studies [2, 14, 15]. Importantly, no deaths were directly attributable to transfusion itself but rather to the severity of underlying conditions. However, delays in transfusion and insufficient availability of blood products may have contributed indirectly to poor outcomes.

This study has several limitations. Its retrospective design and single-center setting may limit generalizability. In addition, the absence of advanced immunohematological testing (such as alloantibody screening) and limited statistical analysis restrict the depth of interpretation.

Despite these limitations, this study provides valuable insight into transfusion practices in a low-resource ICU and highlights key areas for improvement, including strengthening blood supply systems, improving coordination between clinical teams and blood banks, and promoting voluntary blood donation.

## 5. Conclusion

Blood transfusion practices in this ICU are characterized by moderate demand but significant limitations in blood product availability. Improving coordination between clinical teams and blood banks, promoting voluntary blood donation, and optimizing transfusion practices are essential to enhance patient care in resource-limited settings.

## Abbreviations

ICU Intensive Care Unite
CBC Complete Blood Count

## Author Contributions

**Rafanomezantsoa Toky Andriamahefa:** Conceptualization, Resources
**Welson José:** Data curation, Methodology
**Lalarizo Rakoto Mahary:** Formal Analysis, Investigation
**Randriamanantany Zely Arivelo:** Validation
**Harioly Nirina Marie Osé Judicaël:** Validation

## Conflicts of Interest

The authors declare no conflicts of interest.

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