

Blood Utilization and NABH Quality Indicators in a Trauma Center: A Retrospective Cross-Sectional Study

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Abstract: Background: Blood transfusion services are central to patient care, and regular audit of utilization and quality indicators is essential to maintain safety, efficiency, and minimize wastage. NABH-mandated quality indicators provide a practical framework for continuous quality improvement in transfusion medicine. Methods: A retrospective cross-sectional study was conducted over 8 months, from January 2025 to August 2025, at the Trauma Center, Department of Transfusion Medicine. Records of 13,053 blood donations and all transfusion requests were reviewed. Blood utilization indices, including crossmatch-to-transfusion ratio, transfusion probability, and transfusion index, were calculated, along with NABH quality indicators such as transfusion-transmitted infection rate, adverse transfusion reaction rate, adverse donor reaction rate, donor deferral rate, component quality-control failures, discard rate, and turnaround time. Results: A total of 22,615 blood components were transfused. The crossmatch-to-transfusion ratio was 1.2, transfusion probability was 99.5%, and transfusion index was 3.0. The transfusion-transmitted infection rate was 1.7%, adverse transfusion reaction rate was 0.19%, adverse donor reaction rate was 0.38%, donor deferral rate was 2.53%, discard rate was 9.2%, and turnaround time was 45 minutes for elective cases and 30 minutes for emergency cases. Conclusion: Regular monitoring of blood utilization and NABH quality indicators helps identify inefficiencies early and supports corrective and preventive actions. Strengthening component preparation processes and donor counseling can further improve transfusion service quality.

Keywords: Blood transfusion, quality indicators, NABH, blood utilization, trauma center, transfusion medicine

1. Introduction

Blood transfusion services are a critical part of hospital care, especially in trauma and emergency settings where rapid access to safe blood and components can directly affect outcomes. Efficient blood utilization is important not only for patient safety but also for reducing unnecessary crossmatching, wastage, and workload in blood banks.

Quality management systems in transfusion medicine rely on continuous monitoring of key performance indicators and quality indicators to ensure that standards are maintained. NABH has defined a set of blood bank quality indicators that support structured quality monitoring, benchmarking, and corrective action.

Studies from transfusion services have shown that regular audit of utilization indices and quality indicators improves blood bank performance and helps identify areas that need process refinement.

2. Aims and Objectives

Aim

To evaluate blood utilization patterns and NABH quality indicators in a trauma center transfusion service.

Objectives

- To calculate blood utilization indices, including crossmatch-to-transfusion ratio, transfusion probability, and transfusion index.

- To assess NABH-mandated quality indicators in the blood transfusion service.
- To compare observed values with accepted benchmark levels.
- To identify areas requiring improvement in transfusion safety and efficiency.

3. Material and Methods

This retrospective cross-sectional study was conducted over 8 months, from January 2025 to August 2025, in the Department of Transfusion Medicine at a Trauma Center. Records of 13,053 blood donations and all transfusion requests during the study period were reviewed. The study used routine blood bank registers and transfusion records.

Blood utilization was assessed using standard indices: crossmatch-to-transfusion ratio, transfusion probability, and transfusion index. NABH quality indicators were also analyzed, including transfusion-transmitted infection rate, adverse transfusion reaction rate, adverse donor reaction rate, donor deferral rate, component quality-control failures, discard rate, and turnaround time for blood issue.

Data were compiled and analyzed descriptively. The observed indicators were interpreted against NABH benchmark expectations and performance targets used in published transfusion medicine audits.

Study Design

A retrospective cross-sectional observational study was conducted to evaluate blood utilization patterns and National Accreditation Board for Hospitals and Healthcare Providers (NABH)-mandated quality indicators in the Department of Transfusion Medicine at the Trauma Center.

Study Period

The study was carried out over a period of eight months, from January 2025 to August 2025.

Study Setting

The study was conducted in the Department of Transfusion Medicine, Trauma Center, using routine blood bank records and transfusion service data.

Inclusion Criteria

- All whole blood donations collected during the study period.
- All blood component requests and transfusions performed during the study period.
- Records with complete donor and transfusion information available in the blood bank registers.

Exclusion Criteria

- Incomplete or illegible records.
- Duplicate entries identified during data verification.
- Records outside the study period.
- Data Collection

Data were collected retrospectively from routine blood bank registers, donor records, transfusion request forms, component issue registers, transfusion reaction records, donor reaction records, and quality management records.

Data Collection

Data were collected retrospectively from routine blood bank registers, donor records, transfusion request forms, component issue registers, transfusion reaction records, donor reaction records, and quality management records.

Blood utilization was assessed using the following indices:

- Crossmatch-to-Transfusion (C/T) Ratio
- Transfusion Probability (TP%)
- Transfusion Index (TI)

The following NABH quality indicators were evaluated:

- Transfusion-transmitted infection (TTI) rate
- Adverse transfusion reaction rate (ATRR)
- Adverse donor reaction (ADR) rate
- Donor deferral rate (DDR)
- Blood component discard rate
- Component quality-control (QC) failures
- Turnaround time (TAT) for elective and emergency blood component issue

Statistical Analysis

Data were entered into Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and analyzed using descriptive statistics. Continuous variables were expressed as frequencies, percentages, and ratios wherever applicable. Blood utilization indices (C/T ratio, TP%, and TI) and NABH quality indicators were calculated using standard formulae

and compared with accepted NABH benchmark values and published literature. No inferential statistical tests were performed, as the study was descriptive in nature.

4. Results

A total of 13,053 blood donations were recorded, and 22,615 blood components were transfused during the study period. Blood utilization indices showed efficient use of blood and components, with a crossmatch-to-transfusion ratio of 1.2, transfusion probability of 99.5%, and transfusion index of 3.0. NABH quality indicators showed a transfusion-transmitted infection rate of 1.7%, adverse transfusion reaction rate of 0.19%, adverse donor reaction rate of 0.38%, donor deferral rate of 2.53%, and discard rate of 9.2%. Turnaround time was 45 minutes for elective cases and 30 minutes for emergency cases.

Table 1: Blood Utilization and NABH Quality Indicators

Parameter	Observed Value	Interpretation
Blood donations	13,053	Study population
Blood components transfused	22,615	High component utilization
Crossmatch-to-transfusion ratio	1.2	Efficient utilization
Transfusion probability (%)	99.5	Very high utilization
Transfusion index	3.0	Efficient utilization
TTI rate (%)	1.7	Below benchmark
ATRR (%)	0.19	Below benchmark
ADR rate (%)	0.38	Below benchmark
Donor deferral rate (%)	2.53	Low
Discard rate (%)	9.2	Moderate area for improvement
Turnaround time, elective	45 minutes	Acceptable
Turnaround time, emergency	30 minutes	Acceptable

5. Discussion

The findings demonstrate efficient blood utilization, reflected by a low crossmatch-to-transfusion ratio and very high transfusion probability. Similar studies have reported that regular auditing of utilization indices supports better ordering practices and reduces unnecessary crossmatching.

The observed transfusion-transmitted infection rate, adverse transfusion reaction rate, and adverse donor reaction rate were all within acceptable ranges and comparable to quality-audit studies from transfusion centers that actively monitor NABH indicators.

The discard rate of 9.2% suggests that component wastage remains an area for improvement, especially in relation to component preparation, storage, and inventory management. Published NABH-based audits similarly emphasize wastage reduction, donor counseling, and process optimization as important quality targets.

Turnaround time was within a practical range for both elective and emergency transfusion requests. This is important in trauma services, where delays can affect clinical outcomes, and it supports the value of a structured quality management system in transfusion services.

6. Recommendation

Maintain routine monitoring of blood utilization indices and NABH quality indicators. Strengthen component preparation, storage, and inventory control to reduce discard rate. Improve donor counseling and donor-selection processes to reduce deferral and donor reactions. Continue periodic feedback to clinicians to optimize ordering practices and transfusion requests.

Use audit findings for corrective and preventive actions within the quality management system.

7. Limitation

This study was retrospective and based on record review, so it depended on the accuracy and completeness of existing documentation. It was also conducted at a single trauma center over 8 months, which may limit generalizability to other hospitals or longer study periods.

8. Conclusion

Regular monitoring of blood utilization patterns and NABH quality indicators improves transfusion service performance by identifying inefficiencies early and supporting corrective action. The study showed efficient blood use, acceptable safety indicators, and an opportunity to improve component discard rates and donor-related quality processes.

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