



Original Article

# Blood transfusion practices in a tertiary care hospital in Nepal

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## ABSTRACT

**Background:** Blood transfusion is an integral part of patient management. Good transfusion practice guided by standard protocols is considered ideal for optimal use of resources and manpower. Cross-match requests disproportionate to the actual requirement causes overestimation of blood usage and potential wastage. This study aims to determine the crossmatch, transfusion, and utilization rates for blood using transfusion index, and cross-match to transfusion ratio in the various departments of the hospital for the evaluation of transfusion practices.

**Materials and Methods:** A retrospective study was conducted using the records from the hospital blood bank for 12 months to obtain transfusion and cross-match records from various clinical units. Transfusion requests, units cross-matched, and completed transfusions were used to calculate the cross-match to transfusion ratio, and transfusion index for each department.

**Results:** A total of 5156 units of blood were cross-matched for 3437 transfusion requests, out of which 3752 were transfused, giving a mean cross-match to transfusion ratio of 1.37. The non-usage of blood was 27.2% and the transfusion index stood at 1.09. The cross-match to transfusion ratio for the individual clinical units ranged from 1.75 (Surgery) to 1.14 (Medicine).

**Conclusions:** The cross-match to transfusion ratio and transfusion index were within recommended ranges, showing good utilization and low blood wastage. The establishment of a blood ordering protocol via a multidisciplinary approach should be considered to further optimize blood transfusion practices.

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## INTRODUCTION

Blood is a valuable resource for patient management in hospitals. Worldwide, more than 110 million blood donations are done every year, and those in the south-east Asian region comprise about 15% of total donations.<sup>1</sup> Whole blood accounts for 89% of all blood transfusions while apheresis accounts for the remaining 11%. The indications for blood transfusions vary from place to place. Blood transfusions for supportive care in cardiovascular and transplant surgery, massive trauma, and therapy for solid and hematological malignancies are the most common uses in developed countries, while transfusions to treat pregnancy-related complications and severe childhood

anemia are more common in developing countries.<sup>2,3</sup>

Blood transfusion carries the potential to cause adverse effects such as immune and non-immune mediated transfusion reactions, as well as exposes the recipient to various transfusion transmissible diseases. Overestimation of blood usage, especially in resource-constrained settings, burdens the transfusion services in terms of unnecessary usage of reagent, time, and manpower. Over-ordering of blood leads to financial loss for the patient, an increase in cost during hospital-stay, and an increase in overall demand for blood. Thus, the ordering of blood and blood components must be fully justified to avoid misuse or overuse. The cross-match to transfusion (C/T) ratio is used as a measure of the efficiency of blood ordering practice. A ratio of 2.5 and below is generally considered indicative of significant blood usage.<sup>4</sup> A C/T ratio of more than 2.5 means that less than 40% of cross-matched blood is transfused, which indicates excessive cross-matching of blood for a specific procedure.<sup>5-7</sup> Transfusion index (TI) value of 0.5 or more is generally considered indicative of significant blood utilization.<sup>4</sup>

In developing countries like Nepal, the provision of blood and blood products on time is a challenging task due to various factors such as lack of voluntary donors, lack of a robust healthcare network, and inadequate storage and transport facilities. Excessive ordering of blood products and low usage probability further exacerbates the problem. Hence, periodic review and standardisation of transfusion practices are helpful for optimization of blood and blood components utilization, and as a result, improving their availability.

This study was undertaken to evaluate the blood transfusion practices in a tertiary care hospital in Nepal by determining the pattern of transfusion requests, blood utilization, C/T ratio, and TI. We aim to provide a snapshot of where the TI of the hospital lies compared to other hospitals and to formulate general recommendations that will hopefully prove useful in future efforts to optimize blood utilization

## MATERIALS AND METHODS

This retrospective study was conducted at the Shree Birendra Hospital, Chhauni, Kathmandu, Nepal over one year from 14<sup>th</sup> April 2017 to 11<sup>th</sup> April 2018. Permission to carry out the study was obtained from the institutional review committee. The hospital blood bank database was used to obtain cross-match request and transfusion request forms from clinical units including departments of Internal Medicine, Surgery, Pediatrics, Gynecology/Obstetrics, Emergency, Intensive Care Unit, Dialysis, and Oncology during the study period. Transfusion requests, units cross-matched, and completed transfusions were determined for each department and used to calculate the C/T ratio (Total units crossed matched/ Total units transfused), non-usage probability (Total units not transfused/ Total units cross-matched), and transfusion index (TI) (number of units transfused/number of patients cross-matched).<sup>8-9</sup>

As per the hospital policy, all blood products issued out, if not utilized, are returned to the blood bank for proper storage, and whenever possible, crossmatched for another transfusion request. All units issued out and not returned to the blood bank were considered utilized (transfused).

## RESULTS

A total of 5156 units were cross-matched based on 3437 requests for transfusion during the study period of 12 months. The Surgery department had the highest number of transfusion requests (n=1064; 30.9%), followed by the Department of Medicine (n=639; 18.5%). The highest number of blood units were cross-matched for the Surgery department (n=1596; 46.4%).

Out of 5156 cross-matched units, 3752 units (72.7%) were transfused. This gave an average C/T ratio of 1.37 for the entire hospital. Department of Surgery had the highest C/T ratio of 1.75 followed by the Emergency department (1.72). Department of Medicine had the lowest C/T ratio of 1.14, indicating the most efficient usage of blood within

**Table 1: Number of transfusion requests, cross-matching, transfusion, C/T ratio, and TI according to department**

Departments	No. of Transfusion requests	No. of units cross-matched	No. of units transfused n (%)	No. of units not transfused n (%)	C/T ratio	TI
Medicine	640	958	839 (87.5)	119 (12.4)	1.14	1.31
Surgery	1064	1596	907 (56.8)	689 (43.2)	1.75	0.85
Gynae/Obs	415	623	416 (66.7)	207 (33.2)	1.49	1.00
Pediatrics	74	111	96 (86.4)	15 (13.5)	1.15	1.30
Oncology	284	426	320 (75.1)	106 (24.9)	1.33	1.13
Dialysis	430	645	538 (83.4)	107 (16.6)	1.19	1.25
ICU	410	616	531 (86.2)	85 (13.8)	1.16	1.30
Emergency	120	181	105 (58.0)	76 (41.9)	1.72	0.88
<b>Total</b>	<b>3437</b>	<b>5156</b>	<b>3752</b>	<b>1404</b>		

the hospital. The mean transfusion index for the hospital was 1.09. Similarly, the highest TI was seen in the Medicine department (1.31) followed by Pediatrics (1.297), and the lowest was seen in the Surgery department (0.85). (Table 1)

The non-usage value for the hospital stood at 27.2% as 1404 of the 5156 cross-matched units were not transfused. Non-usage was the highest for the department of Surgery (43.2%) and the lowest for the department of Medicine (12.4%).

## DISCUSSION

The main finding of this study is that the mean C/T ratio of all the departments is 1.37. The mean non-usage value is 27.2% and the mean TI is 1.09 for the hospital. The surgery department had the highest C/T ratio of 1.75 and the highest non-usage value of 43.2%, while the department of medicine had the lowest C/T ratio of 1.14 and a non-usage of 12.4 percent.

Overall, the study found the mean C/T ratio in our hospital to be lower than those reported in other tertiary centers in different regions of Nepal and neighboring South Asia countries like India and Pakistan. A pilot study on blood ordering and transfusion practice in routine operation theatres in a tertiary care hospital in Eastern Nepal found a C/T ratio of 6.7.<sup>10</sup> A study on blood transfusion practices in a tertiary care center in northern India found a C/T ratio of 1.6.<sup>11</sup> A study conducted in Egypt in 2011 showed a similar overall CT ratio of 3.9 for a wide range of surgical procedures.<sup>4</sup> The mean C/T ratio is also lower than that reported from other studies from Benin (2.2), Nigeria (2.9), and Saudi Arabia (2.96).<sup>12-14</sup>

A lower C/T ratio indicates better utilization of blood. While the blood that is issued and unused can be returned to the blood bank and potentially reused, non-usage can still lead to increased strain on resources and increases the chance of wastage. The observed differences in utilization may be due to different transfusion policies at different hospitals. In our hospital, blood typing (ABO and Rh) is done before the storage of blood in the blood bank, and cross-matching is only done when transfusion is needed. Moreover, indications of blood transfusions vary depending on the clinical status of patients and their treating clinicians.<sup>15</sup> Possible causes of high C/T ratio include lack of clear blood ordering policies in hospitals, lack of clinical audits, and communication between clinicians and blood bank health care workers.

Our finding of a higher C/T ratio for the Surgery department when compared to the overall C/T ratio of the hospital is expected, and consistent with other studies.<sup>11-14</sup> This could be explained by the need for a precautionary arrangement of blood in various surgical procedures, for use in case of significant blood loss.<sup>16</sup> A large proportion of these

procedures end up not requiring blood transfusion, which contributes to the high C/T ratio. Additionally, preoperative blood ordering tends to be guided more by habit than clinical needs for the specific case.<sup>17</sup> The C/T ratio in the Surgery department in this study, though higher than that for other departments, was still within the generally accepted range of less than 2.5, and also lower than C/T ratios reported for surgical units in other studies.<sup>18</sup> This could be due to differences in department protocols for blood arrangement for procedures in different hospitals.

The TI pattern is similar to those found in other studies done in various parts of the world. A study done by Soleimanha M et al found the TI to be 0.6.<sup>19</sup> Other studies have also shown similar results with high C/T ratios but TI within the generally accepted range.<sup>4</sup>

The current study is limited by its retrospective design and use of secondary data, which introduces errors like typing errors and missing records. We were unable to determine various other indices of blood utilization due to a lack of detailed records. Additionally, there is also a high variation of the primary index (C/T ratio) between hospitals, likely due to the difference in indications for blood ordering based on the type of hospital. A direct comparison with other hospitals is thus difficult.

Instead of cross-match for transfusion practices, the policy of using a type and screen protocol has been proven to be effective without compromising patient safety.<sup>20,21</sup> Other measures with proven improvement in C/T ratio and TI are maximum surgical blood ordering schedule (MSBOS) and type, screen, save, and abbreviated cross-match (TSSAC). The MSBOS uses retrospective analysis of actual blood usage for various elective surgical procedures to specify the number of blood units to be cross-matched for these procedures.<sup>22</sup> In TSSAC, the patient's ABO and Rh groups are identified and screening of the patient's blood is done for irregular antibodies. Full cross-matching is done only if irregular antibodies are found. Otherwise, a quick spin cross-match is done only if the blood is eventually needed for transfusion.<sup>23</sup>

Studies have found MSBOS to be a viable option for reducing unnecessary cross-matching and achieving significant cost savings for the blood bank.<sup>24-26</sup> However, Murphy et al found that "use of an MSBOS does not appear to influence clinical usage of blood for transfusion".<sup>27</sup> Palmer et al found patient-specific blood ordering system, which includes patient and surgeon variables in transfusion prediction to be more accurate than the MSBOS, which uses only the surgical procedure to estimate blood requirement.<sup>28</sup> Nuttall et al formulated a surgical blood ordering equation which incorporated patient factors in the ordering of blood for surgical patients.<sup>29</sup>

Incorporation of some of these systems into transfusion practice in hospitals could potentially improve the C/T ratio.<sup>30-35</sup> For elective surgeries, the arrangement of blood only after the completion of pre-anesthetic checkup and when final surgery is planned can be considered. Regular auditing and periodic feedbacks are vital to improving blood utilization practices in the hospital. A more meticulous approach to record-keeping in the hospital would also help with regular audits and progress tracking.

The financial cost is a serious consideration for patients in developing countries. Due to the limited adoption of health insurance, and limited social security, the average Nepali usually has to bear the full cost of healthcare, which can be quite high. Establishing and adhering to a blood ordering protocol has been proven to reduce the financial burden to the patient, especially for elective surgical procedures.<sup>4,35</sup> Thus, formulating a blood ordering and transfusion protocol tailored to the hospital's needs, with input from all departments concerned, can reduce the non-usage of cross-matched blood units and thus optimize blood transfusion practices.

## CONCLUSIONS

We found the C/T ratio, non-usage probability, and transfusion index to be within generally recommended ranges, showing good utilization and low wastage of blood. Overestimation of the use of blood products is not a major concern at this hospital based on our findings. However, the establishment of an efficient and safe blood ordering and transfusion protocol via a multidisciplinary approach should be considered to further reduce the non-utilization of cross-matched blood units and thus optimize blood transfusion practices.

**Conflict of interest:** None

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