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# Assessment of bedside transfusion practices at a tertiary care center: A step closer to controlling the chaos

Dheeraj Khetan, Rahul Katharia, Hem Chandra Pandey, Rajendra Chaudhary, Rajesh Harsvardhan<sup>1</sup>, Hemchandra Pandey<sup>1</sup>, Atul Sonkar

## Abstract:

**BACKGROUND:** Blood transfusion chain can be divided into three phases: preanalytical (patient bedside), analytical (steps done at transfusion services), and postanalytical (bedside). Majority (~70%) of events due to blood transfusion have been attributed to errors in bedside blood administration practices. Survey of bedside transfusion practices (pre-analytical and post analytical phase) was done to assess awareness and compliance to guidelines regarding requisition and administration of blood components.

**MATERIALS AND METHODS:** Interview-based questionnaire of ward staff and observational survey of actual transfusion of blood components in total 26 wards of the institute was carried out during November–December 2013. All the collected data were coded (to maintain confidentiality) and analyzed using SPSS (v 20). For analysis, wards were divided into three categories: medical, surgical, and others (including all intensive care units).

**RESULTS:** A total of 104 (33 resident doctors and 71 nursing) staff members were interviewed and observational survey could be conducted in 25 wards during the study period. In the preanalytical phase, major issues were as follows: lack of awareness for institute guidelines (80.6% not aware), improper sampling practices (67.3%), and prescription related (56.7%). In the postanalytical phase, major issues were found to be lack of consent for blood transfusion (72%), improper warming of blood component (~80%), and problems in storage and discarding of blood units.

**CONCLUSION:** There is need to create awareness about policies and guidelines of bed side transfusion among the ward staff. Regular audits are necessary for compliance to guidelines among clinical staff.

## Keywords:

Assessment, blood management, process, red blood cell transfusion, red cell component, transfusion practices

## Introduction

Transfusion medicine has grown tremendously in the past few decades and along with this transfusion safety has also improved. The initial focus of transfusion safety was to reduce the transmission of infectious diseases by blood transfusion as well as improve quality of blood. These efforts resulted in noninfectious hazards outweighing the infectious hazards. The focus in recent times

has shifted to the clinical transfusion setting outside the immediate practice areas of the laboratory.

It is now well established that errors in the transfusion chain are the leading cause of noninfectious morbidity and mortality associated with blood transfusion. One of the initial studies focusing on bed side transfusion errors was done by sanguis group,<sup>[1]</sup> who reported that major transfusion errors occur even in nonemergency settings,

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Departments of  
Transfusion Medicine and  
<sup>1</sup>Hospital Administration,  
Sanjay Gandhi  
Postgraduate Institute  
of Medical Sciences,  
Lucknow, Uttar Pradesh,  
India

## Address for correspondence:

Dr. Dheeraj Khetan,  
Department of Transfusion  
Medicine, Sanjay  
Gandhi Postgraduate  
Institute of Medical  
Sciences, Lucknow,  
Uttar Pradesh, India.  
E-mail: dheerajkhetan@  
gmail.com

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in wards, and in nonintensive care units. Earlier,<sup>[2]</sup> we have also tried to ascertain the incidence of near miss, no harm events and adverse events reported to our department with the objective of improving the patient safety. However, error reporting in essence is a retrospective process and may not reflect the actual state of affairs in the existing transfusion chain.

Another approach to improving patient safety may be through audit of blood component transfusion practices. Most of the studies<sup>[3,4]</sup> available in literature have emphasized on improving the clinical use of blood components in specific patient category. There is paucity of publications, where assessment of entire process of blood transfusion, starting from the decision to transfuse a patient to the act of actual component transfusion, has been done.

Dzik<sup>[5]</sup> identified three points in the blood transfusion chain, namely, collection of patient samples, the medical decision to transfuse, and the bedside administration of blood components to be responsible for majority of adverse events. These issues can be addressed both at the national level by adopting evidence-based guidelines and hemovigilance programs<sup>[6]</sup> as well at the hospital level by doing audit of the transfusion practices at periodic intervals. Audit is a cyclical process for establishing best practice taking into account local circumstances and limitations, measuring care against established criteria, taking action to improve care given, and monitoring to sustain improvement.<sup>[6]</sup>

The activities involved in the process of blood transfusion can be described under three broad categories; preanalytical, analytical, and postanalytical. Analysis of transfusion errors in New York state<sup>[7]</sup> has found that almost two-third of the transfusion-related errors occur in the pre- and post-analytical parts of the transfusion chain. In the earlier study<sup>[2]</sup> from our center, we have tried to assess the errors in the activities under analytical category of the blood transfusion process. The present study was therefore planned to assess the knowledge about, attitude towards and the actual practice of blood administration at our institute covering essentially the pre- and post-analytical area of blood transfusion chain, with the aim of improving patient safety through targeted intervention in identified problem areas.

### Materials and Methods

The study was conducted by the Department of Transfusion Medicine of a tertiary care hospital of North India in collaboration with the Department of Hospital Administration after due approval from the institute Ethics committee. Review of bedside transfusion practices from decision to transfuse to

sample collection for cross-matching till completion of the transfusion (pre- and post-analytic phases) for 2 months November–December 2013 was done in preidentified patient care areas. Distinct activities in pre-analytic and post-analytic areas of blood transfusion process at our center are shown in Figure 1. All the steps depicted under the pre- and post-analytical activities have been implemented after the approval of the hospital transfusion committee and are published in the blood transfusion manual provided to various categories of staff as part of induction training program.

### Study area and participants

Based on the blood component utilization, 26 patient care areas of the institute were selected for the review of blood transfusion practices. These areas were further classified into medical, surgical, and other patient care

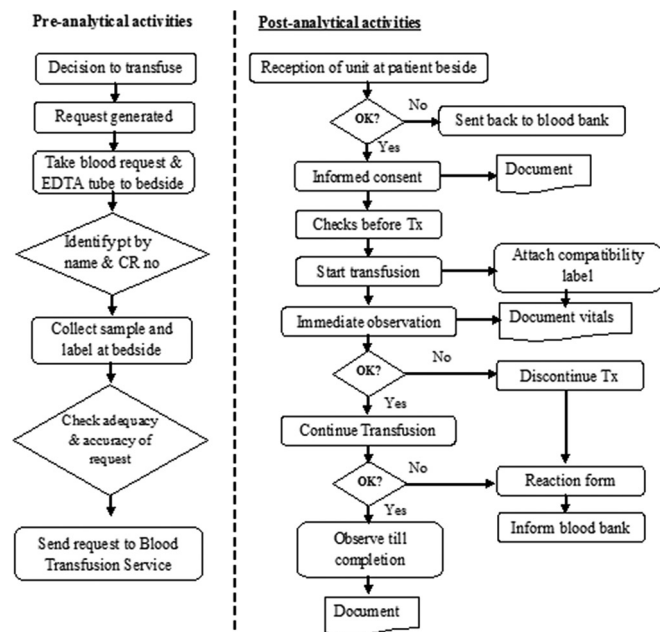


Figure 1: Schematic diagram of process flow of blood transfusion

Table 1: Categorization of patient care areas

Medical	Surgical	Other patient care areas
Cardiology	CVTS	Stem-cell transplant unit
Endomedi cine	Endosurgery	CCM
Gastromedi cine	Gastrosurgery	CVTS ICU
Hematology	Neurosurgery	Dialysis unit
Immunology	Pediatric gastrosurgery	Emergency ward
Medical genetics	Urology	General hospital
Nephrology		Renal transplant unit
Pediatric gastromedi cine		Medical ICU
Pulmonary medicine		Neurosurgery ICU
Radiotherapy		Postoperative ward

CVTS = Cardiovascular and thoracic surgery, CCM = Critical care medicine, ICU = Intensive Care Unit

areas for the purpose of analysis [Table 1]. Emergency care areas and wards with specialized transfusion requirements were grouped together under the category of other patient care areas. Resident doctors and the nursing staff working in each of these patient care areas and directly involved with the process of transfusion participated in the study.

### Survey

Two different approaches were used for reviewing the transfusion practices at our institute. The first was an interview-based questionnaire method wherein each participant was provided with a questionnaire related to pre- and post-analytic practices and was asked about the practices that they follow at each step. The questionnaire was based on the transfusion guidelines approved by the hospital transfusion committee in the form of transfusion manual and easily available to the doctors and staff members over institute website. The questionnaire consisted of eight questions to collect information on individual step depicted under preanalytical activities in Figure 1 and 22 questions covering the steps mentioned under postanalytical activities. Participation

in the study was voluntary and anonymous. Each participant was provided with an information sheet explaining the purpose of the survey before enrolling for interview-based questionnaire. The interview was carried out in person on one-to-one basis by a trained postgraduate medical student. This was later followed by an observation-based survey where a designated postgraduate doctor observed the actual transfusion process in each of these respective patient care areas and noted if the steps of transfusion are actually been followed or not.

### Statistical analysis

For statistical analysis, the collected data were coded and analysis was done using SPSS v. 20 (IBM Corporation, Armonk, NY, USA). Descriptive statistics was done to calculate the frequency of responses given by participants. Nonparametric tests (Kruskal–Wallis and Mann–Whitney U) were used to compare difference in practices among various wards or the staff categories.  $P < 0.05$  was considered statistically significant.

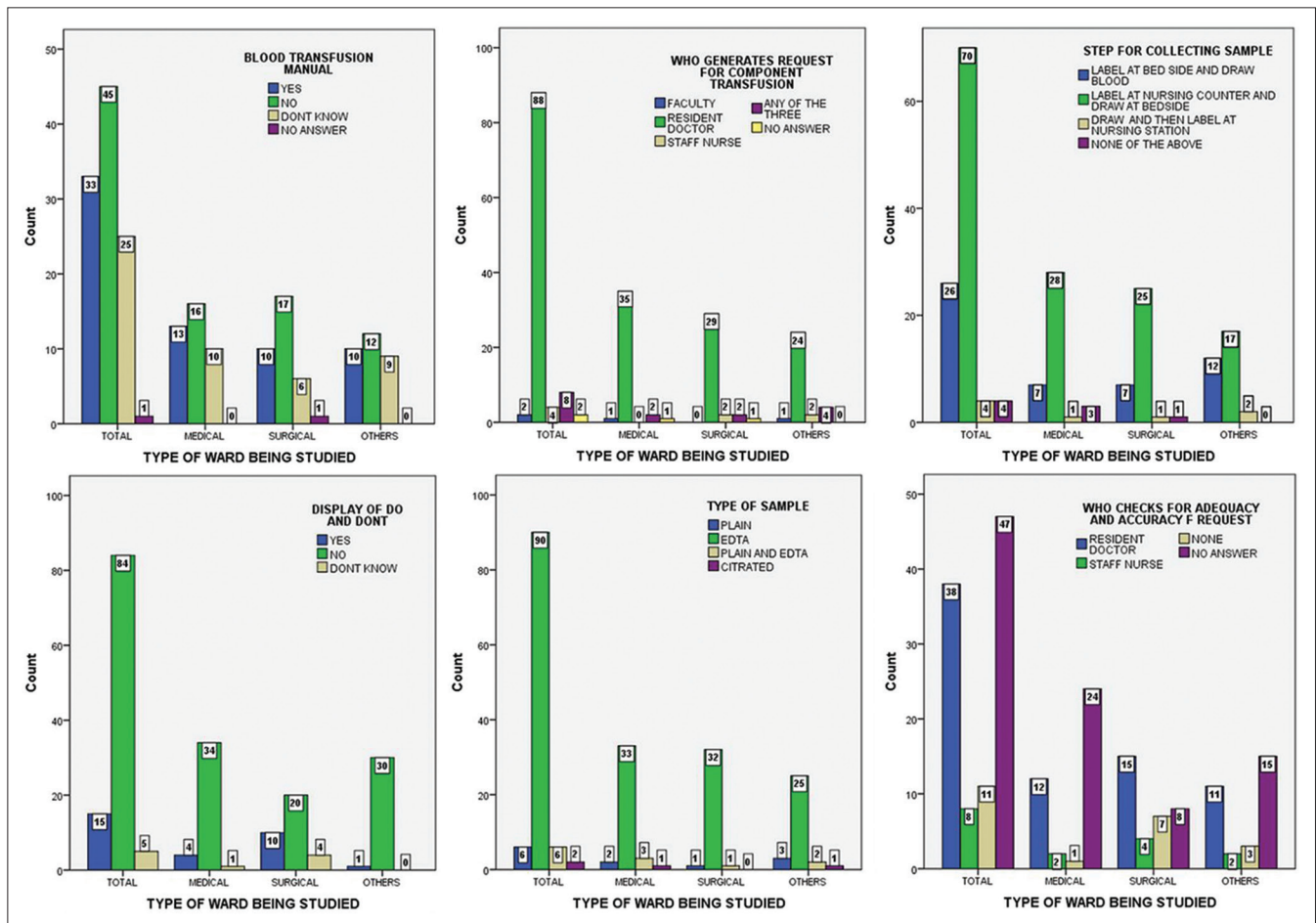


Figure 2: Awareness and practices in preanalytic activities

## Results

A total of 104 staff member from various wards (33 resident doctors and 71 nursing staff) participated in the interview-based questionnaire and total of 25 transfusion episodes were observed in the wards during the study period.

### Awareness regarding institutional policies and guidelines

We found that only 31.7% of the interviewed staff are aware of the guidelines and 80.6% of the staff were not aware of the “do’s and don’ts” of transfusion provided to each ward by the hospital transfusion committee [Figure 2]. There was no difference between medical, surgical, and other ward staff in this category.

### Preanalytical transfusion practices

Significant findings in the pre-analytical transfusion practices are depicted in Figure 2. 87% of the transfusion requests were ordered appropriately. 67.3% of staff labeled the test tube at the nursing counter and then collected the blood from the patient at bedside for

cross match. Labeling of the test tube using two patient identifiers in the form of patient name and hospital registration number was done by 63.5% of staff. None of the participants placed their initials on the sample tubes. 56.7% of the requests were checked for accuracy of information as well as the adequacy of sample before it was sent to the blood bank. The review of request was found to be conducted by resident doctors in 36.5% of cases. The compliance was more in surgical wards as compared to medical and other wards (53% vs. 36% vs. 42%, respectively).

### Postanalytical transfusion practices

Significant findings in the post-analytical transfusion practices are depicted in Figure 3. 44.2% of the participating staff was not aware of the storage condition of blood components. While 98% of the staff were aware of pretransfusion checks including patient identification, checking the blood component to be transfused, and blood group of the patient and the unit to be transfused, only 40% were found to be actually doing these steps in practice. Approximately 8% of them were not aware of checking the expiry date and ~30% were not aware of the

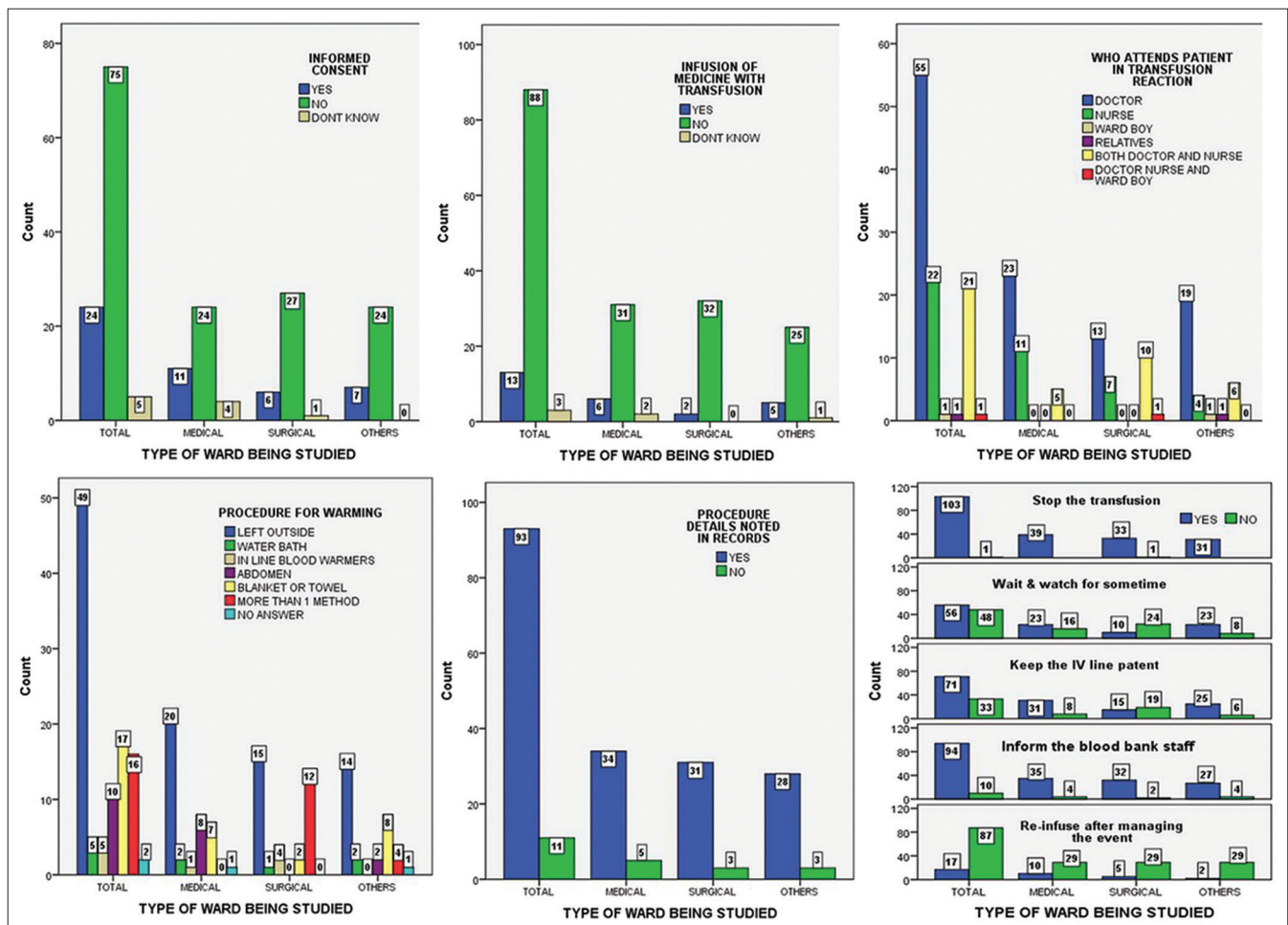


Figure 3: Awareness and practices in postanalytical activities

**Table 2: Practice of bed side transfusion across various category of ward staff**

Activity/information	Resident doctor (33)	Nursing in charge (20)	Nurse (49)	P
Awareness of blood transfusion policy of the institute	20* <sup>†</sup>	2	9	0.032* 0.028 <sup>†</sup>
Check for adequacy and accuracy of sample and request	33* <sup>†</sup>	14	38	0.001* 0.004 <sup>†</sup>
Check expiry date of unit before transfusion	30	17 <sup>‡</sup>	48	0.038 <sup>‡</sup>
Take informed consent before transfusion	9*	02 <sup>‡</sup>	13	0.009* 0.010 <sup>‡</sup>
Document consent in case sheet	9*	0	9	0.016*
Document procedure details/vital signs	7*	20	45	0.029*
Who attends patient in transfusion reactions	27* <sup>†</sup>	13	29	0.035* 0.002 <sup>†</sup>
Method of warming blood (left out at room temp)	20 <sup>†</sup>	10	18	0.005 <sup>†</sup>
Documentation of transfusion reaction	25 <sup>†</sup>	12	25	0.023 <sup>†</sup>
Keep IV line patent in transfusion reaction	26*	10	34	0.031*
Remaining blood bag to be sent with blood administration set in case of transfusion reaction	30 <sup>†</sup>	12	32	0.009 <sup>†</sup>
Discarding of empty blood bag	24 <sup>†</sup>	19	46	0.008*

\*Resident doctors versus senior staff nurse, <sup>†</sup>Resident doctors versus ward nurse, <sup>‡</sup>Senior staff nurse versus ward nurses. IV = Intravenous

importance of observation before blood transfusion. No informed consent for blood transfusion was taken in 72% of the cases. Warming of blood units before transfusion was observed in 95% of cases and the method of warming ranged from leaving the unit for some time at room temperature, use of blanket, and under running tap water. 15% of the respondents thought that transfusion of saline with blood transfusion is an acceptable practice. However, only in one instance, it was observed that an antibiotic was transfused through the line being used for blood transfusion. 31.7% of staff was not aware of the significance of keeping the intravenous line patent after a reaction and 16.3% thought that reinfusion of the unit, after stopping transfusion, in a case of suspected transfusion reaction was justified. The awareness was found to be significantly better in staff posted in medical or other wards compared to the staff in surgical wards. 90% of the staff was found aware about procedure for discarding of empty blood bags.

### Documentation

The transfusion episode was not documented in 10% of the cases and of the documented cases, respiratory rate was not mentioned in 25%, start time was not mentioned in 10%, end time was not mentioned in 14%, and pretransfusion vitals were not mentioned in 8% of the transfusion episodes monitored. Cross-match report was found attached to patient file in 86% of the transfusions monitored.

### Bedside transfusion practices across different categories of ward staff

Awareness as well as practices was found to be better in resident doctors compared to senior nursing staff or ward staff nurse (Grade I). Requisition for blood component transfusion was being raised mostly

be resident doctors while administration of blood component was mostly being done by ward staff nurses. Activities where practices and awareness were found to be significantly different across different category of ward staff are shown in Table 2. Majority of the interview staff ( $n = 75$ ) was not aware about the requirement of taking informed consent from the recipient before blood transfusion.

## Discussion

Role of blood transfusion services is significant as it is highly effective but may be life-threatening if not instituted properly. Lack of knowledge in different aspects of blood transfusion among clinical staff including staff nurses has been identified as real threat to patient safety.<sup>[8]</sup> In a review of 355 transfusion-related deaths reported to US Food and Drug Administration, Sazama<sup>[9]</sup> have concluded that one-third of all transfusion-related deaths and two-third of all incompatible red cell transfusions were the result of preventable errors. We performed this study to know about the status of awareness among different category of ward staff and also to monitor the actual practice of bed side blood transfusion. The survey conducted in the current study is unique as compared to other studies, where either the audit of bedside transfusion was done on compliance to established indications<sup>[10]</sup> or was limited to post analytical activities<sup>[11]</sup> only; we have tried to cover all the activities of patient bedside from prescription to disposal of empty blood bag.

Bedside administration of blood is an area requiring continuous monitoring and improvement due to the fact that the ward staff, especially nurse, is not generally oriented toward evidence base for practice<sup>[12]</sup> and therefore is more prone to errors.

Blood transfusion services in India are still in adolescent phase, all the efforts being focused on ensuring availability of safe blood to patients in need. No proper national guidelines for bedside administration are currently available. Only recently<sup>[13]</sup> has the concept of hemovigilance, introduced in India and concerted efforts are now being taken for prevention of errors in transfusion chain. We have conducted this study with the primary objective of identifying gray area in the blood transfusion process at our center, so that proper corrective actions/interventions may be planned for rectification of identified problems.

As detailed in the results, improper practices and information were identified across all major steps in the blood transfusion chain, including physician orders, patient identification for specimen collection, sample collection and labeling by nursing staff, patient identification, consent of blood transfusion, administration of blood components, management of transfusion reaction, and the documentation of transfusion in patient file. The practice of labeling sample tubes at nursing counter by more than 67% of ward staff is alarming as it may lead to serious consequences. This practice is reflected by the fact that in the previous study from our center, labeling errors accounted for more than 50% of all the near miss events reported from patient bedside.<sup>[2]</sup> The WHO<sup>[14]</sup> has also identified incorrect labeling as one of the three most important issues in sample collection and recommends that the sample labeling should be done at the patient bedside. Errors in practice involving remote checks at nurse's stations have also been reported to lead to mistransfusion.<sup>[15]</sup>

Our finding of faulty-labeling practices as the most significant issue in preanalytical activities at our center [Figures 1 and 2] is consistent with the practices reported worldwide. Q probes program<sup>[16]</sup> of the College of American Pathologists has reported irregularities in patient identification during sample collection or blood administration to be improperly done in ~38% of cases. Linden *et al.*<sup>[7]</sup> pointed that most transfusion errors occurred at patient bedside and were attributed to either phlebotomy error or failure of ward staff to correctly identify the patient and/or unit before starting a blood transfusion. Incorrect placement of label on the phlebotomy specimen was identified by Linden as one of the most important reasons leading to incorrect blood transfusion.

Major problem areas identified under the postanalytical activities were lack of informed consent before blood administration, improper patient identification procedure, incomplete documentation of vitals (especially respiratory rate), and inadequate information regarding handling of transfusion reactions [Figures 1 and 3]. These results

are consistent with literature<sup>[7,9]</sup> and explain the factors contributing to adverse outcome of a blood transfusion. Concept of informed consent is based on the ethical principle of obtaining a valid consent from the patients before offering any treatment. We have found that in almost 72% of the cases, no consent was taken from the recipient and majority of the ward staff was not even aware that there is a need for separate informed consent for blood transfusion. The situation was not unexpected as the need for informed consent has only been introduced as a requirement in the transfusion guidelines of the institute only recently. However, this finding indicates that the concept of informed consent needs to be emphasized more for proper implementation.

Blood warming before administration is a practice with limited indications. Maintenance of proper cold chain in all aspects of blood transfusion is crucial to ensuring safety of blood components, especially with regard to efficacy and prevention of bacterial growth. Use of only dedicated blood warming devices under aseptic conditions is justified in indicated conditions. While the establishments with advanced facilities are trying to reduce the harmful effect on red cell membrane due to rapid warming in these devices,<sup>[17,18]</sup> we found that we are still following the age-old practice of blood warming in aseptic, uncontrolled conditions for nonindications in as much as 95% of the transfusion episodes monitored.

Improper documentation of transfusion episode in patient treatment file was another weak area identified in our survey. Shulman *et al.*,<sup>[10]</sup> in their analysis of 85 transfusion episodes, have reported that the most frequent variance was the failure to document vital signs during the first 15 min after a transfusion was started or after 50 mL of a component had been transfused. Similarly, Friedman and Ebrahim<sup>[19]</sup> in their retrospective review of red blood cell transfusions in adult patients in 2 hospital facilities have reported that transfusion events with suboptimal (intermediate and inadequate) documentation accounted for 49% of all medical record-reviewed transfusion events.

Focus on bedside transfusion practices is very important not only because proper checks before blood administration is the last opportunity to prevent incorrect blood transfusion to individual patient but also due to the fact that it may be useful in generating information important for establishing evidence based transfusion guidelines. For documentation to be effective, ward staff, especially nurses need be sensitized regarding the importance of reducing error and improving safety through use of nonpunitive system approaches. One effective way to ensure proper documentation of blood transfusion in patient treatment file may be inclusion

of dedicated transfusion monitoring worksheet in the treatment file at the time of admission.

Vast gap in the knowledge and practice of blood transfusion between resident doctors and staff nurses [Table 2] in our study may be a reflection of lack of emphasis on blood administration practices during their induction and refresher trainings being conducted at regular intervals in our institute. Aslani *et al.*<sup>[20]</sup> have showed that the nurses' knowledge of blood and blood component was average and insufficient. Similarly, analysis of factors associated with nurses' poor knowledge and practice of blood transfusion has identified delay in recognition of abnormal reactions after transfusion to be a major risk factor.<sup>[21]</sup>

## Conclusion

The current situation at our institute is serious enough whereby untrained staff administer blood transfusion, this may contribute to committing errors or lead to transfusion reactions. The results were shared with hospital transfusion committee and a program for induction and refresher in service training of nursing staff has been implemented with emphasis on collection and labeling of blood sample from the patient, crosschecking of blood component request before sending to blood bank, checks to be done before starting transfusion and monitoring and documentation of transfusion.

Although we were able to fulfill our target, there were certain limitations of the study. First, the survey was conducted only for routine blood transfusions and no assessment of practices during evening/night shifts was done. Second, staffs in operation theater where improper practices may lead to more severe consequences were not included in the survey, and finally, the transfusion practices for only red cell components were surveyed and therefore issues specific to plasma or platelet component transfusion might have been overlooked.

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## Conflicts of interest

There are no conflicts of interest.

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