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Audit-based corrective and preventive actions to reduce wastage of blood components at a single blood center: A quality improvement study

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Abstract:

INTRODUCTION: The rate of discarded blood components or "wastage rate" reflects on the whole process, preparation, and production of blood and its quality control. It is the ratio of blood and blood components discarded to the total number of collections. The discard or unusability of blood products are many, and the ones that can be monitored and regarded as indicators to be improvised on are QC failure rate, transfusion-transmitted infection (TTI) positivity, and component discards (other than TTI), including those that caused transfusion reactions. These were studied over four intervention cycles to see if they could be improved.

MATERIALS AND METHODS: This was a clinical audit and quality improvement study. The clinical audit was conducted over four cycles over 16 months. Each cycle included three stages wherein the data required for calculating those key performance indicators (KPIs) of the blood center were studied and analyzed, and causes for the poorly performing ones were identified; a corrective plan was drawn and implemented, followed by data collection and interpretation of the same in the next cycle for improvement. The data were compiled using a Microsoft Excel spreadsheet and analyzed using SPSS version 19 (IBM Corporation, New York, USA).

RESULTS: The overall discard rates due to all cumulative causes mentioned were at about 5% at the start of the first cycle. The various factors comprising preparatory, preparation, and the management of inventory and issue were analyzed, and corrective interventions were performed in every cycle. The discard rates were reduced to about 3% by the end of the four cycles. The difference was statistically significant, with a $P < 0.05$.

CONCLUSION: The implementation of Corrective and preventive action measures can rectify the deviations in KPIs. The blood center director, staff, and doctors should be responsible for maintaining and continuously improving the quality indicators.

Keywords:

Blood center, blood discards, corrective and preventive actions, key performance indices, wastage rate

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Introduction

All health facility or hospital requires steady support and a supply of regular blood donations from healthy, benevolent donors. We need to consistently focus and work on our efforts to bleed more voluntary, nonremunerated, and healthy donors. Transfusion services can reach the highest levels of quantity and quality of blood by implementing a quality management system from the donor's vein to the recipient's vein.[1] The approach has to be expected to be wholesome. The rate of discarded blood components or "wastage rate" reflects on the whole process, preparation, and production of blood and its quality control.[2] It is the

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ratio of blood and blood components discarded to the total number of collections. High discard or wastage rates reflect the quality of efficiency level of blood collection and components preparation. Hence, the quality management of the Blood Transfusion Service (BTS) by keeping an eye on the wastage rate is crucial for ensuring quality blood supply. The discard or unusability of blood products are many, and the ones that can be monitored and regarded as indicators to be improvised on are QC failure rate, transfusion-transmitted infection (TTI) positivity, and component discards (other than TTI), including those that caused transfusion reactions were studied.[3]

The aim of the study was to, through intelligent analyzing and studying of the reasons for the wastage of blood components, formulate plans to improve the outcome of blood transfusion services and evaluate the changes. These actions would directly or indirectly reduce the amount of blood discarded to more acceptable set standards.

Materials and Methods

Context

The study was conducted in a tertiary care blood center in southeastern India between July 2019 and December 2020. The blood center, on average, issues around 200 blood components daily.

Design

This was a clinical audit and quality improvement study. The clinical audit was conducted in three stages over 16 months.

Stage 1: Data collection: The audit was performed for 3 months in this stage. Key variables required for calculating the Key Performance Indicators (KPIs) per the NABH Blood Centre Quality Monitoring document were extracted from the various registers in the blood center.

Stage 2: Analysis, Interpretation, and Plan for Corrective Action: This stage was planned for 1 month. The data collected were analyzed, and interpretation of the parameters, namely QC failure rate, TTI positivity, components implicated in transfusion reaction and component discards (other than TTI), were performed. Things that were done correctly and could be improved were identified and listed. The causes were studied.

Stage 3: Quality Improvement and Data Collection: Corrective actions were taken to improve the quality indicators during the next audit cycle based on the causes identified. This stage comprises implementing changes formulated during the previous stage. This stage was planned to spread over 3 months with simultaneous data collection. The Plan Do Study Act approach to quality improvement was used to bring changes in the respective sections of the blood center, as shown in Figure 1. This stage was implemented after the 1-month analysis for the next 3 months.

The whole cycle comprising the three stages was repeated four times in total.

Targeted sites

The targeted included all the sections of the blood center directly or indirectly involved in contributing to wastage, including donor screening and selection, phlebotomy, component preparation, and inventory.

Description of intervention

Reducing wastage was started with plans with a series of quantitative objectives, and the interventions are summarized in Table 1.

Outcomes

The improvements in the trends from each cycle concerning the rates of the KPIs mentioned above were calculated.

Sample size

Since the KPIs studied were record-based, all the data during the study were included. No sampling technique was used.

Analysis

The data were compiled using a Microsoft Excel spreadsheet and analyzed using SPSS version 19 (IBM Corporation, New York, USA). Descriptive and inferential statistics were used to analyze the data. Categorical variables such as blood group, component type, characteristics, and causes were summarized as frequency and percentages. The difference among groups was tested using the Chi-square test for independent variables. A $P < 0.05$ was considered statistically significant.

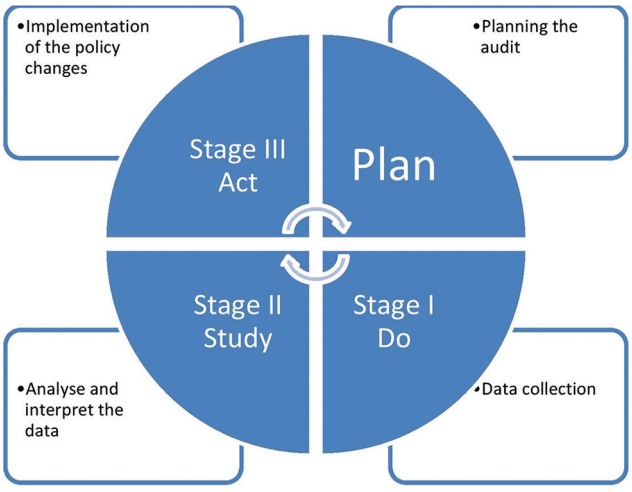

Figure 1: The PDSA cycle. PDSA=Plan do study act

Results

The various causes of discarding, namely TTI positivity, not meeting quality control criteria, expired, return unused, leakages, and others, were collected and analyzed for the first cycle and repeatedly studied for the subsequent three cycles. The rate of discards due to these is described below. All the parameters are shown how they changed over the intervention period. The various causes identified and the action taken for managing each of the KPIs over the cycles are summarized in Table 2.

Discards due to transfusion-transmitted infection positivity

The TTI positivity rate of HIV, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Syphilis, and Malaria over the four cycles is summarized in Tables 3 and 4. The positivity rate reduced from cycle 1 and subsequently, and the change was statistically significant for overall TTI as well as each of HIV, HBV, and HCV, and it was statistically significant with a $P < 0.001$. The malaria infection rate was 0 in most cycles and could not be commented on. The positivity rate though decreased for syphilis, was not statistically significant ($P = 0.53$).

Wastage percentage (%)

Details of blood and blood components transfused during the study are summarized in Table 5.

The total number of blood units transfused in the study period was 45,602. The overall discard rate of blood and blood component was 1.1% (502/45,602). The breakup of components wasted over various cycles is shown in Table 6 and Figure 2.

There was no significant difference in the mean of the parameter between the cycles. There was a significant

Table 1: Interventions planned in various stages of blood component preparation and handling

Prepreparatory factors	Preparation	Postpreparation factors
A SOP was prepared for blood wastage management Blood donor recruitment and blood collection were adjusted based on the demand from the hospital Daily monitoring of inventory was planned to reduce blood donor recruitment and mobile teams at the time of sufficient inventory levels Calibrated and validated equipment was used to store blood components with electronic temperature monitoring and an alarm system linked to the monitoring system with an audible alarm Continual educational programmes were introduced to improve staff performance to minimise technical faults leading to the wastage of blood components. These training courses included standard blood collection, processing, transportation and storage methods based on departmental standard operational procedures	Regular monitoring of blood component wastage. In cases of nonconformity, the root causes were found, and corrective actions were performed if needed FFP packing and removal training	The optimal inventory level for RBCs was re-evaluated to reduce the inventory to 7 days of hospital requirement A particular focus was placed on optimising dispatching Dispatching according to the expiry date of blood components to prevent expired components during storage Training sessions for staff of the distribution department, nursing staff residents and interns Dispatching surplus blood components to neighbouring blood centres in the locality that had lower levels

SOP=Standard operating procedure, RBCs=Red blood cells, FFP=Fresh frozen plasma

Table 2: The various causes identified after each cycle and the actions taken

	Cycle 1		Cycle 2		Cycle 3	
	Problems identified	Actions taken	Problems identified	Actions taken	Problems identified	Actions taken
TTI (%)	False positive results among ELISA kits	Retest with different kits from Microbiology Reporting to the manufacturer	High-risk behaviour among donors, unawareness	Extensive educational campaigns and revision of predonation information and materials	Lack of in-depth counselling	Strengthening counselling and screening procedures
Wastage (%)	Lack of awareness among residents and doctors regarding the return policy of blood Lack of proper cold chain	Treating physicians, residents, and nursing staff were educated and trained regarding the use and handling of blood components Procurement of cold chain equipment for the transfer of blood products	Formation of clots Leakage and breaks, especially FFP	Training for proper usage of blood mixer Staff were trained to reduce mishandling of bags during collection, storage and processing to lessen breakage incidents	Improper communication regarding the time of requirement following raising request, multiple requests for the same patient More than surplus inventory	Flagging readiness of blood products to the respective wards, reporting of incidents to the in-charge A collection based on demand
QC failures (%)	Deviations had crept from the SOPs over time	Revision of SOPs with training for technicians on how to use and comply with adherence to them	Delay in the testing of QC samples at the coagulation laboratory	Streamlining of testing with emphasis on preanalytical variables	Malperforming equipment	Calibration performed on all equipment

QC=Quality control, SOPs=Standard operating procedures, FFP=Fresh frozen plasma, TTI=Transfusion-transmitted infection, ELISA=Enzyme-linked Immunosorbent assay

Table 3: Positivity for various transfusion-transmitted infections during the study period

Cycle number	Number of whole blood tested	Number of reactive (%)	Number of HIV reactive (%)	Number of HBsAg reactive (%)	Number of HCV reactive (%)	Number of malaria reactive (%)	Number of syphilis (RPR) reactive (%)
1	4997	183 (3.39)	42 (0.44)	102 (1.89)	25 (0.79)	0	14 (0.26)
2	4630	160 (3.4)	6 (0.13)	77 (1.63)	64 (1.31)	2 (0.03)	12 (0.25)
3	2447	65 (2.65)	10 (0.4)	29 (1.18)	22 (0.89)	0	4 (0.16)
4	3365	60 (1.75)	5 (0.14)	41 (1.1)	9 (0.26)	0	5 (0.119)
Chi-square statistics (*P*)		28.61 (<0.001)	37.41 (<0.001)	11.97 (<0.001)	38.76 (<0.001)	NA	2.19 (<0.53)

NA=Not available, HBsAg=Hepatitis B surface Antigen, HCV=Hepatitis C virus, RPR=Rapid plasma regain

Table 4: The breakup of individual positivity for various transfusion-transmitted infections during the study period

	Cycle	Number of months	Mean	±2SD	SE
TTI (%)	1	3	3.39	0.52	0.30
	2	3	3.37	0.84	0.48
	3	3	2.90	1.53	0.88
	4	3	1.74	0.93	0.54
	Total	12	2.65	1.07	0.30
HBsAg	1	3	2.48	0.23	0.13
	2	3	1.62	0.20	0.11
	3	3	1.35	0.32	0.18
	4	3	1.21	0.51	0.29
	Total	12	1.41	0.33	0.09
HCV	1	3	0.67	0.20	0.11
	2	3	1.31	0.72	0.42
	3	3	1.09	1.39	0.80
	4	3	0.23	0.11	0.06
	Total	12	0.82	0.80	0.23
HIV	1	3	0.20	0.29	0.17
	2	3	0.12	0.15	0.08
	3	3	0.32	0.34	0.19
	4	3	0.15	0.27	0.15
	Total	12	0.20	0.24	0.07
Syphilis (RPR)	1	3	0.25	0.13	0.07
	2	3	0.23	0.23	0.13
	3	3	0.19	0.17	0.10
	4	3	0.11	0.05	0.02
	Total	12	0.20	0.14	0.04
Malaria	1	3	0	0	0
	2	3	0.09	0.11	0.06
	3	3	0	0	0
	4	3	0	0	0
	Total	12	0.02	0.06	0.01

TTI=Transfusion-transmitted infection, SE=Standard error, SD=Standard deviation, HBsAg=Hepatitis B surface Antigen, HCV=Hepatitis C virus, HIV=Human Immunodeficiency Virus, RPR=Rapid plasma regain

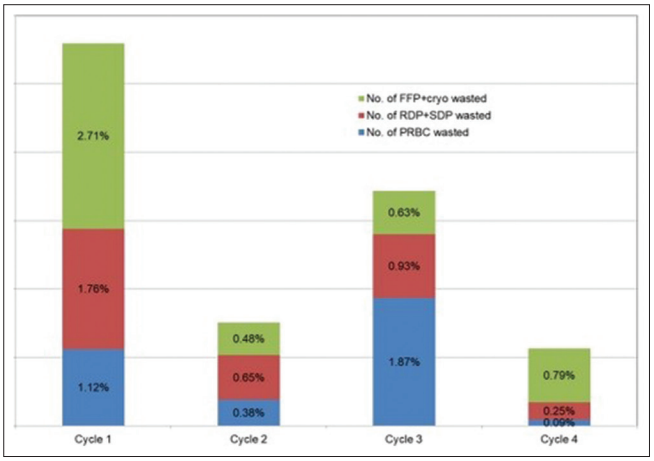

Figure 2: Bar graph showing the summary of blood components discarded in each cycle

decrease in total components issued from cycle 2 to cycle 3. Furthermore, there was a significant difference in mean random donor platelets (RDP) + single donor platelets (SDP) wastage between cycle 1 and cycle 2 ($P = 0.021$), cycle 3 ($P = 0.016$), and cycle 4 ($P = 0.005$), with a significant mean difference of 0.35, 0.38, and 0.48 more in cycle 1 than cycle 2, 3, and 4. There is a significant decrease in total RDP + SDP wastage from cycle 1 to cycles 2, 3, and 4.

The most crucial reason for discard was the expiry of blood components. Out of the 502 blood components discarded, 345 were 68.72% expired. The other reasons for discards were due to leakage (32/6.37%), breakage ((5/0.99%), return of unused blood (49/9.76%), and red blood cell contamination (51/10.15%). The rate of discard for other reasons was 15, which formed 2.98% of the total discards, out of which two packed red blood cell (PRBC) bags were hemolyzed, five PRBC bags were clotted, 4 RDPs were lipemic, 3 RDPs were hemolyzed, and one dirty straw colored fresh frozen plasma (FFP), respectively. The other reasons for discard are reported in Table 7. The lowest discard rate was for platelet aphaeresis at 0%. The percentage of components not meeting the QC criteria is summed up in Table 8. The adverse reactions noticed during the study period are shown in Table 9.

The trend in total wastage is shown in Figure 3.

Discussion

The average discard rate for all the total blood components in the present study was 1.15%. Similar to our study, Javadzadeh Shahshahani and Taghvai did an interventional study to determine component wastage rate before and after interventions. They observed that the total wastage rate was reduced by 60% after the intervention. Discard rates of red blood cells (RBCs),

Table 5: Blood components requests made and issued during the study period

Cycle	PRBC	RDP	FFP	Cryoprecipitate	SDP	Total blood components transfused	Total blood requests made
1	4767	4074	4492	302	87	13,722	10,111
2	5404	3938	4771	359	183	14,655	9845
3	2625	2217	1996	192	170	7200	5731
4	3651	3117	2873	252	132	10,025	6276

FFP=Fresh frozen plasma, RBC=Red blood cell, PRBC=Packed RBC, SDP=Single donor platelet, RDP=Random donor platelets

Table 6: Distribution of total wastage of different blood components

Cycle	Number blood components issued	Number of PRBC wasted (%)	Number of RDP + SDP wasted (%)	Number of FFP + cryo wasted (%)	Total components wasted
1	13,722	54 (1.12)	73 (1.76)	134 (2.71)	261
2	14,655	21 (0.38)	26 (0.65)	25 (0.48)	72
3	7200	50 (1.87)	21 (0.93)	14 (0.63)	85
4	10,025	4 (0.09)	8 (0.25)	25 (0.79)	37
Chi-square statistic (*P*)		79.72 (<0.001)	50.70 (<0.001)	132.85 (<0.001)	189.80 (<0.001)

FFP=Fresh frozen plasma, RBC=Red blood cell, PRBC=Packed RBC, SDP=Single donor platelet, RDP=Random donor platelets

Table 7: Distribution of various reasons for wastage of different blood components across different cycles of audit

Cycle	Blood components	Wastage due to expiry	Wastage due to leakage	Wastage due to RBC contamination	Wastage due to breakage	Wastage due to returning unused	Wastage due to other causes	Total wastage
1	PRBC	53	0	0	0	0	1	54
	RDP	56	3	11	0	0	3	73
	FFP	97	12	16	3	16	1	145
	Cryoprecipitate	5	0	0	0	14	0	19
2	PRBC	19	0	0	0	0	2	21
	RDP	15	3	7	0	0	1	26
	FFP	16	0	9	0	19	0	44
	Cryoprecipitate	0	0	0	0	0	0	0
3	PRBC	46	0	0	0	0	4	50
	RDP	10	3	5	0	0	3	21
	FFP	6	1	1	2	0	0	10
	Cryoprecipitate	4	0	0	0	0	0	4
4	PRBC	4	0	0	0	0	0	4
	RDP	2	5	1	0	0	0	8
	FFP	8	5	1	0	0	0	14
	Cryoprecipitate	9	0	0	0	0	0	9

RBC=Red blood cell, PRBC=Packed RBC, FFP=Fresh frozen plasma, RDP=Random donor platelets

platelets and plasma decreased from 9.7%, 18.5%, and 5.4% to 2.9%, 10.5%, and 2.3% after the intervention, respectively. In Javadzadeh Shahshahani and Taghvai, the expiration of RBCs and platelets was the most prevalent reason for the wastage of blood, similar to our study.[3]

During the first cycle, one PRBC bag was discarded as it was clotted. During the third cycle of the audit, four PRBC bags were discarded due to clots in the bag. In order to tackle the issues of clots in blood bags, RCA was done, which revealed the reason to be due to improper mixing and possible flow rate fluctuations during collection. Some of the blood bags collected in the camp were done without an automatic blood mixer.[4] Interventions were taken in the form of (i) purchase of new extra automated blood collection monitors for automated mixing of blood during collection, (ii) training of blood collection and bleeding staff to thoroughly mix the blood bag during collection, and (iii) effective steps taken to understand, assess and monitor the demand and supply chain of blood during COVID times.[5,6] If adequate stocks were present, donor details were obtained, and donors were sent back with a promise to call them during the blood shortage. Simple interventions and re-strengthening of the foundations of existing literature and standard operating procedures (SOPs) resulted in a significant reduction in blood component wastage. Among different types of blood components, RBCs showed the highest decrease in wastage after the intervention, as shown in Table 5. Continuous monitoring of wastage and implementing corrective and preventive action (CAPA) to solve the root causes occurring within the collection, processing, and storage of blood components effectively

Table 8: Percentage of components meeting quality criteria in various cycles

	Cycle number	Number of months	Sample size	Mean	±2SD	Chi-square statistic (*P*)
PRBC (%)	1	3	53	76.66	9.59707	0.17 (0.98)
	2	3	46	79.60	2.95967	
	3	3	49	83.47	6.88137	
	4	3	33	88.20	3.11192	
	Total	12		81.98	7.00745	
Platelet concentrates (%)	1	3	46	78.33	2.88675	0.06 (0.99)
	2	3	47	81.02	5.47747	
	3	3	45	80.74	5.18587	
	4	3	33	84.10	7.10141	
	Total	12		81.04	5.06016	
FFP (%)	1	3	17	58.89	8.39025	0.35 (0.95)
	2	3	13	61.66	12.58306	
	3	3	18	72.21	9.60133	
	4	3	18	76.66	2.88675	
	Total	12		67.35	10.87729	
Cryoprecipitate (%)	1	3	0	0	0	1.09 (0.58)
	2	3	6	41.66	38.18	
	3	3	6	22.19	38.45	
	4	3	18	76.66	2.85	
	Total	12		35.13	37.41	
SDP (%)	1	3	77	83.35	6.44	0.01 (0.99)
	2	3	102	83.63	3.75	
	3	3	91	85.16	4.76	
	4	3	79	86.40	3.74	
	Total	12		84.63	4.29	

FFP=Fresh frozen plasma, RBC=Red blood cell, PRBC=Packed RBC, SD=Standard deviation, SDP=Single donor platelet

Table 9: Summary of adverse transfusion reaction rates over different cycles in the study

Cycle	Number of blood components issued	Total number of ATRR (%)	Number of allergic reactions (%)	Number of FNHTR reactions (%)	Number of unrelated reactions (%)	Number of anaphylactic reactions (%)	Number of TRALI (%)	Number of TACO (%)
1	13,722	16 (0.12)	5 (0.04)	7 (0.05)	1 (0)	2 (0.01)	0	1 (0)
2	14,655	19 (0.13)	4 (0.03)	11 (0.07)	1 (0)	0	1 (0)	2 (0.01)
3	7200	13 (0.18)	6 (0.08)	5 (0.07)	2 (0.03)	0	0	0
4	10,025	13 (0.13)	8 (0.08)	3 (0.03)	2 (0.02)	0	0	0
Chi-square statistics (*P*)		1.51 (0.68)	5.34 (0.15)	2.41 (0.49)	2.33 (0.51)	NA	NA	NA

NA=Not available, FNHTR=Febrile non-hemolytic transfusion reaction, ATRR=Adverse transfusion reaction rate, TRALI=Transfusion-related acute lung injury, TACO=Transfusion-associated circulatory overload

reduced wastage.[2,3] Doctors and residents were sensitized regarding the indication and use of blood and its components, and they were instructed to send back units not utilized after the issue within 30 min to the blood bank, maintaining a cold chain and sterile condition. PRBC and PC were taken back to inventory if returned within 30 min. FFP was taken back inventory if returned within 15–30 min of the issue and was stored at 1°C–4°C. These effective CAPA measures helped us reduce the wastage due to return and not-utilized reason of discard to zero percent by the end of the final cycle of the audit.[2]

The reason for the expiry of PRBC, WB, and FFP was a failure in the proper implementation of the first in, first out (FIFO) policy. This was prevented through continuous monitoring and many re-emphasis of the FIFO policy with maintaining stock inventory regularly.[4] The improvement in transfusion practice with respect to wastage rate was achieved by sound policymaking, CAPA planning and its implementation with every cycle of the clinical audit. The clinical audit of blood components discarded overtime gave us an idea about various reasons for discarding and helped us plan necessary actions to prevent the unnecessary discard of blood components.

The rate of TTI progressively decreased from the first cycle of the clinical audit till the final cycle. The trend of seropositivity decreased from 3.39% (183/5226) to 1.75% (60/3425) over the study period. Based on the results, the overall decrease in prevalence can be attributed to better donor selection, screening procedures and counseling practices, both in-house and camps,

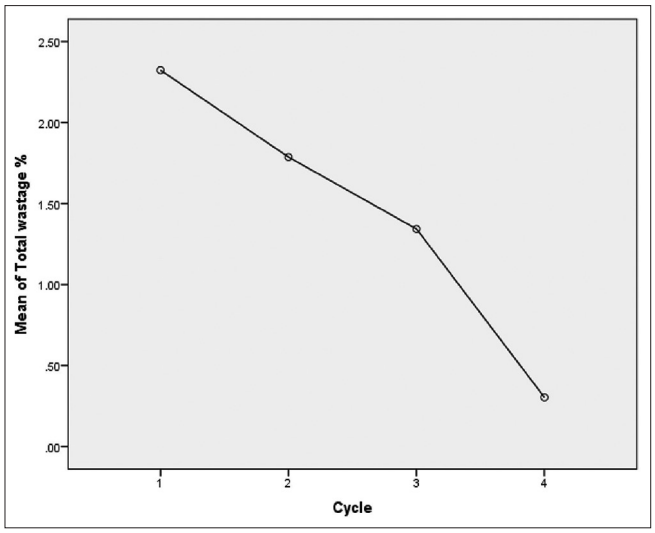

Figure 3: The trend of total wastage percentage over the different cycles of the study period

due to the availability of two counselors. Though the number of blood donations has decreased due to the COVID pandemic, more voluntary donations through camps were collected during this pandemic and also due to the efficient postdonation notification system in our blood center.

Corrective actions were taken primarily in the form of re-emphasis of CAPA steps taken in the previous cycle, increased awareness among blood donors, self-rejection, and regular technical sensitization meetings on improving (a) predonation counseling of voluntary blood donors, (b) deferring high-risk behavior, (c) postdonation counseling of seropositive donors, and (d) increased voluntary than replacement donors. The effective measures that helped in bringing down the TTI percentage due to either foreseeable or unforeseeable errors are proper donor screening, reliable screening tests, awareness creation activity targeting younger age groups, stringent donor screening, training of counselors through regular technical meetings for donor history questionnaire and counseling of TTI positive donors. The implementation of these policies helped in the reduction of transmissible transfusion infections.

In our study, with every cycle of the clinical audit, steps were taken, and interventions were done, which resulted in a subsequent decrease in the frequency of QC-not meeting. There was a drastic improvement in the QC of FFP and cryoprecipitate from the first to the final cycle, even though many technical issues could influence QC parameters.

Root cause analysis was performed whenever QC was out of range. Training and sensitization of technicians on proper stripping of the segment before performing QC, root cause analysis of FFP QC to understand the shortcomings, processing, and transport of FFP samples within 10 min after thawing to centralized hematology laboratory, standardization of volume of blood components, calibration of the deep freezer which maintains −80°C for storage of FFPs and cryoprecipitate was performed.[7,8] The inconsistency of a deep freezer at −80°, overloading and improper transport of FFP at −80°−−40° was the main reason for FFP and Cryoprecipitate QC deviation from the standard benchmarks. The dilution of the segment was corrected using the proper training of technicians. In apheresis, we found all the QC within the range. In FFP, during the first cycle, one of the causes of the failure of QC was due to the low volume of plasma, for which standardization of volume was done and continued in the other cycles of the clinical audit. In cryoprecipitate and FFP, the leading cause of QC failure was deranged factor VIII level which was the cause in 88% of cases due to the temperature sensitivity of the factors, while low fibrinogen was the cause in 14% of cases.

At the end of the fourth cycle, 88.2%, 84.1%, 86.4%, respectively of PRBC, PC, SDP, and 76.67% each of FFP and cryoprecipitate, met the QC parameters from 76.67%, 78.33%, 83.35%, 58.89%, and 0% in the first cycle. In the final cycle, among the cryoprecipitate, QC the factor VIII assay conformed with norms concerning their levels in 81% of units, while three bags had levels below the recommendation out of the tested 18 cryoprecipitate bags, which further needs CAPA measures to be taken in the near future.

In our study, the incidence of transfusion reactions was 0.15%. FNHTR and allergic reactions were the more commonly occurring adverse transfusion reactions to blood transfusion, similar to Gente *et al*. In our study, no acute hemolytic transfusion reaction, bacterial contamination of blood units, and hypotensive transfusion reaction was reported. TRALI reported in various studies ranged from 0.001% to 0.008%, much greater than our study of 0.0002%.[9,10] As suggested by the HvPI, all female multiparous plasma is quarantined and sent for plasma fractionation. Re-emphasis of the already existing SOPs and practices about safe practices and safe transfusion was done to maintain the standards of blood transfusion, taking adequate measures regarding rational use of blood components, use of leukoreduced and buffy coat reduced PRBCs for chronically transfused conditions such as thalassemia, transplant patients, repeated FNHTR reactions, played an essential role in reducing the rates of such adverse reactions due to unforeseeable causes. It is vital to ensure the appropriate use of blood components and reduce unwanted transfusions so that the incidence of adverse events reduces spontaneously. Most of the time, however trivial a reaction is, the product implicated is wasted.

Hence, reducing these reactions will also reduce the total blood discards.

The limitation of the study is that the Covid -19 pandemic has impacted a shortage of inventory and blood component issues, factor assays in QC of FFP and cryoprecipitate, and equipment repair and maintenance, leading to variations in between the cycles.

Conclusion

Quality indicators are tools for continuous improvement to enable the blood center to achieve its highest quality standards. The implementation of CAPA measures can rectify the deviations in KPIs. Revision and regular update of predonation information and materials, thereby strengthening counseling and screening procedures, QC, and performance-based selection of TTI kits, can help reduce the TTI positivity rates. Extensive educational campaigns on handling and administering blood components to all staff involved in the transfusion chain help reduce the discard rates due to other causes. Revision of SOPs based on learning from errors and training technicians on how to use and comply with adherence to them and regular calibration of equipment will help achieve better QC accomplishments.

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Conflicts of interest

There are no conflicts of interest.

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