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LEAN MANAGEMENT TO REDUCE WAITING TIME FOR ROUTINE BLOOD SERVICE AT BLOOD TRANSFUSION SERVICE UNIT CIPTO MANGUNKUSUMO HOSPITAL

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ABSTRACT

Background: Blood supply at Cipto Mangunkusumo Hospital is done by the Blood Transfusion Service Unit which is responsible for the availability of safe, high-quality, and sufficient blood. The high number of routine blood demand at the same time makes the waiting time lengthen and exceed the standard time. The implementation of lean methods is needed to identify value added and work activities that do not add value in order to meet the waiting time standard for routine blood services. Methods: This is an action research conducted at UPTD RSCM from October to November 2019. Samples taken by consecutive sampling for 2 weeks during working hours and outside working hours, weekdays and weekend. Observation guidelines use value-added, non-value added, waiting time, cycle time, and lead time observation sheets. Waste is included in the DOWNTIME matrix. Followed by interviews and focus group discussions and the implementation of 5S and visual management (PRC order monitoring systems based on information technology). Results: Research on 50 samples of routine blood demand pre-intervention and 50 samples of post-intervention with PRC blood and first serial transfusion. The most samples pre- and post-intervention came from the Thalassemia Polyclinic, Inpatient Building A, and Emergency Room. Waste found includes over production, waiting, non- utilized talent, transportation, motion, and extra processing. Value added of routine blood service post-intervention decreased from 1 hour 26 minutes 49 seconds to 1 hour 22 minutes 52 seconds (5%). The post-intervention waiting time decreased from 48 minutes 19 seconds to 31 minutes 23 seconds (35%). The routine blood service lead time at the UPTD RSCM post-intervention decreased from 2 hours 35 minutes 31 seconds to 2 hours 7 minutes 47 seconds (18%). An efficient process of routine blood demand occurs with an increase in value added ratio from 56% to 65% (9%). Conclusion: Implementation of lean management, namely 5R and visual management (PRC order monitoring system based in information technology), can reduce the waiting time for routine blood services in UPTD RSCM. The routine blood service process at UPTD RSCM has become more efficient.

Keywords: Lean management, Blood service, Waiting time

INTRODUCTION

Blood services as one of the health efforts in the context of healing diseases and health recovery are in dire need of the availability of blood products and blood components that are sufficient, safe, useful, easily accessible, and affordable by the community. The continuous availability of blood products is needed for diseases that require routine blood transfusions such as thalassemia, hemophilia, and aplastic anemia as well as for surgery. Blood supply at Cipto Mangunkusumo Hospital is done by the Blood Transfusion Service Unit which is responsible for the availability of safe, high- quality, and sufficient blood. Data on blood usage in RSCM during 2018 were 106,652 blood bags. The most blood use came from the Department of Internal Medicine (46.2%), followed by the Department of Child Health (29.1%), and the Department of Surgery (19.5%).[1]

The process of blood demand from the ward to the UPTD can be in the form of an urgent blood request for emergency conditions, elective blood requests, and routine blood requests (blood supply on the same day as blood demand). The waiting time for routine blood service is counted since the ticket window clerk receives and checks the completeness of the routine blood request form along with the blood sample, until the blood is finished with a pre-transfusion test.2 The high number of routine blood demand at the same time makes the service waiting time lengthen and exceed the standard time ≤ 3 hours. During 2018, UPTD RSCM only fulfill 945 out of 1,128 (83.78%) routine blood demand ≤ 3 hours.1 The lengthening waiting time for blood services is a potential injury condition that can have an impact on patient management and safety. The length of time waiting for blood services is due to lack of standards in employment, poor layout, and uneven distribution of work in transfusion services.[3]

Work activities that provide added value or do not provide added value (waste) need to be identified in the process of transforming inputs into outputs throughout the process of supplying blood. Waste that occurs includes waiting time for laboratory examination results and wasted motion throughout the process that flows in the transfusion service.3 In the process of receiving until the examination of blood samples, as much as 31.5% of the time spent working on documents and 12.6% for walking.[4]

Through lean methods which include value stream mapping, standardized work, job instruction

training, visual management, and 5S can identify and eliminate work that has no added value.[5,6,7,8]

METHODS

This is an action research conducted at UPTD RSCM since the date of issuance of ethical clearance by the Ethics Commission of the Faculty of Medicine, University of Indonesia. Samples taken by consecutive sampling. The calculation of the sample size of this study was 48 routine blood requests with the inclusion criteria: 1) Routine blood request, 2) PRC blood, 3) First serial transfusion and exclusion criteria: 1) Emergency and elective blood request, 2) Positive antibody screening.

In the preparation stage, the researcher prepares a value stream mapping sheet, data collection sheet, and interview guide. Continued at the diagnosis stage by observing the routine blood request process, starting from receiving the blood request form along with blood samples at the UPTD reception counter until the pre-transfusion test is finished in the laboratory room. Then do the calculation of value added, non value added, cycle time, lead time, value added ratio and make a current state map. Based on these results, waste identification is done using the DOWNTIME matrix. Interviews were then conducted with blood transfusion technicians and FGD officers consisting of the head of the UPTD, service coordinator, the person in charge of special services, and the person in charge of human resources.

In the planning stage, create a future state map which contains the corrective action plan and determine the selected improvement ideas, namely 5S and visual management (PRC order monitoring systems based on information technology). The purpose of making this monitoring system is so that each laboratory officer knows the time of the PRC order and the working time of the pre-transfusion test examination stages for each sample. The PRC order monitoring system was implemented for 1 week and then re-observed the application of the system.

The qualitative data of this study will be presented in the form of value stream mapping and interview transcripts and focus group discussions. This research has 2 independent variables with nominal measurement scale and 1 dependent variable with ratio measurement scale (before and after implementation). Data is presented in tabular and graphical form.

RESULTS

The study was conducted for 6 weeks from October to November 2019 in the RSCM Blood Transfusion Service Unit. The study sample each amounted to 50 pre- and post-intervention. In this study the most routine blood demand came from the Thalassemia Polyclinic, pre-intervention (64%) and post-intervention (46%), followed by Inpatient Building A, pre-intervention (16%) and post-intervention (28%), and Emergency, pre-intervention (14%) and post-intervention (16%). Based on the day of service, routine blood demand is highest on weekdays, pre-intervention (95%) and post- intervention (64%). Whereas the time of the most routine blood demand in the morning shift is pre-intervention (86%) and post-intervention (62%).

The routine blood service processing time is calculated from the routine blood request form received by UPTD officers at the Reception Counter until the pre- transfusion test results at the Laboratory are completed. The process at the Reception Counter is divided into 4 cycles, while the Laboratory is divided into 9 cycles. Increased value added post-intervention at the Reception Counter on antibody data input and order screening on computers (51%). While the value added post-intervention at the Reception Counter which declined was the identification of the completeness of the form (8%) and the making of evidence of blood receipt and given to the porter (8%).

The total value added post-intervention at the Reception Counter increased from 6 minutes 8 seconds to 7 minutes (14%). Increased value added after the intervention in the Laboratory on returning donor blood bags to the refrigerator by 48%. However, there was a decrease in the highest value added on integrating the examination results sheet into the form (59%) and identifying the form and making a list of names in the screening book (53%). The total value added post-intervention in the Laboratory decreased from 1 hour 20 minutes 41 seconds to 1 hour 15 minutes 52 seconds (6%). Overall, the added value of routine post-intervention blood services, from the Reception Counter to the Laboratory, decreased from 1 hour 26 minutes 49 seconds to 1 hour 22 minutes 52 seconds (5%).

The highest decrease in waiting time after intervention at the Reception Counter on making evidence of blood reception and given to the porter, from 40 seconds to 28 seconds (30%). However, there was an increase in waiting time after the intervention in the input of patient data and order for antibody screening on the computer from 1 minute 24 seconds to 1 minute 31 seconds (9%). The total waiting time after the intervention at the Reception Counter decreased from 2 minutes 19 seconds to 2 minutes 13 seconds (4%). The

highest decrease in waiting time post-intervention in the Laboratory while waiting for the identification of forms and finding an appropriate donor blood bag (53%), followed while waiting for blood type examination and screening for antibodies in the automation machine (49%) and identification of forms and making a list of names on screening book (38%). But there was an increase in waiting time in returning donor blood bags to the refrigerator (42%) and examination of donor blood groups (manual) (18%). Total post-intervention waiting time at the Laboratory decreased from 46 minutes to 29 minutes 10 seconds (37%). Overall waiting time for routine blood service post- intervention, from the Reception Counter to the Laboratory, decreased from 48 minutes 19 seconds to 31 minutes 23 seconds (35%).

The lead time for routine pre-intervention blood demand originating from the Thalassemia Polyclinic (2 hours 9 minutes 19 seconds) is lower than the non-olyclinic Thalassemia lead time (2 hours 24 minutes 38 seconds). Post-intervention, the reduction in lead time for routine blood demand from the Thalassemia Polyclinic by 11 minutes 43 seconds (9%) was lower than that for the non-Polyclinic Thalassemia by 33 minutes 16 seconds (23%). While the decrease in waiting time post-intervention from non- Thalassemia Polyclinic by 28 minutes 49 seconds (52%) is higher than Thalassemia Polyclinic by 6 minutes 57 seconds (16%). Pre-intervention routine blood demand lead time in the morning shift (2 hours 11 minutes 11 seconds) is lower than the afternoon shift (2 hours 39 minutes 26 seconds). Post-intervention, the decrease in lead time for routine blood demand in the morning shift by 15 minutes 46 seconds (12%) is lower than the afternoon shift by 47 minutes 7 seconds (30%).

This study shows the pre-intervention lead time of 31 routine blood requests for the Thalassemia Polyclinic, 1 of which is > 3 hours. Whereas the pre-intervention lead time of 19 routine blood demands for Thalassemia Non-Polyclinic, 4 of which were > 3 hours, 2 on weekday night shifts and 2 on Saturday morning shifts (Figure 6). Post- intervention, the lead time for all routine blood requests, both Thalassemia and Non- Polyclinic Thalassemia Clinics < 3 hours with the lowest Thalassemia Polyclinic lead time is 1 hour 20 minutes and the highest is 2 hours 52 minutes and the lowest Non-Polyclinic Thalassemia lead time is 1 hour and 29 minutes and the highest is 2 hours 53 minutes.

Total post-intervention lead time in the Laboratory decreased from 2 hours 27 minutes 4 seconds to 1 hour 58 minutes 34 seconds (19%). Overall, the lead time for routine post- intervention blood services, from the Reception Counter to the Laboratory, decreased from 2 hours 35 minutes 31 seconds to 2 hours 7 minutes 47 seconds (18%). Process efficiency as measured by the value added ratio shows a change from 56% to 65%, in other words an increase of 9%. This study showed a decrease in lead time for routine post-intervention blood services by 27 minutes 7 seconds, followed by a decrease in waiting time from 31% to 25% (6%) and a decrease in non-value added from 13% to 11% (2%).

DISCUSSION

Routine blood demand is the most blood service in the UPTD RSCM compared to emergency and elective blood demand. Fulfillment of emergency blood demand < 30 minutes has been fully achieved, in contrast to meeting routine blood demand ≤ 3 hours which only reached 83.78% in 2018. The number of routine blood demand and sometimes at almost the same time, especially on the Thalassemia Polyclinic day every Monday, Wednesday, and Friday and at peak hours between 10 am to 2 pm, making service waiting times lengthen and not in accordance with predetermined time standards. The most routine blood demand comes from the Thalassemia Polyclinic, pre-intervention (64%) and post-intervention (46%), and most requests on weekdays with morning service time (07.30 am to 2.30 pm).

This study shows the lead time of routine blood demand for pre-intervention originating from the Thalassemia Polyclinic (2 hours 8 minutes 17 seconds) is lower than the non-Polyclinic routine blood demand lead time (2 hours 24 minutes 38 seconds). Post- intervention, the decrease in lead time for routine blood demand originating from the Thalassemia Polyclinic (8%) was lower than the decrease in the lead time for routine non-Polyclinic Thalassemia routine blood demand (23%). The number of routine blood requests that come from the Thalassemia Polyclinic at the same time does not make the lead time higher than the non-Thalassemia Polyclinic because the blood pre-transfusion test process can be done simultaneously compared to blood samples from non-Polyclinics who come at separate times. The impact of waiting time increases because the sample must wait for other samples to be processed.

Whereas the lead time for routine blood demand for pre-intervention in the morning shift (2 hours 10 minutes 27 seconds) is lower than the lead time for routine blood demand in the afternoon shift (2 hours 39 minutes 26 seconds). Post-intervention, the decrease in lead time for routine blood demand in the morning shift by 15 minutes 2 seconds (12%) is lower than the decrease in lead

time for routine blood demand in the afternoon shift by 47 minutes 10 seconds (30%). The delay in processing blood samples actually occurs in the time after peak hours. The work ethic and skills of officers need to be further improved considering that 35.21% of the potential failures are related to the skills and knowledge of workers.9 Thus it is necessary to increase workers' awareness and provide appropriate training courses so as to significantly reduce risk and cause problems.[9]

Blood requests are made by the Doctor in Charge of Services by filling in the blood request form. Completeness of form filling is important and must be accompanied by supporting documents and blood samples of the patient. Education on filling out blood forms to the DPJP as well as education on patients and officers at the polyclinic and re- treatment room was carried out to support the smooth process of blood services. Incomplete forms and supporting documents will be returned and this can extend the time to fulfill blood products. This study showed a decrease in value added identification of the complete blood request form from 1 minute 26 seconds to 1 minute 19 seconds (8%) after re-education to patients in the form of information on the document requirements attached to the reception counter.

Routine blood service activities, whether providing value added or not adding value (waste) need to be identified in the process of transforming inputs into outputs throughout the process of supplying blood. This study shows that there is waste in routine blood services at UPTD RSCM. The biggest waste found is waiting, which is waiting for blood type examination and antibody screening in the automation machine for 8 minutes 49 seconds. In addition, another waste category found in this study is motion in excess which is seen through the movement of employees from work stations to place forms into the immediate spin basket or look for pens and staplers that are often lost at work stations. This is in line with Sunyog (2004) which states that the waste that occurs includes the waiting time of the results of laboratory examination and wasted motion throughout the process that flows in the transfusion service.[3]

This study showed a decrease in post-intervention lead time in the Laboratory from 2 hours 26 minutes 25 seconds to 1 hour 58 minutes 32 seconds (19%). Overall, the lead time for routine post-intervention blood services decreased from from 2 hours 35 minutes 31 seconds to 2 hours 7 minutes 47 seconds (18%). In addition there is the efficiency of routine blood services in UPTD RSCM as indicated by the increase in value added ratio (VAR) from 56% to 65% (9%) after the application of 5R and visual management in the form of information technology-based PRC order monitoring systems. LaRocco (2010) states that through lean methods which include value stream mapping, standardized work, job instruction training, visual management, and 5S can identify and eliminate work that has no added value.[5]

The information technology-based PRC order monitoring system applied in this study aims to monitor the processing time for blood requests from orders received to pre- transfusion testing. Blood Technician and PJ Shift on duty at the Laboratory can monitor every incoming order to be immediately carried out pre-transfusion tests and maintain routine blood service time ≤ 3 hours. This monitoring system informs the time of the blood demand order and the time of each stage of the pre-transfusion test that has been completed.

The PRC order monitoring system is a means of communication between one blood technician and another. So far, although the officer is in one room, the progress of the process of supplying blood products per sample has not been clearly monitored. Norfolk (2013) states that the key elements at each stage of the blood delivery process are correct patient identification, good documentation, and good communication.[10,11,12]

CONCLUSION

The application of lean management, namely 5R and visual management in the form of an information technology-based PRC order monitoring system, can reduce the routine blood service processing time at UPTD RSCM The waiting time for routine blood services in UPTD RSCM post-intervention decreased from 2 hours 35 minutes 31 seconds to 2 hours 7 minutes 47 seconds (18%). Efficiency in the routine blood demand process in UPTD RSCM is increasing the value added ratio from 56% to 65% (9%).

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