

Process Mapping of a Blood Bank in tertiary care multi specialty Hospital

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Abstract: Process mapping in healthcare has Evolved as mechanism of reviewing the complex processes holistically. When done at initial stages, it helps in visualizing the processes by identifying the sequence of events, work responsibilities, operational decisions involved & as the process grows organically over a long period of time, it acts as a technique of identifying the bottle necks areas, thereby aids in further streamlining of the processes. Blood bank is an area involving multiple sub-process & inter-departmental interactions .Efficient working of which is of utmost importance for timely provision of compatible blood and its safe and appropriate use. Process mapping of such an area helps in detection and prevention of errors, risk control thus leading to implementation of improved and efficient processes. Process maps also acts as blueprints for developing standard operating procedures (SOPs) in the department, which form an important part of Quality Management System (QMS) in hospitals.

Keywords: Blood products, Component separation, Decision Points, Donors, Whole blood

I. Introduction

Process mapping helps in understanding the workflow in an area by separating it into sequential events in order of their occurrences (activities, decision points, or staff interactions, documentation). These sequential steps between two points can be viewed as a process of care (Trebble, Hansi et al 2010). Identifying how the current system is operating is an essential element to further identify improvement opportunities in the system. Process maps can identify hidden interactions between processes & uncover redundant tasks. Thus helps in improving quality and generating more income. It also helps in looking beyond the functional activities of a department and highlights the core process by providing accurate visual representation of activities and interaction, fitting all of them into one big picture (Savory & Olson 2001). Mapping of processes had benefited various specialties and multidisciplinary teams in healthcare system by acting as pioneer step in redesigning their processes (Taylor & Randall 2007) (King, Ben-Tovim et al 2006).

Blood is a vital resource in healthcare used in wide range of processes in hospitals such as surgery, medical emergency. Control and coordination of blood-bank processes is necessary to ensure easy access to blood & blood product and to minimize its wastage (Ramani, Dileep et al 2009). Blood bank is can be considered as a manufacturing unit which consists of many processes starting from selection of donor to the issue of blood and blood products. Process mapping helps in clearly defining all the processes within blood bank thus accomplishing the first and foremost step in ensuring good manufacturing processes [7]. National Aids control organization (NACO) India has laid down standards for all the processes in blood bank including donor selection, collection of blood, testing of collected blood, blood component preparation, compatibility testing, storage, transportation and expiration & issue of blood and its components [8].

II. Research Methodology

The process started with the observation of workflow at initial stage of the project & identifying the major processes occurring in the blood bank starting from donor selection till the discarding of blood / blood component .Observation checklist was then used to study the processes. A narrative outline of all the process was made by group interview & discussion with the blood bank officer cum in-charge and the senior technician in the blood bank. All these activities were carried out over a period of 15 days. Review draft of process map was prepared & approval was taken from blood bank officer. The key parameters observed during the process were work responsibility & time taken in the activities.

III. Observation

Blood bank being an area where multiple processes are carried out in many number of steps, mapping was done in seven parts representing those seven major processes described in Fig 1

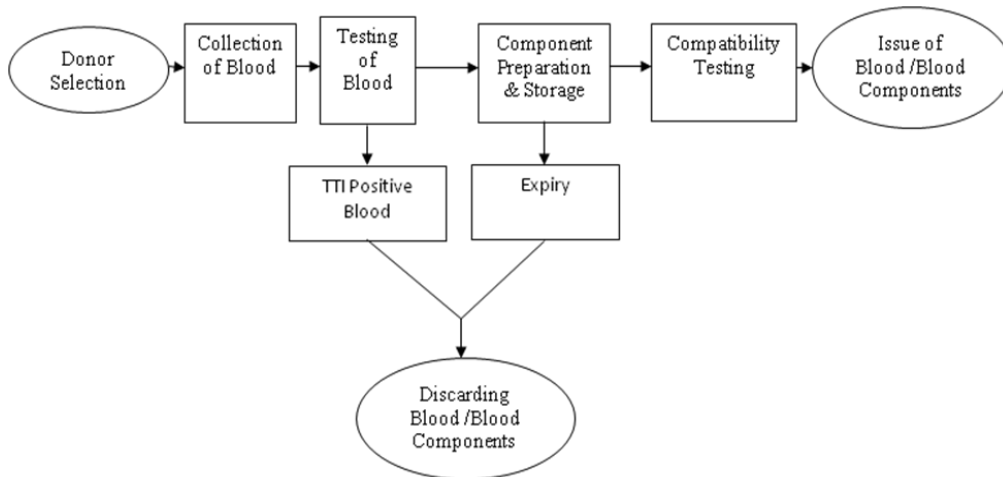


Fig1: The outline of the processes in blood bank.

Donor selection

This process comprehensively involved selection of individuals who were fit for blood donation, which was done through multiple sequential events of filling of questionnaire provided in local language, estimation of hemoglobin, educational activities including pre donation counseling for those who are fit as well as unfit for blood donation. Complete elaboration of various steps in this process has been illustrated in Fig 2. Work responsibilities of each activities were identified which has been described in TABLE 1.

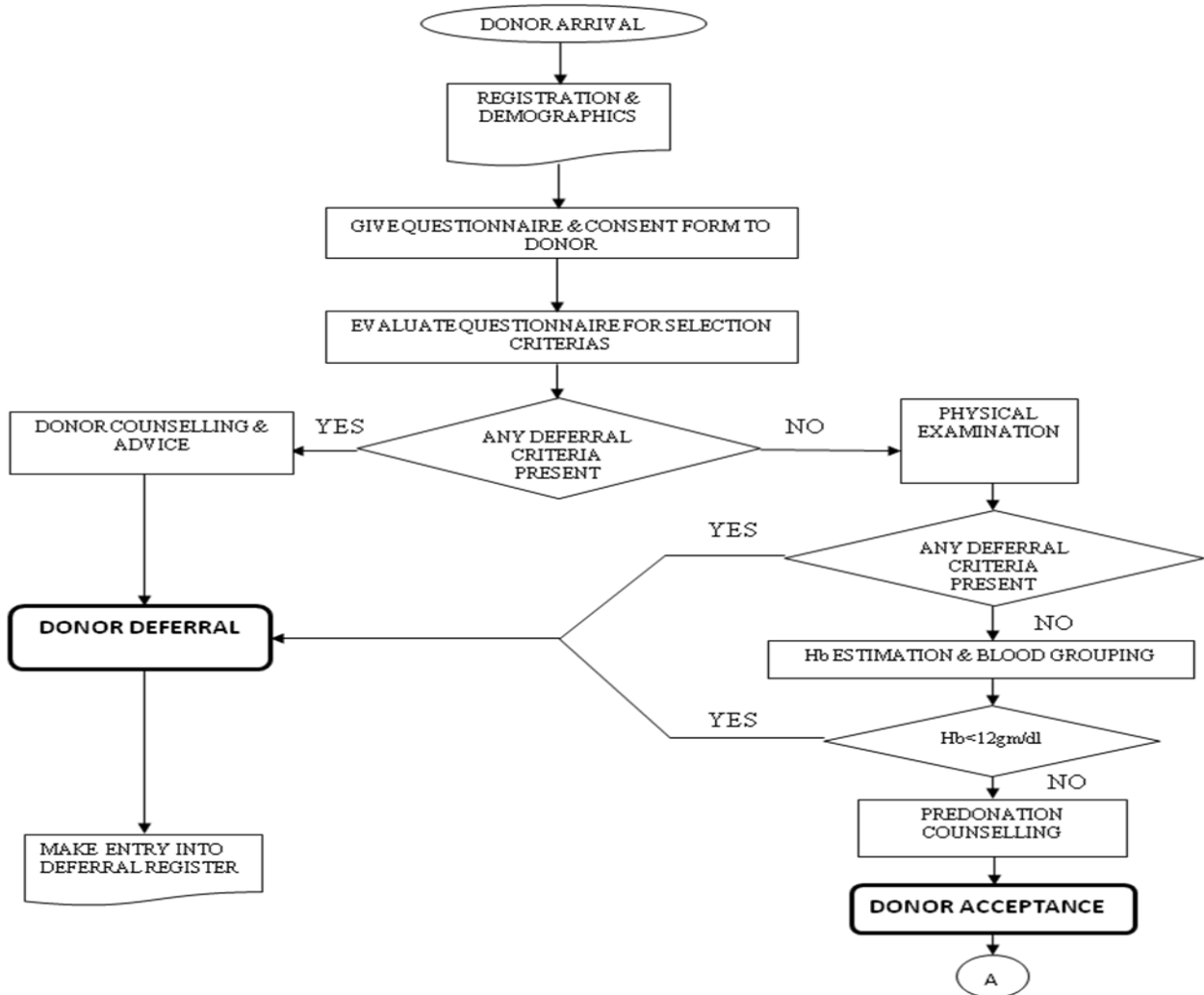


Fig 2: Donor Selection Process

Table 1- Activities & Work Responsibilities in Donor Selection Process

S.NO	ACTIVITIES	RESPONSIBILITY
Step 1	Registration of donor and demographic details	Assistant technician / technician in- charge
Step 2.	Give questionnaire and consent form to donor	Blood bank officer
Step 3	Evaluation of filled form	Blood bank officer
Step 4	Physical examination	Blood bank officer
Step 5	Estimation of hemoglobin level	Technician in-charge
Step 6	Counseling of donor	Blood bank officer
Step 7	Documentation	Technician/ Attendant

Blood collection

Once donor has been counseled about the donation process, tests carried out on donated blood & Confidentiality of test results, consent was taken from patient for collection of blood & sequential activities mentioned in Fig 3 was carried out.

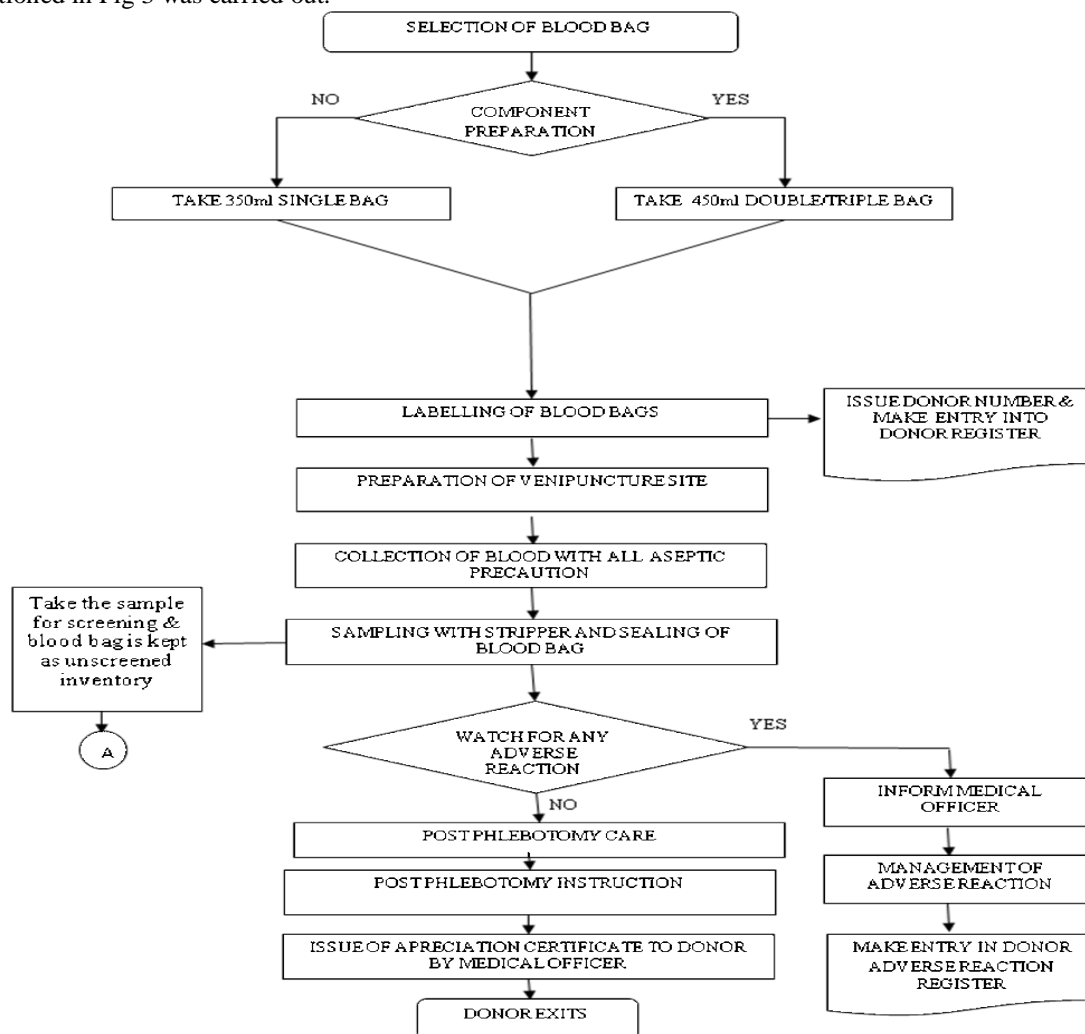


Fig 3 Blood Collection Process

Table 2: Activities & Work Responsibilities In Blood Collection Process

S.NO	ACTIVITIES	RESPONSIBILITY
Step 1	Selection of bags	Assistant technician/phlebotomist
Step 2	Labeling of bags	Assistant technician/phlebotomist
Step 3	Preparation of venipuncture site collection of blood	Technician /phlebotomist
Step 4	Collection of blood	Technician /phlebotomist
Step 5	Management of adverse reaction (if any)	Medical officer
Step 6	Sampling , Stripping & storage of blood bags	Technician /phlebotomist
Step 7	Post phlebotomy care	Nursing staff/ technician
Step 8	Post phlebotomy instructions	Nursing staff/ technician
Step 9	Issue of medical certificate	Medical officer
Step 10	Sample sent for screening & blood bag kept in unscreened inventory	Attendant
Step 11	Documentation	Technician

Testing of blood

Screening of blood is of utmost importance in order to prevent further complications or occurrence of TTIs. Blood was tested to determine ABO grouping, RH Type & presence of any antibodies. It was mandatory to test all donated blood units for four infections transmissible by transfusion. Process has been illustrated in Fig 4

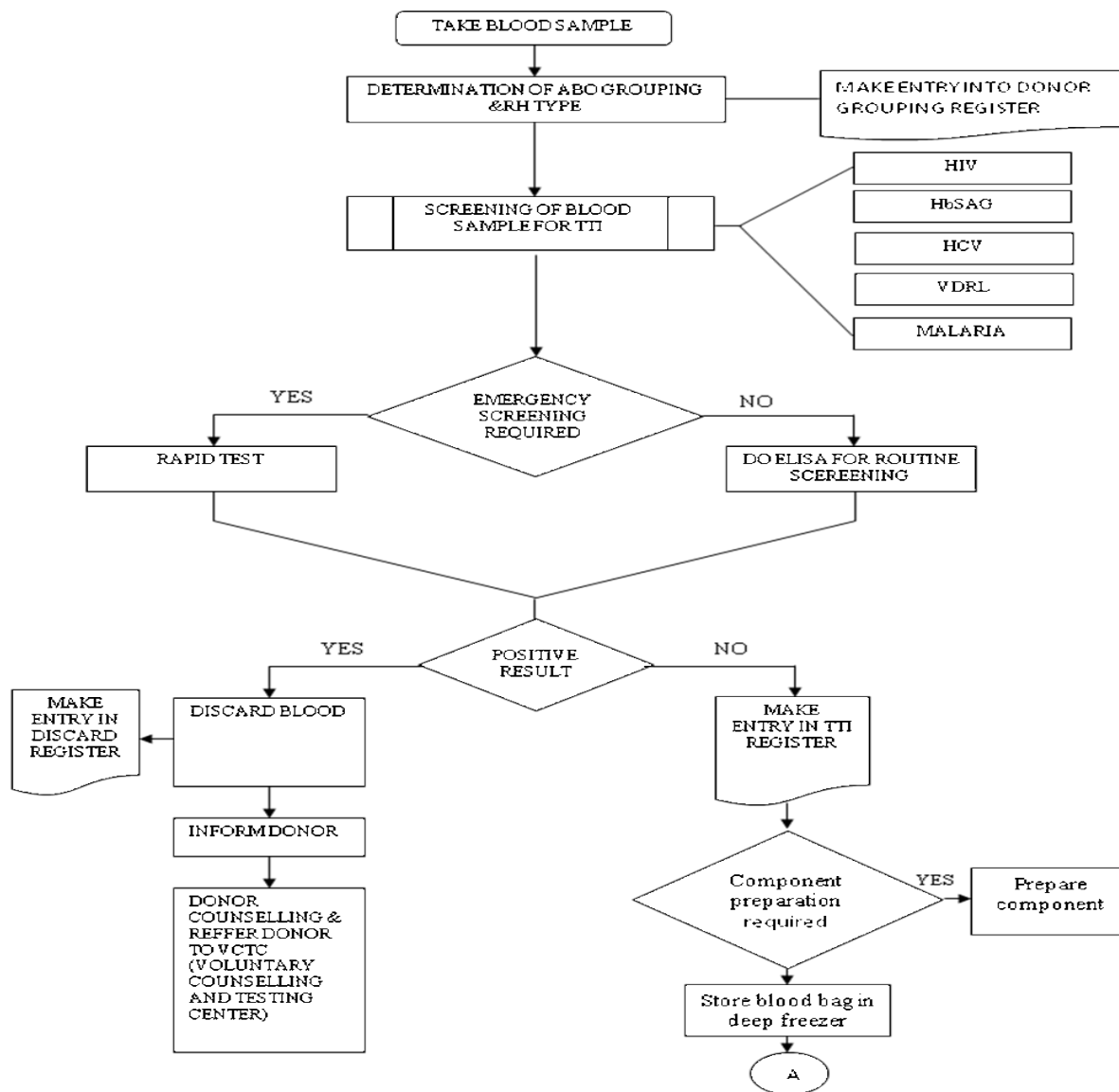


Fig 4: Blood Testing Process

Table 3. Activities & Work Responsibilities In Testing Of Blood

S.NO	ACTIVITIES	RESPONSIBILITY
Step 1	Blood grouping	Assistant technician
Step 2	Rh Typing	Assistant technician
Step 3	RAPID TEST(emergency screening)	Technician in charge
Step 4	ELISA(routine screening)	Technician in charge
Step 5	Discard blood	Attendant
Step 6	Donor counseling & referral to VCTC	Medical officer
Step 7	Component storage as screened inventory / sent for component preparation	Assistant technician
Step 8	Documentation	Technician

Preparation of Blood Component

Component preparation was done only for those units which qualify to be negative for TTIs after screening .During processing of blood into its component, sterility was maintained using aseptic methods and sterile pyrogen free disposable bags and solutions. Stepwise illustration is given in Fig 5

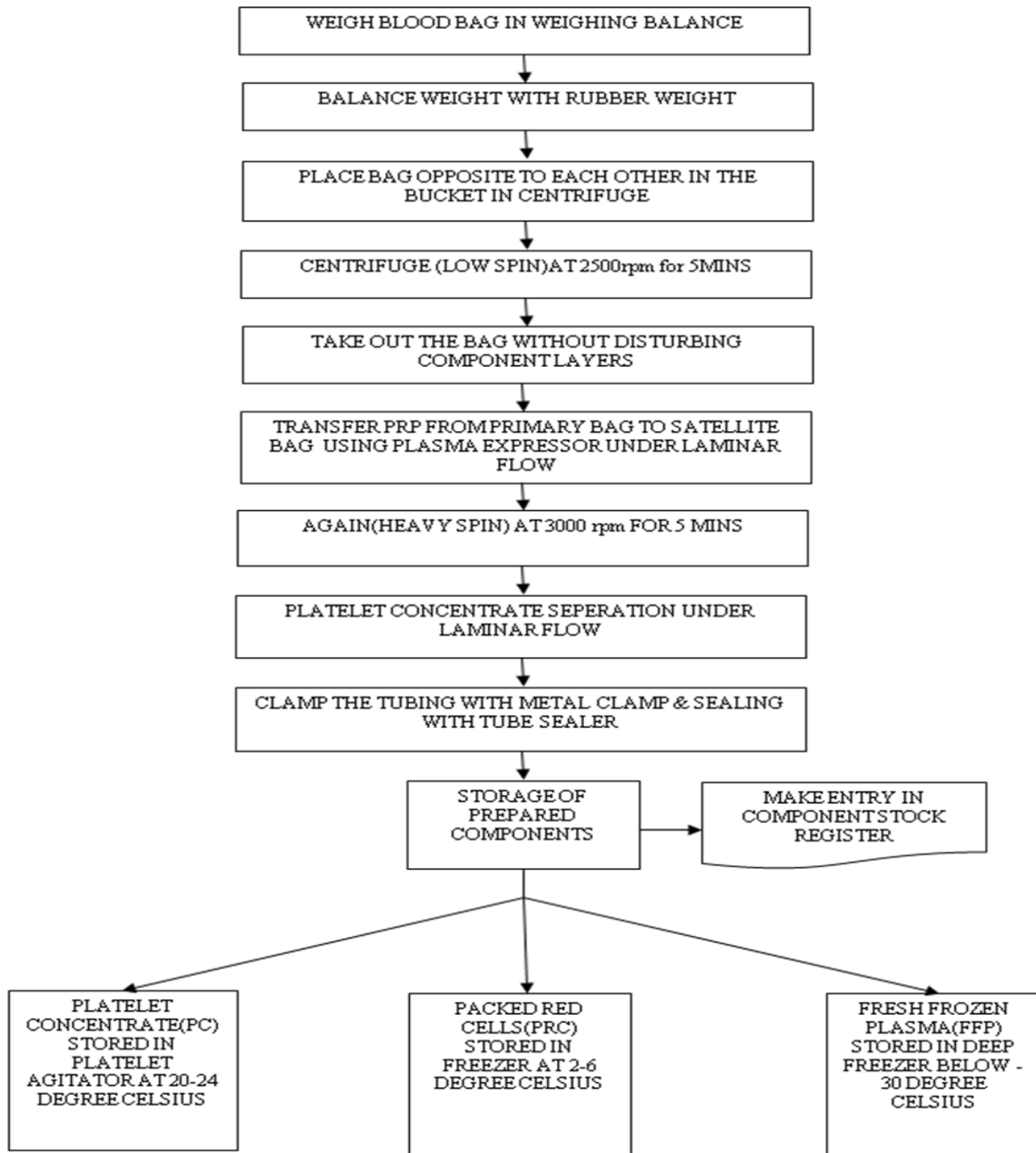


Fig 5: Blood component Preparation Process

Table 4. Activities & Work Responsibilities In Component Preparation

S.NO	ACTIVITIES	RESPONSIBILITY
Step 1	Weighing & placing blood bags into centrifuge	Technician in charge
Step 2	Low spin centrifuge	Technician in charge
Step 3	Separation of PRP	Technician in charge
Step 4	Heavy spin centrifuge	Technician in charge
Step 5	Separation of platelet concentrate	Technician in charge
Step 6	Sealing & clamping	Technician in charge
Step 7	Documentation	Technician

Compatibility Testing

Compatibility tests are done in order to prevent occurrences of post transfusion hemolytic reactions which may be caused by antibodies of the ABO blood group system or by antibodies to other blood group antigens.

Test included verification of ABO Grouping, Rh Typing & Cross matching of recipient serum or plasma was done with sample of donor taken from segment attached to blood bag.

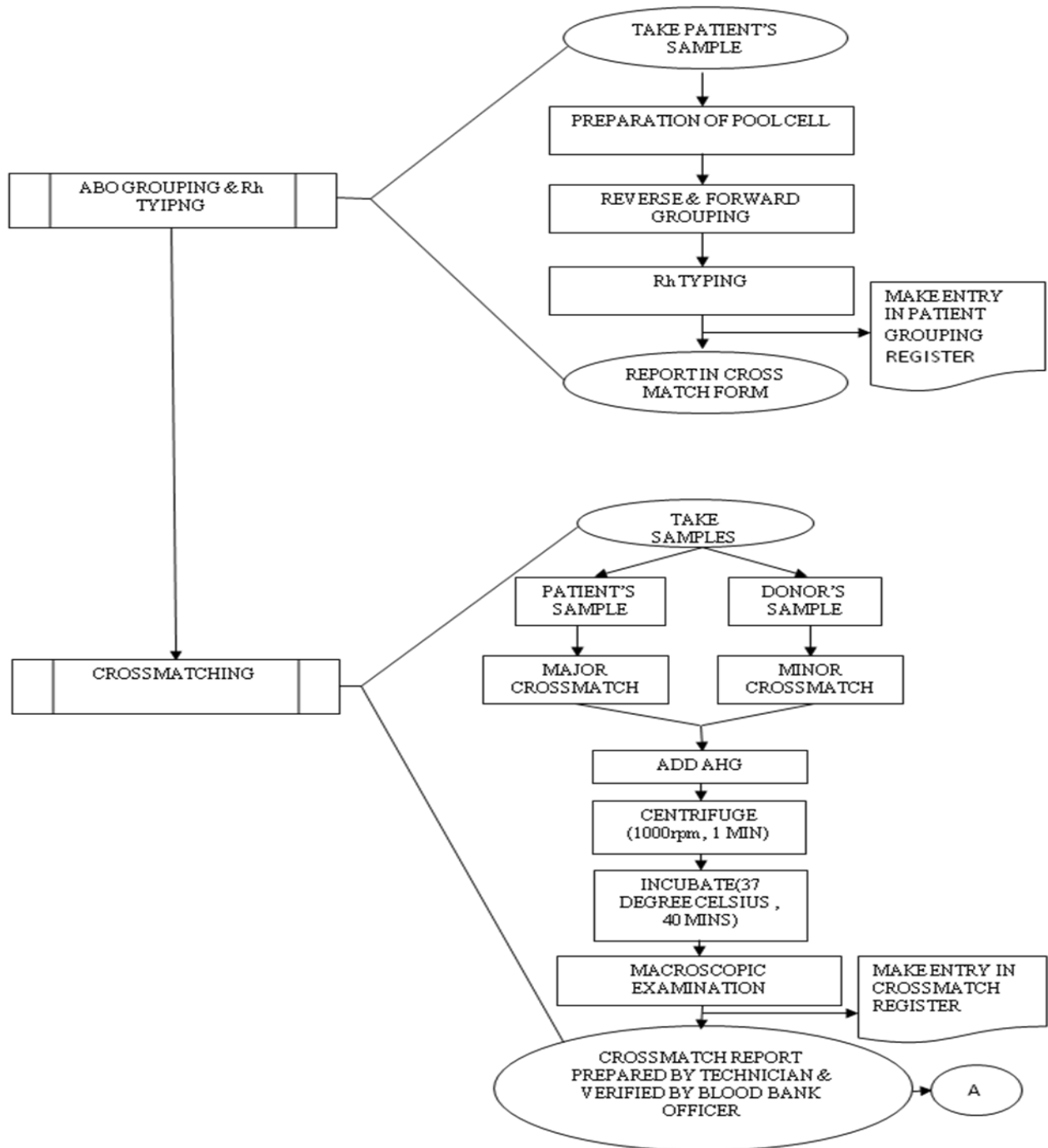


FIG 6

Table 5. Activities & Work Responsibilities in Compatibility Testing

S.NO	ACTIVITIES	RESPONSIBILITY
Step 1	Preparation of pool cell	Assistant technician
Step 2	Reverse & forward typing & Rh typing	Assistant technician/ Technician in charge
Step 3	Add AHG & Centrifugation	Assistant technician/ Technician in charge
Step 4	Incubate	Assistant technician
Step 5	Macroscopic examination & preparation of report	Assistant technician/ Technician in charge
Step 6	Verification of cross match report	Blood bank officer
Step 7	Documentation	Technician

Issue of Blood/Blood Components

Process for both emergency & routine issuing of blood/ blood component unit is well defined in blood bank to ensure timely supply of safe blood as any kind of delay in emergency situations can be detrimental to survival of patients. Criteria had been laid down for acceptance of unit if not used.

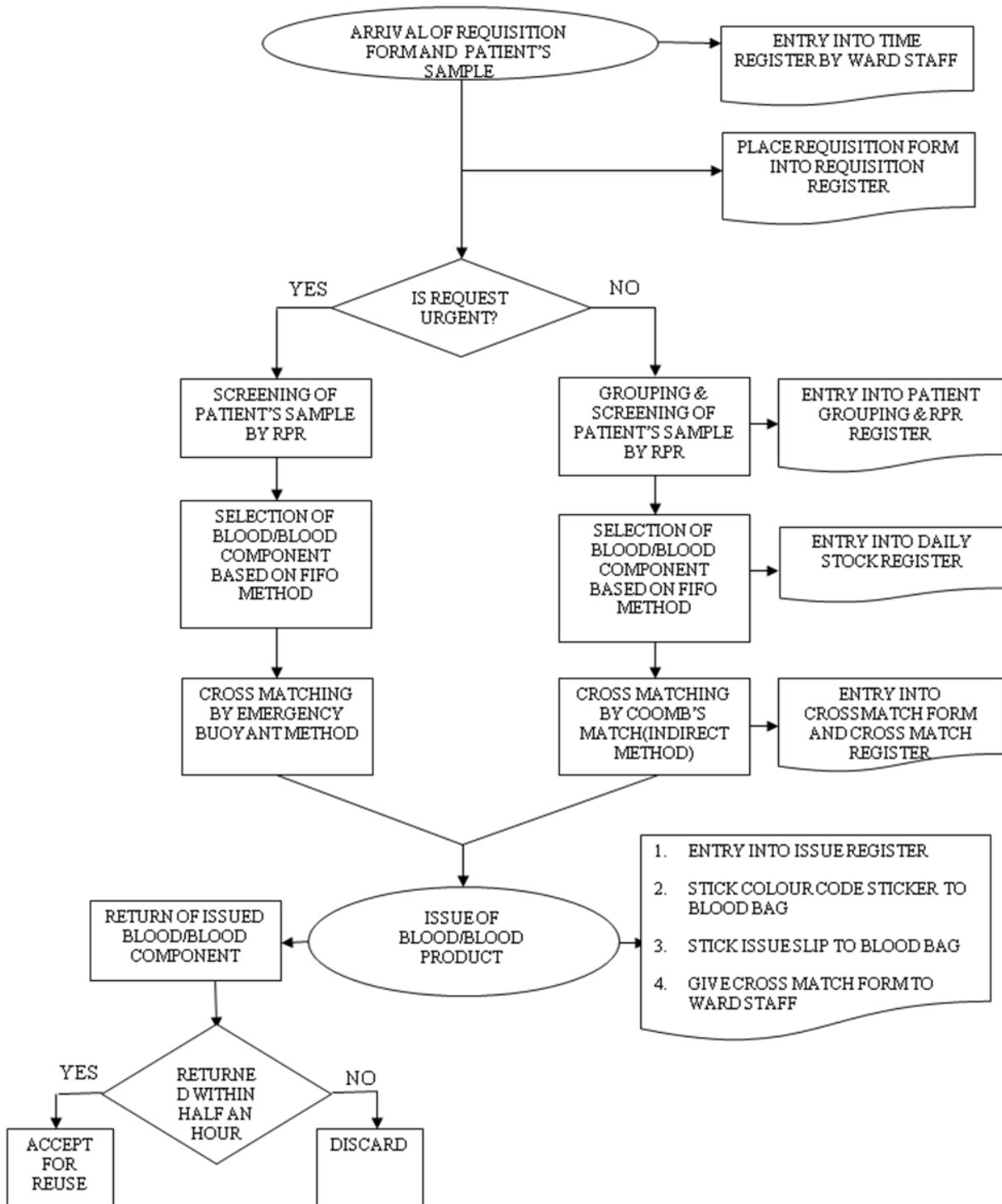


Fig 7: Issue of Blood Component

Table 6. Activities & Work Responsibilities in Issue Process

S.NO	ACTIVITIES	RESPONSIBILITY
Step1	Arrival of requisition form & patient sample	Ward staff
Step 2	Blood grouping	Assistant technician
Step 3	Screening	Assistant technician/ Technician in charge
Step 4	Selection of blood bag	Assistant technician
Step 5	Cross-matching	technician in charge & blood bank officer
Step 6	Issue of blood bag	Technician in charge
Step 7	Return of blood bank	Ward staff
Step 8	Blood bag kept for reuse	Attendant
Step 9	Discard blood bag	Attendant
Step 10	Documentation	Technician

IV. Result & Discussions

Process mapping revealed the level of complexity of each process by analyzing certain parameters in each process. Multiple decision points & staff interactions increase chances of ambiguity in effective completion of that process. Table 7 shows the analysis of various processes in blood bank by enumerating all the parameters in each process. Phlebotomy & issue procedures were found to be the most complex ones involving maximum steps, staff interactions & documentations. Donor selection involves maximum decision points. Component separation can be taken as one of the simplest step as not much of staff interaction & decision points were involved.

Table7. Analysis of Processes

S.No	Parameters	Donor Selection	Phlebotomy	Testing of Blood	Component Preparation	Compatibility Testing	Issue of Blood
1	No. of Steps	7	11	8	7	7	10
2	No. of Staff Involved	3	5	3	2	3	4
3	No. of Staff Interaction	3	4	2	1	3	4
4	No. of Decision Points	3	2	3	-	1	2
5	No. Of Documentation	2	2	3	1	2	6
6	Probable Outcomes	2	1	2	1	2	3

V. Conclusion

Process mapping of blood bank generated a complete picture of study area by including all activities occurring in that area. This technique once applied in a blood bank helped in streamlining of activities. It makes the understanding of processes easier & make sure that none of the important steps are missed while performing various activities. It also helps in orientation of the new staff in the department and is an integral part of user manuals. Process mapping also forms a part of quality systems in GMP (Good Manufacturing Practices). Implementation of process mapping in blood bank facilitates examining of bottlenecks, sources of delay, role ambiguity, preventable errors, unnecessary handovers, work duplication & reduces cycle time thereby improving service levels in blood bank.

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