Blood Transfusion Failures in Hospital Settings: A Study

Dissertation Submitted to

The IIHMR University, Jaipur

For the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

By

Mr. Biswajit Kumar Jena

Under the supervision and guidance of

Dr. Nutan P Jain

2022

Study

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Medanta, The Medicity

Global Health
Limited

Date: 17th Jun- 2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Biswajit Kumar Jena** has completed his **Internship** in the department of **Quality** from 23.03.2022 to 17.06.2022 with Global Health Ltd. (GHL) Medanta – The Medicity.

We wish him all the best for his future endeavors.

For GLOBAL HEALTH LTD

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Deputy General Manager- Human Resources

DECLARATION BY STUDENT

I hereby declare that this dissertation titled **Blood Transfusion Failures in Hospital Settings** is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Mr. Biswajit Kumar Jena

Date : 03-06-2022

Abstract

Background: FMEA (Failure Mode Effective Analysis) it's a method which is used to evaluate the risk of potential failures and harms causes by failures during the Blood Transfusion Process and to identify the associated clinical issue.

Objective: To study the Blood Transfusion Process, the type of errors occurs to assess the risk of failures and harm to patient related to Blood Transfusion Process and suggest action plan and implementation of action plan.

Methodology: A systematic review done for each process of blood transfusion by using FMEA tool. Four session of 2 hour held to perform this FMEA for blood transfusion. Which have five phases.

Key Results: The scoring range for hazards matrix was 1 to 4. For risk priority number (RPNs) highest was 64 and lowest was 1. Failure modes and highest RPN scoring areas were identified. From which one area's failure mode scoring was 64 (wrong patient labelled on vacutainer) and four failure mode were associated with RPNs scoring over 36.

Conclusion: FMEA has proven to be a successful methodology for analysing and re-engineering healthcare procedures, particularly complex procedures that could be dangerous for patients. In this work, we used FMEA to identify many critical failure modes that could endanger patient safety. With the introduction of information technology, enhance the entire transfusion procedure.

Key words: Blood transfusion, Failure modes, Risk analysis, Hazard matrix, FMEA.

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Abbreviations

FMEA- Failure Mode Effects Analysis

FMS- Facility Management and Safety

JCI- Joint Commission International

NABH- National Accreditation Board for Hospital & Healthcare Providers

RPN- Risk Priority Number

JACHO- Joint Commission on Accreditation of Healthcare Organization

HFMEA- Healthcare Failure Mode Effects Analysis

TL- Team Leader

OT- Operation Theatre

ICU- Intensive Care Unit

FMECA- Failure Modes Effects and Criticality Analysis

1. INTRODUCTION:

Blood transfusion plays a vital role for any patient, and this is directly related to patient health. Any single incident in whole Blood Transfusion process could adversely effect on patient health or it could be death for the patient.

There were multiple incidents raised for Blood Transfusion. All of them reported as sentinel events, however there was a wrong infusion reported in this year 2022 but no adverse events occurs because the recipient patient blood type was AB positive. Other than that wrong sampling, wrong patient identification, wrong labelling on vacutainer, mismatching of blood box happens. In general, 30 to 40 incidents raised for blood transfusion. Apart from there was a incident happens for delivering of expired blood bag. As there were multiple check points to avoid any adverse events so no wrong infusion happens which can lead to adverse event. However, all this sentinel incidents were questionable for hospital.

It could be simple to anticipate possible mistakes if risk management tools are proactive. By making the mitigation in the process of blood transfusion more concentrated and accurate, it will increase quality and safety.

Blood transfusion it’s a potential life-saving procedure which can help to replace blood lost due to any surgical procedure or injury. It’s also can help if any illness prevents our body from producing blood or blood components (example; thalassaemia). As a correct blood transfusion can save a patient life likewise wrong infusion leads to patient death. Therefor it’s very important to safe blood transfusion. For conducting a safe blood transfusion, we have to ensure a systematic process and correct completion of each process. Starting form patient identification, adequate information on blood requisition form to delivering of correct and valid blood as per request and lastly monitoring of patient vitals before, during and after transfusion.

The management of healthcare facilities is directed by the National Accreditation Board for Hospitals and Healthcare Providers (NABH) in its accreditation standard Responsibilities of Management 6a to provide proactive risk management throughout the organisation. Similar to this, the NABH's FMS 1a and the Joint Commission International's (JCI) FMS 2 standards for facility management and safety (FMS) 2 focus on hazard identification and risk analysis exercises for hospitals and require the facility to take all necessary measures to eliminate or reduce hazards and associated risks.

For conducting a successful FMEA the Joint Commission on Accreditation of Healthcare Organization (JACHO) shaped a standard procedure. Which include:

1. Forming the team from respective departments who have thorough knowledge for the existing process.
2. Make a flow chart for the process and sub process for a particular process.
3. Describing potential failure modes, possible causes and failure effects for each sub process.
4. Giving each probable failure mode a numerical value based on its seriousness, likelihood, and detection, then using that value to determine the risk priority number.
5. The next step is to select the top 10 areas which are having mor RPN score to proposing and implementing mitigating actions for identified failure modes causes.
6. Set an expected date of completion for implementation and again rescoring for those selected areas and compare it with previous RPN scoring.

Conducting FMEA to assess the delicate and dangerous blood transfusion process. Hospitals intend to create a safer blood transfusion system that is capable of anticipating potentially dangerous situations by applying FMEA.

1.1 Rationale

As there were one hundred nine sentinel incidents reported for Blood Transfusion from past 4 months in this hospital have urged to conduct to study the existing process identify the failure occurring areas and improve it.

Therefore, using the FMEA tool can aid management in developing improvement strategies for a particular process linked to the greatest number of failure mode occurrences.

1.2 Research Questions

- What are common errors for entire process of blood transfusion in a 1200 bedded hospital ?
- Which of these processes have the maximum and most severe failure mode events ?

1.3 Objectives

- To study the Blood Transfusion Process

- To study the type of error occurs in Blood Transfusion process which leads to incidents
- To evaluate the failure risk and patient harms associated with the blood transfusion process.
- To suggest action plan and implement the action plan

2. REVIEW OF LITERATURE:

"Protective Risk Assessment of Blood Transfusion Process in Paediatric Emergency Using the Health Care Failure Mode and Effects Analysis (HFMEA) – January 2015"

The purpose of this study was to evaluate the proactive risk assessment of the blood transfusion process in the paediatric emergency of the Qaem education-treatment centre in Mashhad using the healthcare failure mode and effects analysis (HFMEA) technique. When a child is in need of emergency care, which has been classified as a high-risk area, blood transfusion is recognised as a unique clinical measure.

This cross-sectional study used a combination of quantitative and qualitative methods to analyse the causes, modes, and consequences of the blood transfusion process. The process's potential flaws were found and examined using a proactive HFMEA. The data for the items in HFMEA forms was gathered after focus group discussions and interviews with the expert panel yielded a consensus on their respective points of view.

For the 24 sub-processes included in the 8 blood transfusion procedures, a total of 77 failure modes have been discovered. In the blood transfusion procedure, a total of 13 failure modes were determined to be non-acceptable risks (hazard scores more than 8) and were moved to the decision tree. In cause-effect meetings, the underlying reasons of high-risk behaviours were discussed and categorised using a model that had been approved by the UK's national health system (NHS). The action kinds were categorised as acceptance (11.6%), control (74.2%), and elimination (14.2 percent). Using the TRIZ ("Theory of Inventive Problem Solving"), recommendations were divided into 7 categories.

"Adopting the Healthcare Failure Mode and Effect Analysis to Improve the Blood Transfusion Processes – January 2012"

In the research hospital, a number of transfusion-related adverse events have compelled the Patient Safety Committee to move swiftly to stop dangerous medical errors caused by transfusion-related procedures. It was predicted that an effective risk prevention strategy would lower the incidence of negative blood transfusion events at the research hospital. The HFMEA will be performed as part of this study in order to assess how vulnerable and risky the blood transfusion process is. The research facility intends to use HFMEA to create a safer blood transfusion system that can identify potentially dangerous situations beforehand. The study was carried out at the Cathay General Hospital in Taipei, Taiwan, a 600-bed, university-affiliated, tertiary referral acute care hospital.

Through 2009, the use of HFMEA resulted in just two adverse events throughout the blood transfusion procedure. These action plans will be made available to all of the hospitals that make up the Cathay Healthcare System, including the Cathay General Hospital, Sijhih Branch, Hsinchu Branch, and the Cathay Neihu Clinic, in order to guarantee the security of every patient. This HFMEA project's execution includes additional benefits. It was possible to evaluate the efficacy of the blood transfusion procedure using the data collected using the PDA system, including blood transport and injection timings as well as blood return rates. Users (satisfaction rate: 34.7%) believed the enhancements helped them manage their daily tasks. Data gathering was allowed to take place from 2005 to 2009. 58,933 blood transfusion procedures in total were carried out throughout this inquiry (13,261 in 2005, 12,013 in 2006, 11,306 in 2007, 10,795 in 2008 and 11,558 in 2009). 19 adverse events occurred during these blood transfusion procedures, yielding a defect rate of nearly 0.032 percent (4 in 2005, 2 in 2006, 11 in 2007, 0 in 2008, and 2 in 2009).

3. METHODOLOGY:

3.1. Study Design

A cross-sectional observational study was used for this study.

3.2. Sampling Technique

Everyday on an average 130 blood transfusion was going on in this hospital and 80% (104) of this going for OT and emergency which were not undergoing all the mentioned steps for transfusion. From rest 20% (which is 26 patients per day) were going through all the mentioned steps. Therefore, convenience sampling technique was used for collecting data.

3.3. Sample Size

The total sample were collected for this study was 180.

3.4. Data Collection Procedure

Data was collected through direct observation who were advised for blood transfusion starting from doctor's advice to completion of transfusion process & some data collected from system which were raised for Blood Transfusion related incidents.

3.5. Data Collection Method and Tool

Failure mode and effect analysis (FMEA) is also known as "Failure Modes Effects and Criticality Analysis (FMECA)" it is a method use to identifying potential failure modes that can cause greatest overall risk for an entire process, product or service which include failures in design, manufacturing or assembly lines. It is a process analysis tool, which specifically design on identifying possible failure modes & causes. When it comes to processes that include patient safety and medical equipment, such as when making changes to an existing process, FMEA can be utilised as a systematic approach for risk assessment and hazard identification in the healthcare industry. To perform an FMEA, a committed group of experts from the relevant departments is needed. These experts must have a solid grasp of the processes being assessed.

Risk management is described as the systematic analysis, evaluation, and management of risks through policies, procedures, and practises. Risk management in the healthcare sector is closely related to patient safety, which includes preventing errors and reducing the likelihood that adverse events will occur in a healthcare setting.

It is appropriate to state that FMEA is a useful tool for outlining a risk-reduction strategy to increase the safety and dependability of a system.

The tool of data collection that is, observation checklist which was developed using Failure Mode and Effects Analysis (FMEA) - a methodical, proactive approach to process evaluation that identifies potential failure points and assesses the relative impact of various failures in order to pinpoint the areas of the process that require the most improvement. The following are reviewed as part of the FMEA:

- Steps in the process
- Failure modes (What could go wrong?)
- Failure causes (Why would the failure happen?)

- Failure effects (What would be the consequences of each failure?)

Each failure mode gets a numeric score that quantifies (a) likelihood of failure occurrence, (b) likelihood that the failure was not detected and (c) the degree of pain or damage a person could sustain as a result of the failure mode (severity) .

3.6. Steps to Conduct the Study

This study was conducted based on five phases. Which includes:

First Phase: Define the FMEA topic

As JCI requirement every hospital need to show their improvement area where problem occurs often or where the severity of incident can adversely effect to patient health.

Second Phase: Formation of Team

In this stage a team of 8 individuals participated as FMEA team member. This multidisciplinary team included the expert from responsible departments. Three person including HOD of medical quality department, two expert from blood bank department including HOD and blood bank manager, one laboratory expert including nursing head & head of nursing quality department.

Third Phase: Describing the Process

At this phase complete blood transfusion process and subprocesses were designed.

Fourth Phase: Hazard Analysis was done in 2 stages

First Stage: Determining the Potential Failure Modes

For each sub processes of blood transfusion brainstorming had been done among respective FMEA team members.

Second Stage: Determining the Hazard Score

The hazard score was determined based on hazard matrix and enlisted it the FMEA sheet. The hazard analysis sheet is given below:

HAZARD ANALYSIS		
SCORING		PROBABILITY RATING
OCCURANCE RATING	4	Frequent Probable to take place right away or soon (may happen several times in one year)
	3	Occasional - Probability is that (may happen several times in 1 to 2 years)
	2	Uncommon - Possibly taking place (may happen sometime in 2 to 5 years)
	1	Remote - Not likely to happen (may happen sometime in 5 to 30 years)
SEVERITY RATING	4	Catastrophic Event(Traditional FMEA Rating of 10 -Failure could cause death or injury)
	3	Major Event(Traditional FMEA Rating of 7 –Failure causes a high degree of customer dissatisfaction.)
	2	Moderate Event (Traditional FMEA Rating of "4"–Failure can be overcome with modifications to the process or product, but there is minor performance loss.)
	1	Minor Event(Traditional FMEA Rating of "1"–Failure would not be noticeable to the customer and would not affect delivery of the service or product.)
DETECTIBILITY RATING	4	Unlikely to detect
	3	Difficult to detect but can be done
	2	Easily detectable as the control measures are in place
	1	Very easy to detect by visual assessment or comparison

Table 3.6.1. Evaluation of Risk Priority Numbers (RPNs) including the Severity Score, the Probability of Occurrence Score, and the Probability of Detection Score and related corrective action for highest RPN

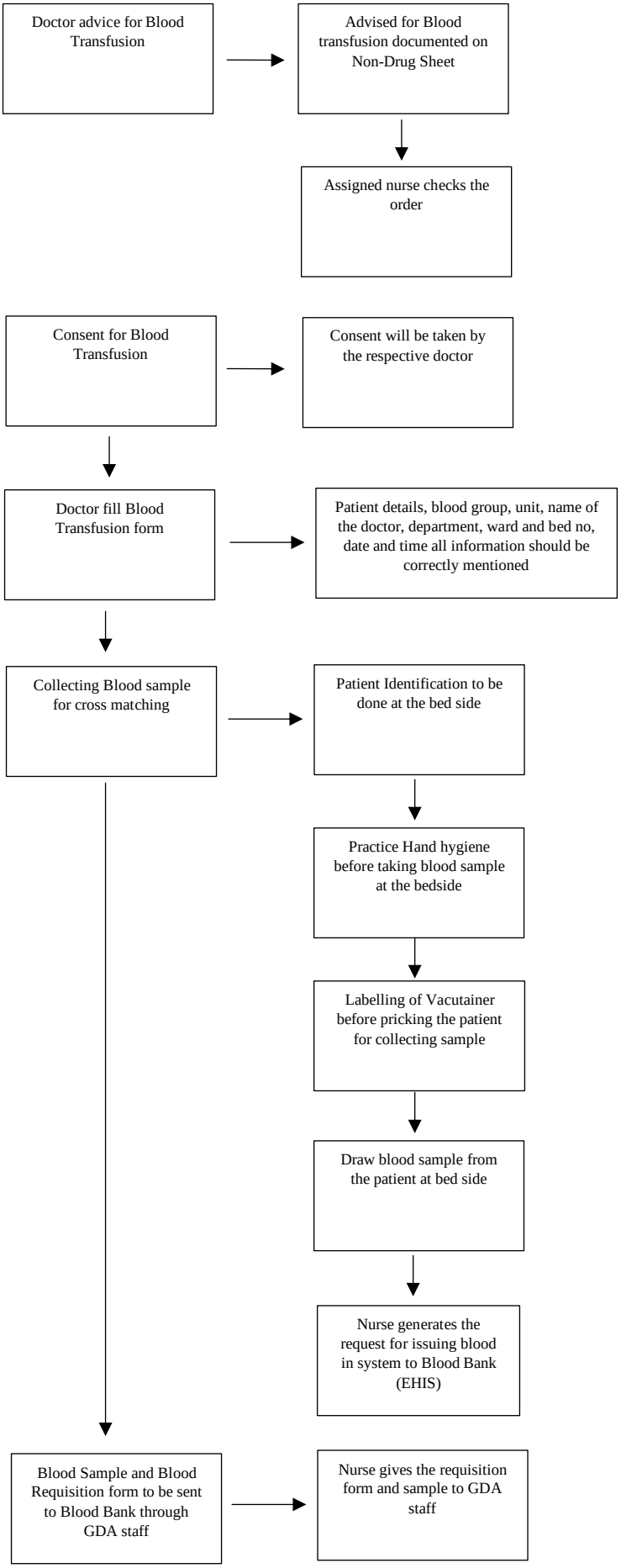
4. RESULTS :

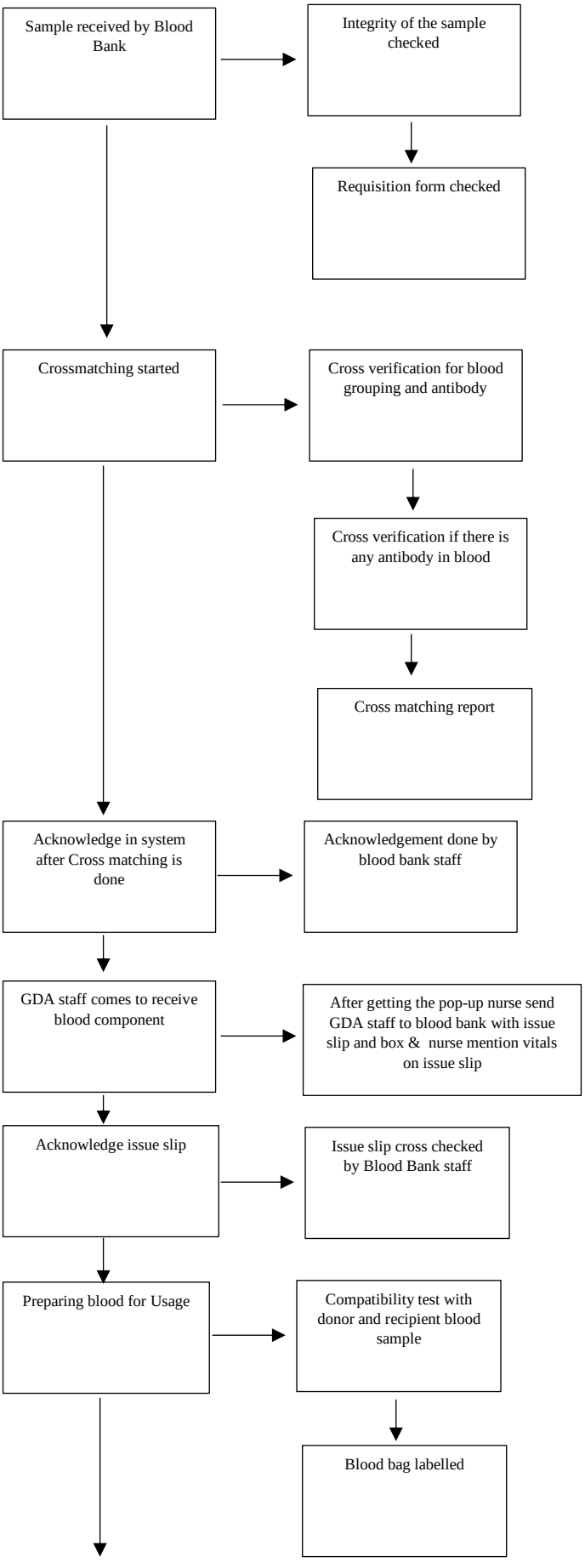
Blood Transfusion Process & Sub-Process :

To begin the with transfusion process first steps is doctor's advice, the advice should be mentioned on 'non-drug order sheet' and assigned nurse have to check doctor's order or advice after doctor's round. The next step is to taking consent from patient or attendant for blood transfusion. As transfusion has it's risk and benefits therefore doctor have to explain it to patient or attendant and before taking the consent. After taking consent doctor have to fill the requisition form and unit, blood group, reason for transfusion, type of blood patient details, doctor's sign, id, date & time of request has to be correctly mentioned on that form for ordering blood from blood bank. The nest step is collection the blood sample from patient and before collecting the sample patient identification has to be done at patient bed side by using "**Two patient identifier"** , before sample collection hand hygiene should practice preventing HAI, vacutainer should be labelled before collection the blood sample then drawing patient blood sample and lastly nurse have to generate request on system for issuing blood to the Blood Bank. After collecting the blood sample nurse call GDA staff and sent the blood sample and requisition form to

Blood Bank. After receiving the sample and requisition form blood bank check the integrity of the sample and check the adequacy of requisition form. If all the checking done successfully then cross matching start for blood grouping and antibody testing and generate the report once it's successfully done and blood group matched with previous report. Once this step is done blood bank staff do acknowledge in system. And the pop-up generate at respective floor monitor the nurse send GDA staff with issue slip and box to receive the blood and before sending GDA staff to collect the blood nurse have to check the current vitals of patient and it has to be mentioned on issue slip. Once Blood Bank receive the issue slip first they acknowledge it to the system. After that preparation starts for blood usage, in this step they check the compatibility test with donor blood once it's successfully done blood bag labelled. Then issue it to GDA staff and GDA staff give the blood bag box to the nurse. Informed consent adequacy has to be check by nurse. After that cross checking starts to check receiving blood validity, patient details, unit, blood group, type first checking done by doctor then second and third should done by nursing supervisor and assign nurse at the presence of TL. Once cross checking done successfully then infusion process starts. After 15 mins of infusion vitals should be checked and documented on "**Blood transfusion monitoring sheet"**, then it has to be done 3 times in a gap of 1 hour, then at the time of completion and 1 hour after completion. In case of a reaction, stop transfusion and follow transfusion reaction protocol and inform blood bank asap and send samples for workup.

The processes and sub processes are given below :


Doctor advice for Blood Transfusion
Advised for Blood transfusion documented on Non-Drug Sheet
Assigned nurse checks the order
Consent for Blood Transfusion
Consent will be taken by the respective doctor
Doctor fill Blood Transfusion form
Patient details, blood group, unit, name of the doctor, department, ward and bed no, date and time all information should be correctly mentioned
Collecting Blood sample for cross matching
Patient Identification to be done at the bed side
Practice Hand hygiene before taking blood sample at the bedside
Labelling of Vacutainer before pricking the patient for collecting sample
Draw blood sample from the patient at bed side
Nurse generates the request for issuing blood in system to Blood Bank (EHIS)
Blood Sample and Blood Requisition form to be sent to Blood Bank through GDA staff
Nurse gives the requisition form and sample to GDA staff


Sample received by Blood Bank
Integrity of the sample checked
Requisition form checked
Crossmatching started
Cross verification for blood grouping and antibody
Cross verification if there is any antibody in blood
Cross matching report
Acknowledge in system after Cross matching is done
Acknowledgement done by blood bank staff
GDA staff comes to receive blood component
After getting the pop-up nurse send GDA staff to blood bank with issue slip and box & nurse mention vitals on issue slip
Acknowledge issue slip
Issue slip cross checked by Blood Bank staff
Preparing blood for Usage
Compatibility test with donor and recipient blood sample
Blood bag labelled

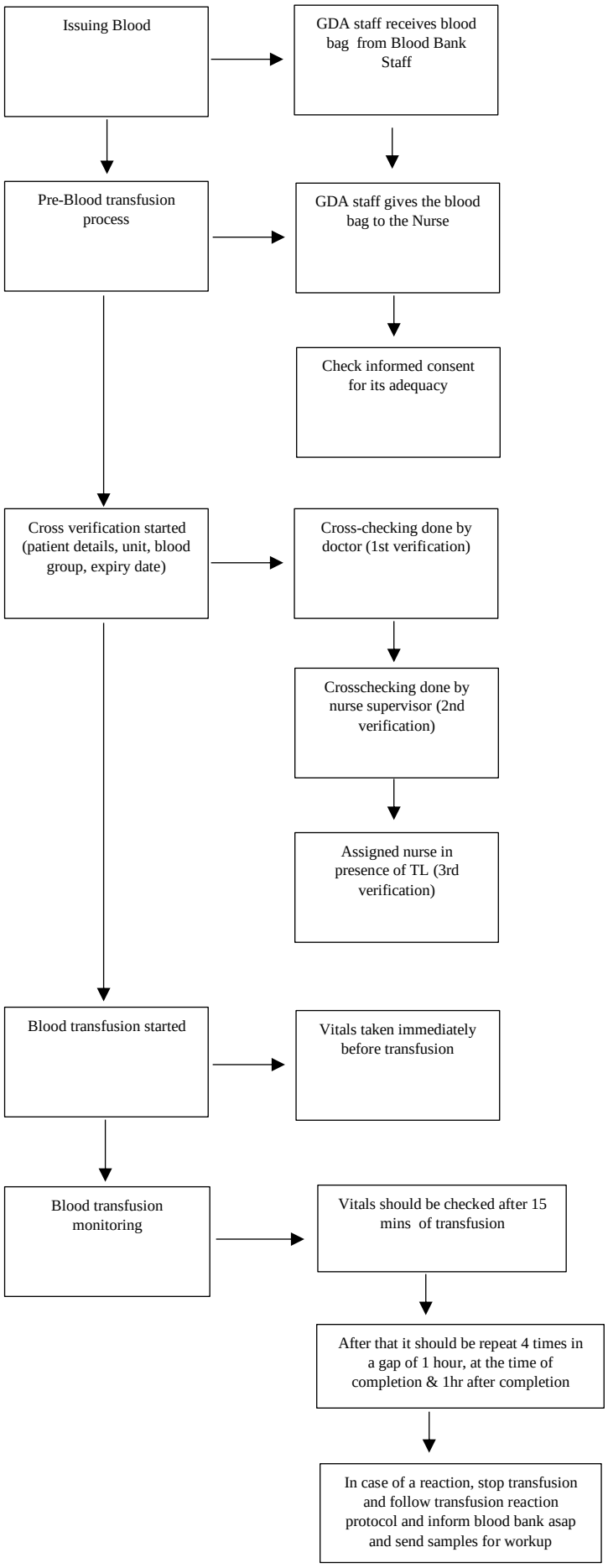

Issuing Blood
GDA staff receives blood bag from Blood Bank Staff
Pre-Blood transfusion process
GDA staff gives the blood bag to the Nurse
Check informed consent for its adequacy
Cross verification started (patient details, unit, blood group, expiry date)
Cross-checking done by doctor (1st verification)
Crosschecking done by nurse supervisor (2nd verification)
Assigned nurse in presence of TL (3rd verification)
Blood transfusion started
Vitals taken immediately before transfusion
Blood transfusion monitoring
Vitals should be checked after 15 mins of transfusion
After that it should be repeat 4 times in a gap of 1 hour, at the time of completion & 1hr after completion
In case of a reaction, stop transfusion and follow transfusion reaction protocol and inform blood bank asap and send samples for workup

Figure 4.1. Process mapping for Blood Transfusion (from doctor's advice to completion of infusion)

Type of error occurs in Blood Transfusion process which leads to incidents

During the study errors were found for blood transfusion. According to the checklist failures and incidents observed from below given area (which have highest RPNs as per occurrence) :

Potential Failure Areas	Occurrence
Wrong patient sticker labelled on vacutainer	13
Vacutainer not labelled before sample collection	9
Sample drawn from wrong patient / Correct sample collected on wrong labelled vacutainer	13
Patient Identifiers not used before sample collection (use bed no as patient identifiers)	21
Box Mismatched by GDA staff	17
Nurse missed to check the order for Blood Transfusion	1
Inadequate information documented by doctor on the requisition form	3
Hand hygiene not practiced by nurse before sample collection	7
GDA staff delays in delivering the blood sample for cross matching	16
Advice for blood transfusion documented on **'progress sheet'** not on **'non-drug sheet'**	11

Table 4.1. Number of failure occurs from the most occurring failure mode areas

Risk assessment

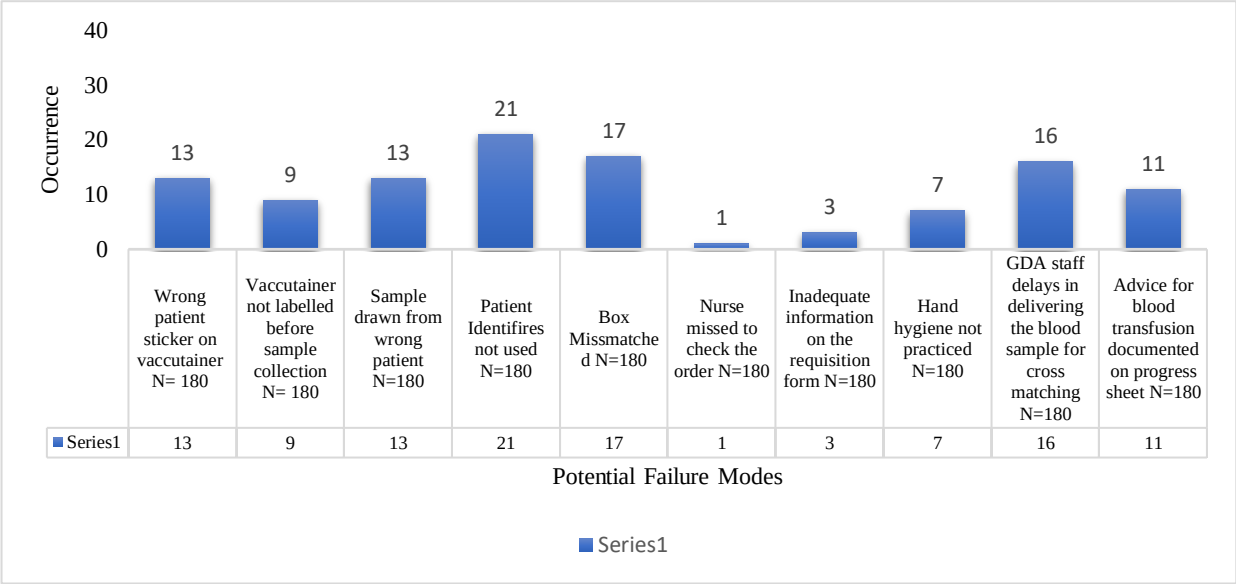


Figure 4.2. Graphical representation of occurrence error of highest RPN scoring area

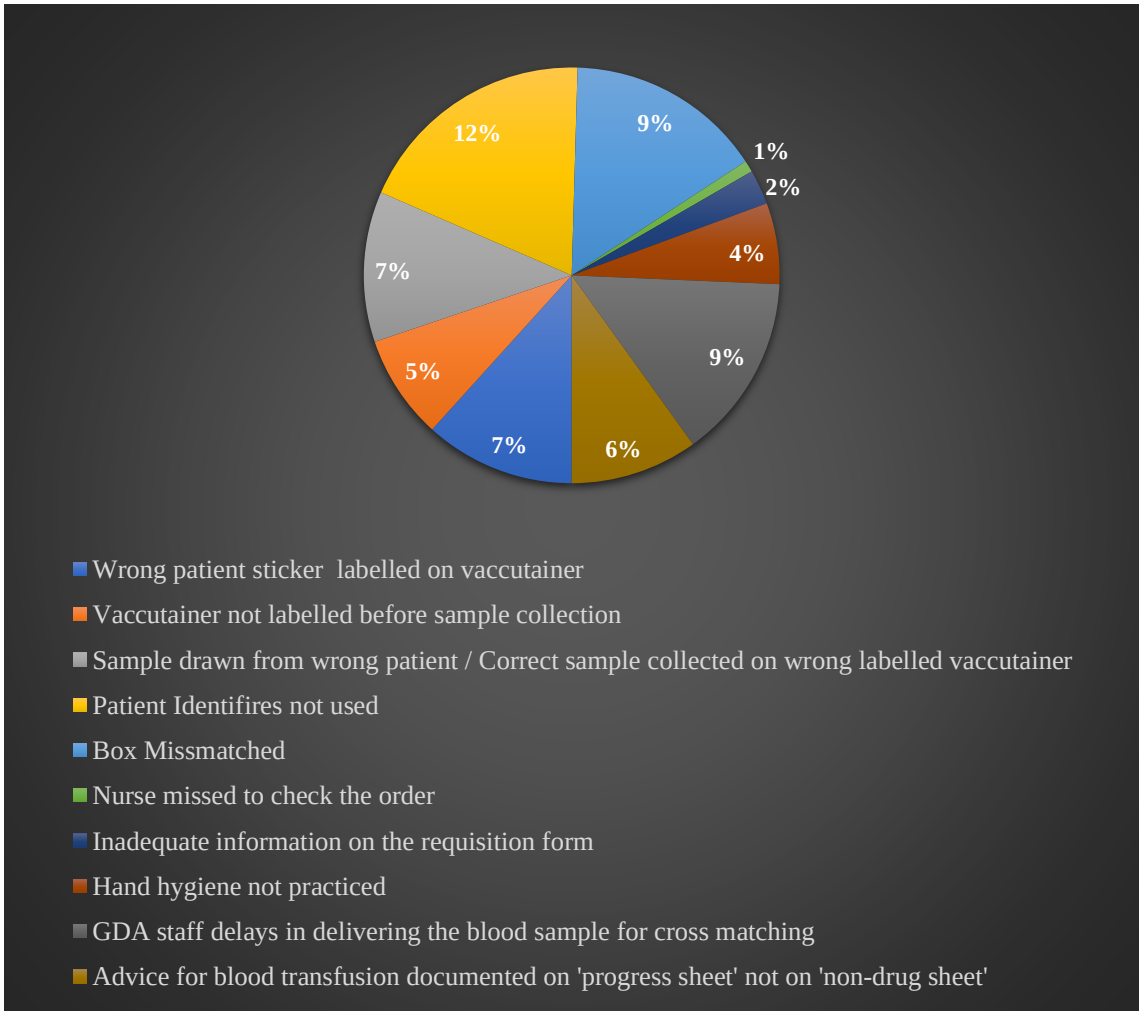


Figure 4.3. Percentage of occurring error of highest RPN scoring area

SUB PROCESS	POTENTIAL FAILURE MODES	POSSIBLE CAUSES	FAILURE EFFECTS	SCORING				Actionable for Improvements
				Severity (1-4)	Occurrence (1-4)	Detection (1-4)	RPN	
Labelling of Vacutainer before pricking the patient for collecting sample	Wrong patient sticker pasted on vacutainer	Look alike patient names/training issues/Inattentiveness of staff/attaching labels of multiple patients together	Crossmatching result of correct patient's blood sample not matching with the information provided on label	4	4	4	64	Attend one patient at a time, use **"Two patient identifiers"**, vacutainer labelling should be done at patient bedside
	Vacutainer not labelled before sample collection	Training issue/ Casualness/ Unawareness about the standards	Blood sample of wrong patient collected	3	4	4	48	Weekly training and evaluation, Vacutainer labelling should be done at patient bedside
Draw blood sample from the patient at bed side	Sample drawn from wrong patient / Correct sample collected but in wrong labelled vacutainers	Mismatched information on specimen and requisition/ not check ID wristbands of patient/ Nonadherence to guideline, workload (multiple patients to attend to) or incorrect patient documents taken to bedside/ Unlabelled tubes taken from bedside and cluttered workspace which multiple staff use causes confusion/ Technical error in sampling by nursing staff	Wrong sample sent for crossmatching	3	4	4	48	Use **"Two patient identifiers"** & labelling of vacutainer should be done at patient bedside before pricking the sample
Patient Identification to be done at the bed side	2 patient identifiers not used	Training issues/ High workload	Patient not identified correctly	4	3	3	36	Weekly training and evaluation about standards
	Bed number used for identification of the patient	Training issue/ Unawareness about the standards						
GDA staff gives the box to the Nurse	Box mismatched, Delay in delivering the blood product	Unaware about the protocol/careless attitude/ lack of training	Wrong transfusion/ Delay in transfusion 30 minutes might exceed	4	3	3	36	Use Hemovigil Box, Training & there should be a pop-up through system after delivering the blood product
Assigned nurse checks the order	Nurse missed to check the order	Memory lapse of the staff/ Unaware about the protocol	Patient blood transfusion cannot be performed, or it cannot be performed within appropriate time frame	3	3	3	27	During doctor rounds nurse should note if doctor order for any advice
Patient details, blood group, unit, name of the doctor, department, ward and bed no, date and time all information should be correctly mentioned	Wrong information documented on the requisition form	Lack of knowledge / Training issue/ Haste while writing order	Wrong blood order given to Blood Bank	3	3	3	27	Training & Evaluation
Practice Hand hygiene before taking blood sample at the bedside	Hand hygiene not practiced/ All the steps of hand hygiene not followed	Training issue/ Unawareness about the standards	Risk of HAI to patient	3	2	4	24	Training & Evaluation, an eye-catching hand hygiene signage at bedside
Nurse gives the requisition form and sample to GDA staff	GDA staff delays in delivering the blood sample for cross matching	Lack of seriousness	Integrity of the sample compromised/ delay in the process	3	2	4	24	Deliver through pneumatic chute
Advised for Blood transfusion	Advice for blood transfusion	Training issue/ lack of knowledge	Patient blood transfusion cannot be	3	3	2	18	Training & Evaluation

documented on Non-Drug Sheet	documented **on progress sheet** and not on non-drug sheet		performed, or it cannot be performed within appropriate time frame					

Table 4.2. Evaluation of Risk Priority Numbers (RPNs) including the Severity Score, the Probability of Occurrence Score and the Probability of Detection Score and related corrective action for highest RPN scoring failure mode areas

The table which is showing that potential failure areas where the risk and risk associated harm is severe which are having highest RPN for this blood transfusion study. And these are the areas where most of the incidents raised.

It was found that sometimes doctor mentioned transfusion advice on progress sheet which was needed to be on non-drug order sheet. Nurses were not document vital during transfusion. During transfusion audit it also found that expired blood transfusion consent and sometimes the consent was taken just before transfusion which was needed to take after doctor's advice.

During study period error found on some process which were; patient identification, wrong labelling on vacutainer, practice for hand hygiene, documentation of adequate information, mismatching of blood, delay for delivering sample to blood bank for cross matching.

DISCUSSION:

Blood transfusion is a crucial therapeutic procedure where proper risk management results in a notable improvement in the standard of care and patient safety. To evaluate the risks of blood, we used the FMEA method. Transfusion in a medical facility. It We weren't just concerned with the actual transfusion of blood, but also on patient identifiers labelling, sampling, patient identification, as well as potential contributing variables faulty blood transfusion procedures. The study's highest rate of blood transfusion failures was lack of knowledge about the standard and protocol as many of them are new joiners, training issues, unawareness, and other factors contributed to RPN scores as well as a lack of modern and common equipment. Contrarily, blood transfusion errors associated with low institutional practises produced the RPN score likewise the kind of employee training. Therefore, recommendations for controlling and improving the blood transfusion failures as well as ensuring a safer blood transfusion to provide better healthcare.

During the study it found that out of 180 samples occurrence of not using patient identifiers & not labelling of vacutainer before sample collection was 12% and 5% respectively, which leads to wrong sampling & wrong patient labelled on vacutainer the occurrence for both the failure mode areas was 7%. These were the areas where most of the focus require for improvements. Because wrong identification could lead a wrong transfusion which can leads to death of the patient. Occurrence for delay in delivering blood sample for cross matching & box mismatching was 9% which could lead to some sentinel events and patient might face some temporary complications. As per the standard protocol doctors should have mention any order or advice on 'non-drug sheet' sometimes it found on 'progress sheet' not on 'non-drug sheet' the occurrence of this incident was 6% due to this occurrence of missed to check order by nurse was 1%, however nurses were advised to check 'progress sheet' after doctor's round. Prevention for hospital accrued infection play a vital role for any hospital and during the observation is it found that occurrence of not practicing hand hygiene was 4% . Lastly it is found that doctor's did not fill the adequate information on blood requisition form for ordering the blood from blood bank, it is found that sometimes blood group & unit not mentioned on the form and the occurrence of this was 4% .

This study results indicated the inappropriate steps which were practicing on most vital steps for blood transfusion that could lead a serious morbidity or mortality. The steps include:

a. Failure to comply with standard for patient identification & prevent patient form Hospital Acquire Infection (HAI)
b. Inadequate or wrong information documented on requisition form to order blood components
c. Mismatching of blood bag carrying box
d. Documentation for transfusion on inappropriate form that leads a big delay for transfusion which can adversely effect on patient health
e. Lack of documentation of the patient's vitals & symptom during the transfusion

To address these issues, this research study recommends some corrective actions to avoid further errors for blood transfusion:

a. To improve patient identification; Daily briefing, weekly training & evaluation can be done about standard policies & protocols as many of staffs were new

joiners. Patient identifiers should be double checked (2nd verification can be done by nursing TL or Nursing supervisor).

b. To prevent mismatching of blood carrying box Hemovigil box can be use. The special function of this box is it can be locked with passcode and the same passcode will have on patient wrist band. Therefor if any mismatching takes place without correct passcode the box will not open. Secondly, training for GDA staff also require about hospital's standard policies and protocols.
c. To improve delay in delivering blood sample to blood bank for cross matching nurse can use pneumatic chute to deliver the blood sample.
d. To improve documentation, require random audits and share with responsible department head to improve it by training & evaluation.

Conclusion:

FMEA has proven to be a successful methodology for analysing and re-engineering healthcare procedures, particularly complex procedures that could be dangerous for patients. In this work, we used FMEA to identify many critical failure modes that could endanger patient safety. With the introduction of information technology, enhance the entire transfusion procedure.

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