

IMPLEMENTATION OF HIS IN BLOOD BANK

**Internship Training
at
Paras Hospitals, Gurgaon**

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**Under the guidance of
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**MBA Hospital & Health Management
2013–15**


**Institute of Health Management Research
Jaipur
2015**

TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr.Swati Agrawal** student of MBA Hospital and Health Management from IIHMR University, Jaipur has undergone dissertation training at **PARAS Hospital, Gurgaon** from **Feburary,2015 to April, 2015**

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical. This work, in partial fulfillment of the course requirements, is recommended for the award of Management in Health & Hospital Administration.

I wish her all success in all her future endeavors.



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WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Swati Agarwal** has successfully completed her dissertation in the department of **Information Technology** from **9th February, 2015** to **9th April, 2015**.

During her dissertation period, she was found to be sincere and dedicated towards her assignment.

We wish her all the best for her future endeavors.

For Paras Hospitals



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CERTIFICATE BY SCHOLAR

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A handwritten signature in blue ink, appearing to read 'Swati', with a horizontal line underneath it.

Dr. Swati Agrawal

DECLARATION

I hereby declare that the present dissertation entitled “**HIS Implementation Phase 2 in Blood Bank of Paras Hospital, Gurgaon**” embodied in this study was prepared by me as per Dissertation period allocated by IIHMR University academic calendar (2013-15), at Paras Hospital , Gurgaon under Supervision of **Dr. Kapil Garg** (Corporate Zonal Director) and **Dr. Santosh Kumar** , Associate Professor , The IIHMR University, Jaipur during academic year 2013-2015.

It is further stated that no part of this dissertation has been submitted in part or full for the award of any degree or diploma of this or any other Institution

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Abstract

Healthcare is a very important part of our society & it is imperative for healthcare providers to do their jobs in an effective & efficient manner, HIS help them manage all their medical & administrative information. When we joined the hospital phase II HIS implementation was going on in various department of the hospital eg Blood Bank , OT, CSSD etc

I was assigned the work of HIS implementation in blood bank department, hospital has a tie up with an external software agency who designed the basic software for the department , I was asked to coordinate with the staff of the department & software agency to implement the changes in the software according to the functional requirement of department. once all the changes were being made training was given to the staff for the effective & efficient use of software. All the problems encountered while using the software were enlisted in the form of an issue tracker to keep the records.

Software make the work lot more easier for the staff & enhances their efficiency. Periodic review was done to make sure the proper functioning of the software.

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LIST OF ABBREVIATION

- BME- Bio Medical Engineering
- BMW- Bio Medical Waste
- CD- Compact Disc
- CPDA- Citrate Phosphate Dextrose Adenine
- CSSD- Central Sterile Sterilization Department
- DMLT- Diploma in Medical Laboratory Technology
- DVD- Digital Video Disc
- EMR/ EHR- Electronic Medical Record
- FFP- Fresh Frozen Plasma
- Hb- Hemoglobin
- HCV- Hepatitis C virus
- HIV- Human Immunodeficiency Virus
- HMIS/HIS- Hospital Management Information System
- HOD- Head Of Department
- ICU- Intensive Care Unit
- IPD- In-Patient Department
- IT- Information Technology
- MLT- Medical Laboratory Technology
- MP- Malaria Parasite
- MRD- Medical Record Department
- NABH- National Accreditation Board for Hospitals and Healthcare Providers
- NABL- National Accreditation Board for Testing and Calibration Laboratories
- OPD- Out-Patient Department
- OT- Operation Theatre
- PRBC- Packed Red Blood Cell
- RBC- Red Blood Cell
- RDP- Random Donor Platelet
- ROI- Return On Investment
- SDP- Single Donor Platelet
- VDRL- Venereal Disease Research Laboratory Test

1. DISSERTITATION

1.1) INTRODUCTION

- Healthcare is a very important part of our society and it is imperative for healthcare providers to do their jobs in an efficient and effective manner. Each day hundreds of thousands of patients enter healthcare facilities challenging the administration to run the show smoothly. The employees have to manage and integrate clinical, financial and operational information that grows with the practice. Previously, this data was organized manually, which was time consuming and failed to deliver the desired level of efficiency. Most professionally run hospitals and clinics now rely on hospital information systems (HIS) that help them manage all their medical and administrative information. A hospital information system (HIS) is essentially a computer system that can manage all the information to allow health care providers to do their jobs effectively. These systems have been around since they were first introduced in the 1960s and have evolved with time and the modernization of healthcare facilities. The computers were not as fast in those days and they were not able to provide information in real time as they do today. The staff used them primarily for managing billing and hospital inventory. All this has changed now, and today hospital information systems include the integration of all clinical, financial and administrative applications. Modern HIS includes many applications addressing the needs of various departments in a hospital. A centralized information system can be customized according to the specific requirements of a hospital. A hospital can tell the solution provider its needs and the applications can then be molded to deliver exactly what was demanded. For instance, you can demand a solution that is based on RDBMS for easy retrieval of information. You can also ask the vendor for a HIS that has user friendly features and a multilingual interface that can be used by a diverse workforce.

1.2) NEED OF HIS IN BLOOD BANK-

- Healthcare aspect is vital in daily lives where most people nowadays prefer to find a hospital that offers better healthcare services. People's demands for good-quality services provided by hospitals drive these organizations to improve their services by adopting information system. Adopting HIS will improve operational efficiency, patient care, quality & this will lead to improved decision making.
- It will ease the access to patient's data.
- By improving operational efficiency it could also reduce the cost.
- By providing accurate & reliable information the use of system could enhance decision making.
- To centralize HIS in order to get it connected with the rest three branches of hospital which lies in different part of the country.

2) Objectives

I. To study the functionality of Blood Bank.

II. To implement HIS & to computerize the entire process of Blood Bank.

3) Rationale

- I. To manage the data related to the clinic, finance department, laboratory, nursing, pharmacy and also the radiology and pathology departments.
- II. To have access to quick and reliable information including patients' records illustrating details about their demographics, gender, age etc.
- III. An effective HIS also delivers benefits such as:
 - ✓ enhances information integrity
 - ✓ reduces transcription errors
 - ✓ reduces duplication of information entries
 - ✓ optimizes report turnaround times
- IV. Modern hospital information systems typically use fast computers connected to one another through an optimized network. These computers are programmed to collect, process, and retrieve patient care and administrative information ensuring better ROI and delivery of service. If the hospital authorities have more relevant information they can make better decisions.

4.3) REVIEW OF LITERATURE:

Healthcare aspect is vital in daily lives where most people nowadays prefer to find a hospital that offers better healthcare services. People's demands for good-quality services provided by hospitals drive these organizations to improve their services by adopting information system (IS). In the context of hospital environment, the adoption of IS is quite tremendous since many hospitals are able to increase their services to high quality level for competing with other healthcare entities . This can be proven in many developed countries like United States of America (USA), United Kingdom (UK), and other countries which have adopted IS in their organizations^[1]

Hospital and IS

Hospital and IS Hospitals around the world have widely utilized IS for over 30 years. IS for many hospitals in US and UK have been automated since the emergence of IBM systems. For example, US government has made the adoption of the electronic medical records as mandatory to all healthcare providers by 2014 (RAND Health 2005). Besides that, the emergence of the technology evident the adoption of the systems has taken place across hospitals in most countries like USA, England, Egypt and Jordan , Scotland and New Zealand .

At the beginning of IS implementation, it focused only on improving efficiencies in accounting function such as billing and financial reporting (Trimmer et al. 2002). Far East Journal of Psychology and Business Vol. 8 No. 3 Sep 2012 3 However, as the need to manage and integrate clinical, financial and operational information grows and evolves, HIS gives many benefits such as it could provide the best possible support of patient care and administration by electronic data processing (Ammenwerth, Kaiser, Wilhelmy and Hofer 2003). Realizing these benefits, MOH pioneered HIS project in hospitals around Malaysia, including Terengganu, Pahang and Sarawak. The adopted HIS is the systems that can help the selected hospitals to

become the benchmark of modern, automated hospitals and realize the goals of becoming a model “e-hospital” in Malaysia.^[1]

Hospital Information System (HIS)

Hospital Information System (HIS) Hospitals are information-intensive organizations and pay a great attention on information management and processing, which have to be carried out using appropriate IS. HIS is a computer-based system designed to assist the management of the administrative and medical information within a hospital (Trimmer et al. 2002). It helps to improve operational efficiency, care quality and more informed decision making.

According to N.ghosh (2010), the systems give comfortable access to patient data. The increasing customers’ expectations and regulatory requirements also lead to the need for clinical information and administrative tools that can be immediately accessible. It has been further stated by Lee and Meuter (2010), that efficiency is achieved through the use of the system that allows users to obtain patient critical information as soon as it is needed.

Furthermore, by improving operation efficiency, the application of the systems could also reduce the costs (Spathis and Ananiadis 2005). As supported by Hegji et al. (2007) serving patients with quality of care would be worth for better return in the future. Additionally, by providing accurate and reliable information, the use of the system could enhance decision making (Spathis and Ananiadis 2005). It is also noted in the study conducted by Ashcroft (1998) found that users in healthcare services had clearly perceived the significant impact of the system on their decision making. Despite its widely accepted benefits, HIS adoption is still at a slow pace in certain countries due to lack of computer skills and training (Meinert and Peterson 2009). The inability of individual user to facilitate their knowledge in the systems application has caused significant barriers to wider adoption of HIS. This is argued by Caldeira and Dhillon (2010) by listing 17 facilitating competencies in delivering IS benefits, which is among all are, ability to ensure user application knowledge and provide ongoing IS training.^[1]

Users acceptance towards the system

The role of IS has led to many changes, and it creates more opportunities for those who adopt and utilize it. Even though IS seems to provide many benefits, the increase of rate in its adoption is influenced significantly by its users (Stefanou and Revanoglou 2006). Therefore, users ‘acceptance towards the systems is an important aspect. Since IS is usually adopted as a result of environmental changes, economic pressure, competition and organizational change, thus many unable to manage it appropriately in order to get the best output from it. Some rather prefer to stick to manual systems because of several factors such as strong resistance to adapt, effect on job practices, as well as training and skills.

According to Aggelidis and Chatzoglou (2008), perceived usefulness and ease of use are two fundamental factors in evaluating technology acceptance by users. Basically, users are more open to a new system when they become familiar with the function and could witness benefits from it (Stefanou and Revanoglou 2006). It is further noted that the system should provide more managerial involvement in the implementation, facilitate research needs, act as a protection against future complaints, and as the measurement of professional hierarchy (Darr et al. 2003).^[2]

Factors to be considered while implementing the software

From the literature accessed for this study, social factors were identified to be more critical than the technical factors when determining the success of implementation. The most common factor observed in the literature that influenced the success of HIS implementation related directly or indirectly to change management, pointing out the necessity of formal managerial skills to manage the transformation, the need for effective communication channels, and the importance of a vision for change (Berg, Aarts et al. 2003; Lorenzi and Riley 2003; Alvarez 2004; Kensing, Sigurdardottir et al. 2007; Ovretveit, Scott et al. 2007). Extensive upfront planning (IT 2007; Frame, Watson et al. 2008), securing political support (Cassels 1995; Alvarez 2004), and implementation from the top (Ovretveit, Scott et al. 2007b) were also identified as important success factors. Associated with these factors was mention of the characteristics of leaders (Berg, Aarts et al. 2003; Lorenzi and Riley 2003; McGrath 2006; Frame, Watson et al. 2008). These included beneficial characteristics that led to success (e.g. transformational type, physician-champion, senior), and detrimental characteristics that predisposed an implementation to failure (e.g. over committed and emotionally involved leader).^[2]

Consideration of the end user was the next most commonly identified factor. Raising users' understanding of the requirements and benefits of change, as well as ensuring user participation in the design and development of the system were identified (Kuhn and Giuse 2001; Meijden, Tange et al. 2001; Ball 2003; Alvarez 2004; Igira, Titlestad et al. 2007; Kensing, Sigurdardottir et al. 2007; Kyhlback and Sutter 2007; Ovretveit, Scott et al. 2007; Soriyan, Ajayi et al. 2007; Frame, Watson et al. 2008). Regarding user involvement it was pointed out that the difference between genuine user involvement and users being mere informants should be borne in mind.^[2]

More Restraints than Drivers

There are an estimated 14,000 hospitals in India, excluding the private clinics and nursing homes. This factor should be enough to drive the hospital information systems (HIS) market in India along with the

corporatization of the healthcare provider space, growth in the health insurance market, and the development of medical tourism. On the contrary, the HIS market in India is still in the early growth stage. It is a small market dominated by in-house implementations and customized solutions developed by small local software developers. In terms of technology adoption, the Indian market is far behind its Asia Pacific counterparts such as Australia, Japan, South Korea, Singapore, and Malaysia.

Undoubtedly, Indian hospitals have been very late in realizing the advantages of information technology (IT). Lack of awareness, the low priority given to financing of IT-related investments, lack of suitable solutions, as well as the absence of professional decision making has led to low penetration of HIS in this high-potential market.^[3]

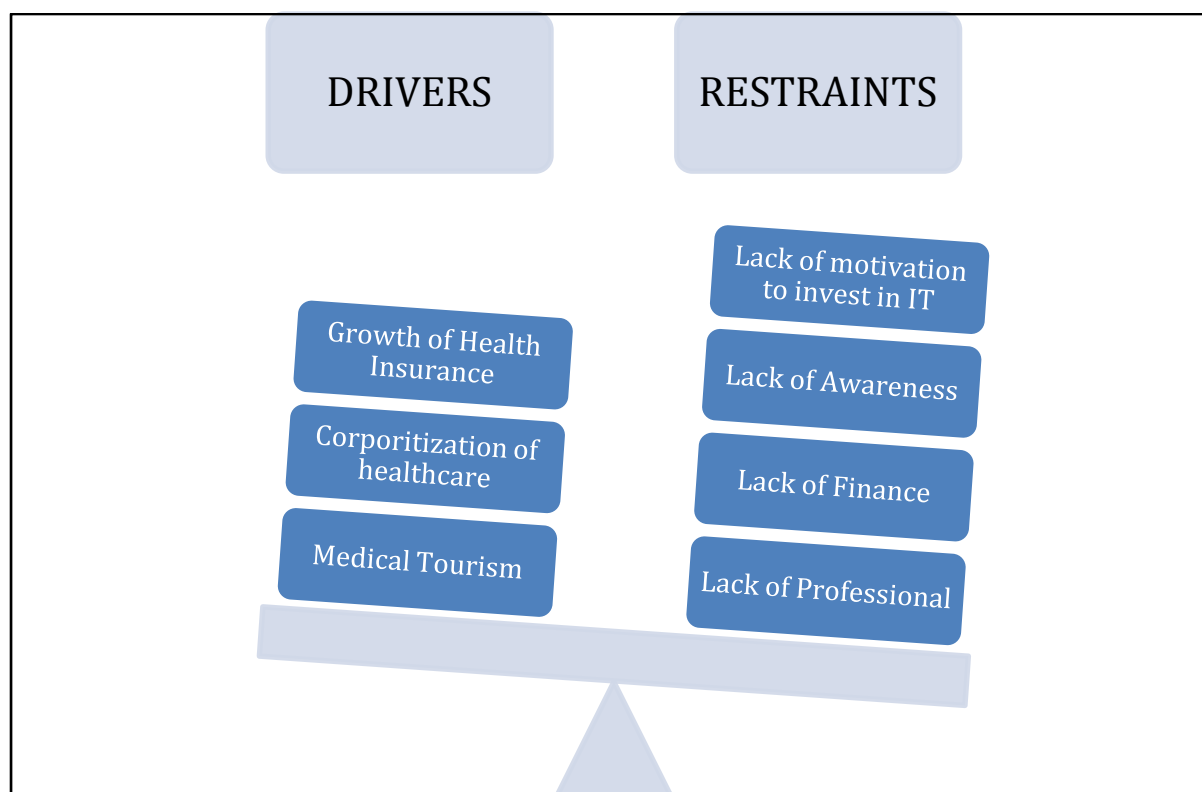


Figure 2-Factors to be considered while implementing the software

Low priority to spending on IT

Hospitals in India give IT budgeting a low priority as compared to equipment budgeting. They do not mind spending a large sum of money on a Computed Tomography scanners or Magnetic Resonance Imaging systems, but allocate small budgets for the implementation of HIS solutions. A high-cost solution such as Picture Archiving and Communications System (PACS) is being implemented only in corporate hospitals or high-end private and charitable ones in India, while other hospitals are averse to accepting such high-cost solutions.^[3]

Information System Failures

The causes of Information System Failure during Implementation

Poor communications:

Good communication is essential and often, it needs to be done via different media in order to ensure that it reaches all levels of the organisation.

It serves to communicate the vision of the project, as well as allowing feedback from staff on the progress and any unintended consequences that may have arisen as a result of the changes. In addition, one must always remember that "action speaks louder than words". This means that the actions of the leadership and management must be consistent with the messages that they are espousing.

Lack of a powerful guiding coalition:

For successful change to occur, the leadership must include strong line-leadership who is committed to the success of the project. They must work together with other stakeholders in order to achieve lasting change. Full support and commitment of the top-leaders have been found to be an essential factor for success.

Lack of change management:

Project management is important to ensure that the project is adequately staffed, funded and coordinated. However, even more important is the management of change within the organisation. Human nature prefers the status quo; so often, the response to change is either fight or flight. Neither would benefit the change process. Individuals who can motivate and inspire their peers and fellow workers are essential in this aspect.

Lack of short-term wins:

As most Information Systems implementation takes many months if not years, there needs to be planned achievable short-term goals built into the process every 6 to 18 months. These small "celebrations" allows the renewals of motivation among all staff and also serve to remind them that the final goal is achievable and is one step closer to fruition. This would also allow them to re-focus their efforts and attention on the project.

Designing short-term goals into the process naturally leads to an incremental implementation process overall, which is much more likely of success than prolonged "big-bang" approaches^[4]

4.4) Research Methodology-

- **Location-** Blood Bank , Paras Hospital Gurgaon
- **Duration-** 9th Feb – 9th April 2015
- **Type of study-** Descriptive Study
- **Data tool** - Hospital Information Software employed in blood bank, having input of the data related to patients coming from OPD, IPD, and Emergency & Accident.

- **INCLUSION CRITERIA:** Implementation of Phase 2 HIS in a particular department i.e .Blood Bank in Paras Hospital, Gurgaon.
- **EXCLUSION CRITERIA:** Implementation of HIS in other departments of Paras Hospital like Blood Bank, CSSD, Linen and Laundry, EMR, Complaint Management
- **ETHICAL CONSIDERATIONS :**
 - a) Confidentiality – entrusted private and linked data will be kept that way.
 - b) Integrity – technical competence, openness, ethics and scientific soundness will be observed in all operations.
 - c) Gender sensitivity, fairness and universal coverage will be ensured.
- Staff at agencies were aware of all of the security features of the HMIS that they have chosen. They were also aware of their responsibilities for keeping client information safe and confidential at the agency level
- Special security training was provided to key agency staff or to all staff to ensure that they understand and adopt appropriate security protocols, issues of confidentiality, disclosure, and grievance procedures.

4.5) FUNCTIONALITY OF BLOOD BANK-

A blood bank is a bank of blood or blood components, collected from donors, stored and preserved for later use. Paras Hospital has its own Blood Bank for the need of the hour. Two types of donors come here- one is Voluntary Donors and the other is Donors for Replacement of blood.

Voluntary Donors- Voluntary Donors are those who donate blood according to their own will.

Donors for Replacement of Blood- If a patient, whether OPD or IPD needs blood transfusion then it is to be replaced by a replacement/family donor.

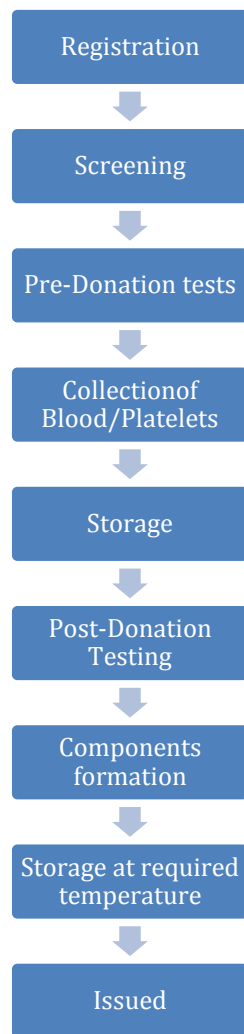


Fig 1)PROCESS FLOW OF BLOOD BANK

4.2)RECORDS MAINTAINED –

- Issue Register
- Master Register
- NAT and ECI Test Report File
- ECI Control Report File
- ECI Test Report File
- NAT Report File
- Donor Record Register
- Donor Blood Grouping Register
- Patient Blood Grouping Register
- Component Register
- Blood Donor Form File
- Blood Donor Defer Form File
- Apheresis Donor Form File
- Apheresis Donor Defer Form File

- Lab. Blood Grouping Register
- Blood Requisition Form File
- Donor Feedback Register
- Daily QC- Quality Control
- Blood Bank Dispatch Register
- Unit received from other Blood Bank Register
- Rapid card Register
- Stock Register of Antisera
- Blood Bag Disposal Register
- Thalassemia Record Register
- Antisera opening Register

HIS IMPLEMENTATION

In Paras Hospitals Gurgaon HIS implementation Phase 1 was already completed in certain departments like Registration Front Desk, IPD, billing, pharmacy, Laboratory, Radiology, ward management, etc. , as the work load and data entries were excess in these departments .

Now HIS Implementation Phase 2 for following departments started- Blood bank, OT, CSSD, Linen and Laundry, MRD ,EHR , Equipment maintenance, Housekeeping departments.

Software cycle-

We joined the process of HIS implementation in the middle where the software was being introduced in the departments which was basic software strictly according to the vendor and our work was to modify that software according to the functional requirements of the particular department.

- **Software Selection-** Applications from various local vendors were being invited to fill the tender. Application which was best suited the organization according to cost & software feature.
- **Features of software-**
 - Database- SQL Server
 - Back end- asp dotnet
 - Front end- HIS

- Type of network required to implement- Local Network
- Nodes in Blood Bank- 200

Paras Hospitals had tied up with external agency for the software. The software provided basic functionalities and our task to track the process in departments and refine the system according to the needs of the department and to train their staff to use the system efficiently.

In blood bank HIS implementation the software extended a helping hand while recording following things:

- donor registration
- Reports
- Tracking registered patients
- Patient Details
- issue of blood
- blood store

Earlier they used to note every detail manually and maintain records , but after HIS , all records and entries were done on system. Various records that were being maintained earlier in the registers will be now maintained through this software.

To use this software first one has to create masters ie one has to create various options which are being used further to run this software smoothly.

Opening page- this page shows various masters & each master has a specific function eg blood group master is being used to create various blood groups.

Master section-

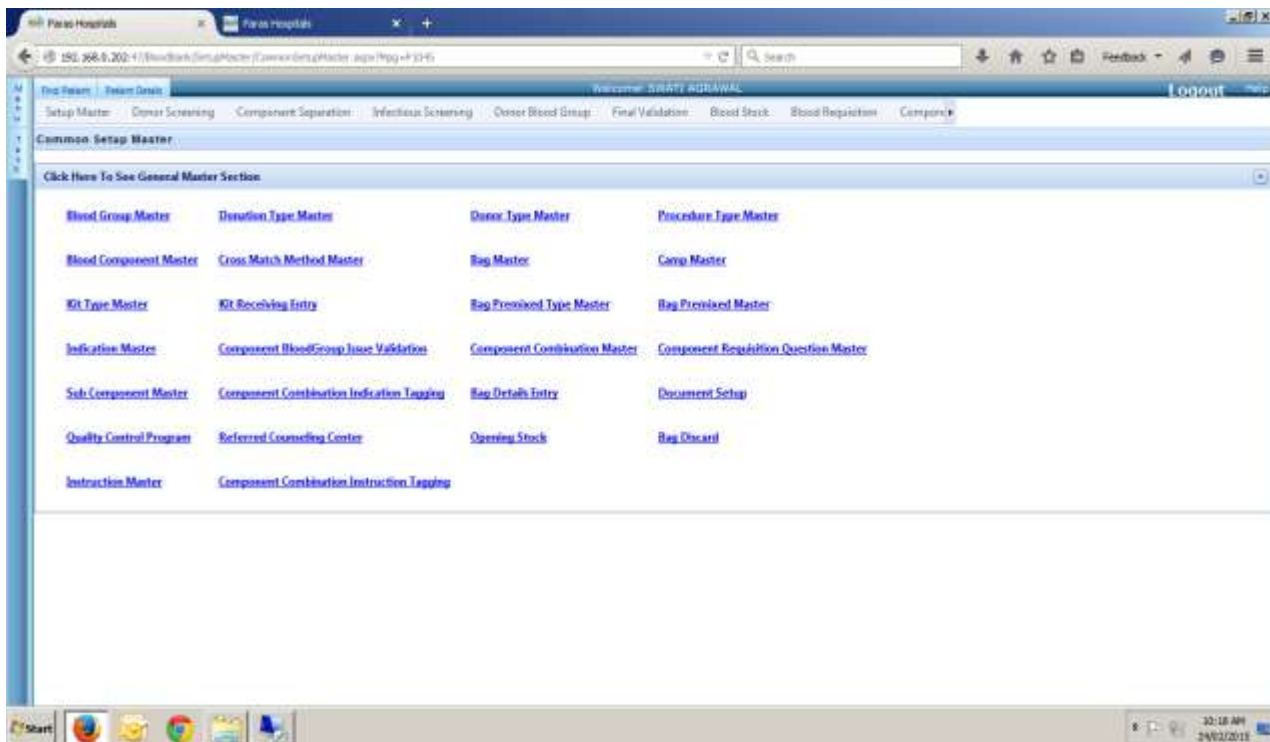


Figure 3 Masters of blood bank

With the help of these masters various options are being created in the software quite similar to that of the records being maintained in the department manually so that the use of software will be more easier for the staff.

Donor screening-

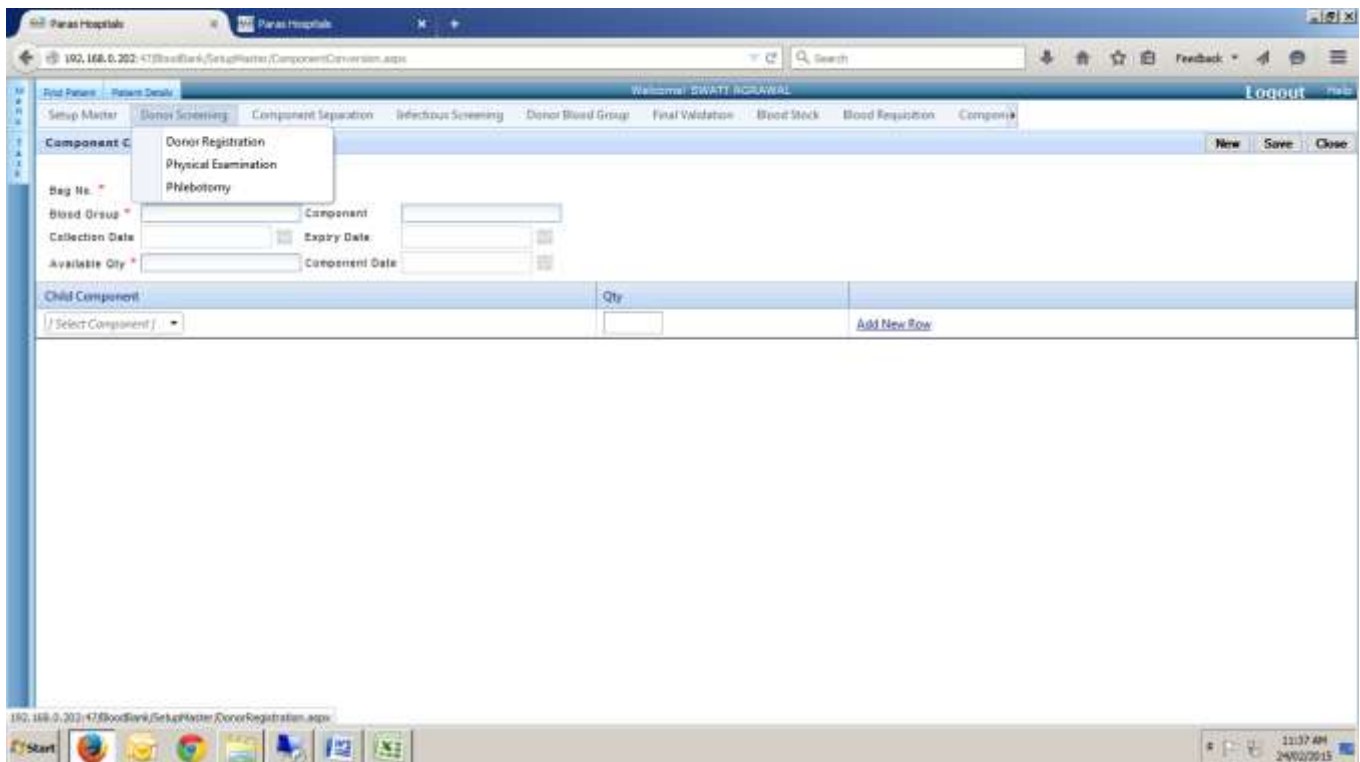


Figure 4 Donor screening

as shown earlier in the process flow of blood bank first step was registration, quite similarly it was introduced here in the form of donor registration. Donor screening comprises of three steps- registration, physical examination & phlebotomy. Physical examination & phlebotomy are similar to that of screening ie step two of manual process.

Donor registration-

The screenshot shows the 'Donor Registration' form in the Parag Hospitals system. The form is titled 'Donor Registration' and includes fields for Donor Reg. No., Manual Donor Registration No., Donation Date (26/02/2015), Old Donor Reg Number, Donation Type, Donor Type, Procedure Type, and various personal details like First Name, Middle Name, Last Name, Gender, DOB, Age, Height, Weight, Blood Group, and Address. It also includes checkboxes for 'Wish to Donate Again' and 'Want to become a Voluntary Donor', and a 'Diagnosis' field.

Figure 5 Donor registration

Physical examination-

The screenshot shows the 'Physical Examination' form in the Parag Hospitals system. The form is titled 'Physical Examination' and includes fields for Donor Reg. No., Donor Name, Blood Group, Examination Date, Donation Type, Accepted/Rejected (Accepted Donor, Deferred Donor), Status (Active), and a table for Physical Examination List with columns for Parameter Name, Value, and Remarks. The table lists parameters like WEIGHT, HEIGHT, PULSE RATE, TEMPERATURE, BLOOD PRESSURE, HEMOGLOBIN, and questions about health and donation history.

Parameter Name	Value	Remarks
WEIGHT	kg	
HEIGHT	cm	
PULSE RATE	per minute	
TEMPERATURE	celcius	
BLOOD PRESSURE	mm of Hg	
HAEMOGLOBIN	gm/dl	
Are you feeling healthy and well today?	[Select]	
Have you eaten in the past 2-3 hours?	[Select]	
Did you sleep well last night?	[Select]	
Have you donated blood, plasma, platelets in past 3 months?	[Select]	

Figure 6 Physical examination

Paras Hospitals

292.188.0.202-171BloodBank/SetupMaster/PhysicalExamination.aspx

Welcome! SWATI AGRAWAL Logout

Physical Examination Physical Examination List New Save Close

Donor Reg. No.

Donor Name

Blood Group

Accepted/Rejected ☐ Accepted Donor ☐ Deferred Donor

Examination Date

Donation Type

Remarks if any

Status

Parameter Name	Value	Remarks
Did you have any unconscious during previous donation?	[Select]	
Are you now taking or have you ever taken medications or have been treated for the disease BALDNESS?	[Select]	
Are you now taking or have you ever taken medications or have been treated for the disease PSORIASIS?	[Select]	
Have you been inoculated/vaccinated in the last 1-year?	[Select]	
Have you received any blood or blood components?	[Select]	
Were you ever treated for Syphilis or Gonorrhea?	[Select]	
Have you any reason to believe that you may have been infected by the HIV Virus that causes AIDS?	[Select]	
Recently have you been suffering from consistent diarrhea, unexplained weight loss, swollen glands, night sweats, or persistent fever?	[Select]	
In the past 1-year, were you Operated?	[Select]	
In the past 1-year, had a tattoo, acupuncture, body or ear-piercing done?	[Select]	

10:43 AM 24/02/2015

Paras Hospitals

192.188.0.202-171BloodBank/SetupMaster/PhysicalExamination.aspx

Welcome! SWATI AGRAWAL Logout

Physical Examination Physical Examination List New Save Close

Donor Reg. No.

Donor Name

Blood Group

Accepted/Rejected ☐ Accepted Donor ☐ Deferred Donor

Examination Date

Donation Type

Remarks if any

Status

Parameter Name	Value	Remarks
After your 11th birthday, did you ever have hepatitis or yellow jaundice?	[Select]	
Has your blood ever tested positive for HBsAg(Australia Antigen) and/or Anti-HCV tests?	[Select]	
In the past 1-Year, Have you been given hepatitis B immunoglobulin (HBIG)?	[Select]	
In the last 3-months, have you suffered from Malaria or taken antimalarial drugs?	[Select]	
In the last 1-year, have you suffered from Typhoid or Paratyphoid?	[Select]	
In the past 72 hours, have you taken ASPIRIN or any medicine with ASPIRIN in it?	[Select]	
Are you currently suffering from or taking treatment for CANCER?	[Select]	
Are you currently suffering from or taking treatment for HEART DISEASE?	[Select]	
Are you currently suffering from or taking treatment for ASTHMA?	[Select]	
Are you currently suffering from or taking treatment for ABNORMAL BLEEDING TENDENCIES?	[Select]	

10:46 AM 24/02/2015

Phlebotomy-

The screenshot shows the 'Phlebotomy' form in the Paras Hospital software. The form is titled 'Donor Phlebotomy' and includes a 'New', 'Save', and 'Close' button bar. The form is divided into two main sections: 'Donor Reg. No.' and 'Select for Update'. The 'Donor Reg. No.' section contains fields for Donor Name, Blood Group, Donor Type, Bag Type, Bag Name, Bag Expiry Date, Segment No., Bag No., and Incomplete Reason. The 'Select for Update' section contains fields for Donation Date, Donation Type, Weight, Bag Capacity, Bag Batch No., Anticoagulant, Quantity Collected, and Remarks. The form is displayed in a web browser window with the URL 'http://192.168.0.252:417/ParasHospital/ScriptMaster/Phlebotomy.aspx'.

Figure7 Phlebotomy

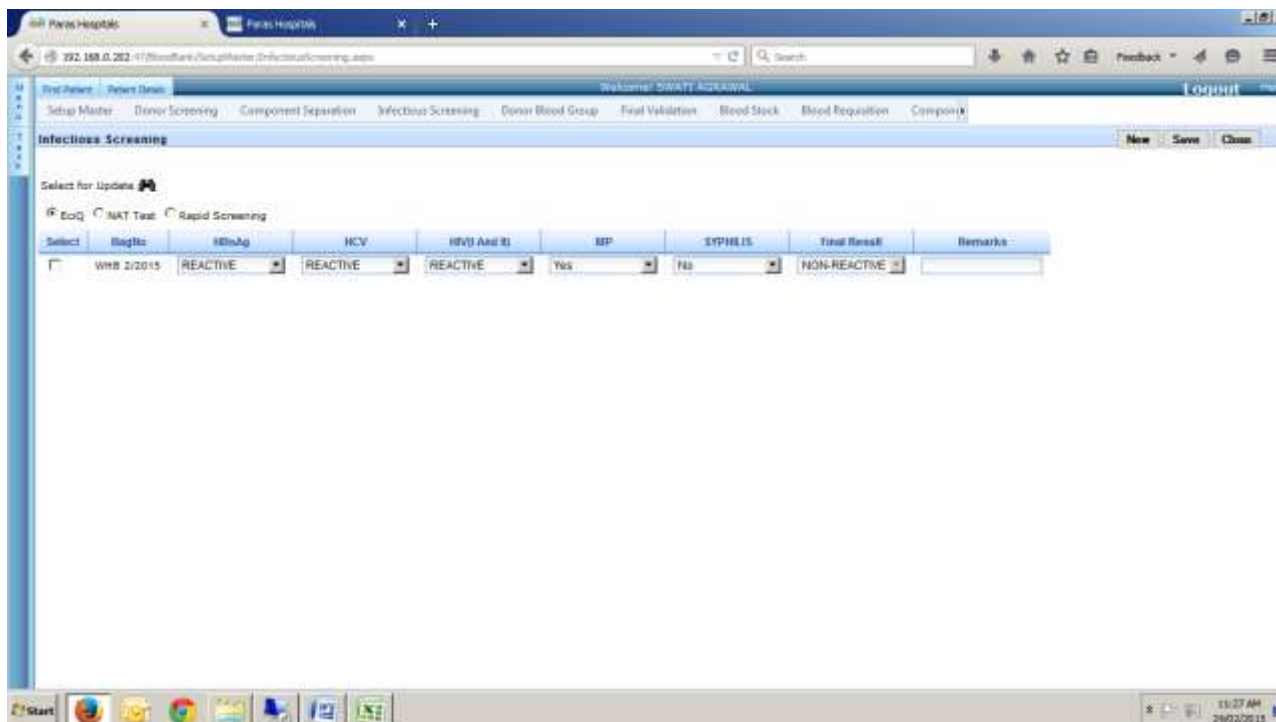
Component division-

The screenshot shows the 'Component Division' form in the Paras Hospital software. The form is titled 'Component Division' and includes a 'New', 'Save', and 'Close' button bar. The form is divided into two main sections: 'Collection Date' and 'Search'. The 'Collection Date' section contains fields for Bag No., Collection Date, Component Date, Blood Group, Bag Expiry Date, Donor No., AvailableQty, Bag Used, SegmentNo, Donation Type, Anticoagulant, and Mixture Name. The 'Search' section contains a 'Search' button and a 'Select Combination for display spin' dropdown menu. The form is displayed in a web browser window with the URL 'http://192.168.0.252:417/ParasHospital/ScriptMaster/ComponentDivision.aspx'.

Figure 8 Component division

In this step blood components which are being made , their record is maintained which comes later in the manual process as compare to HIS.

Infectious screening-



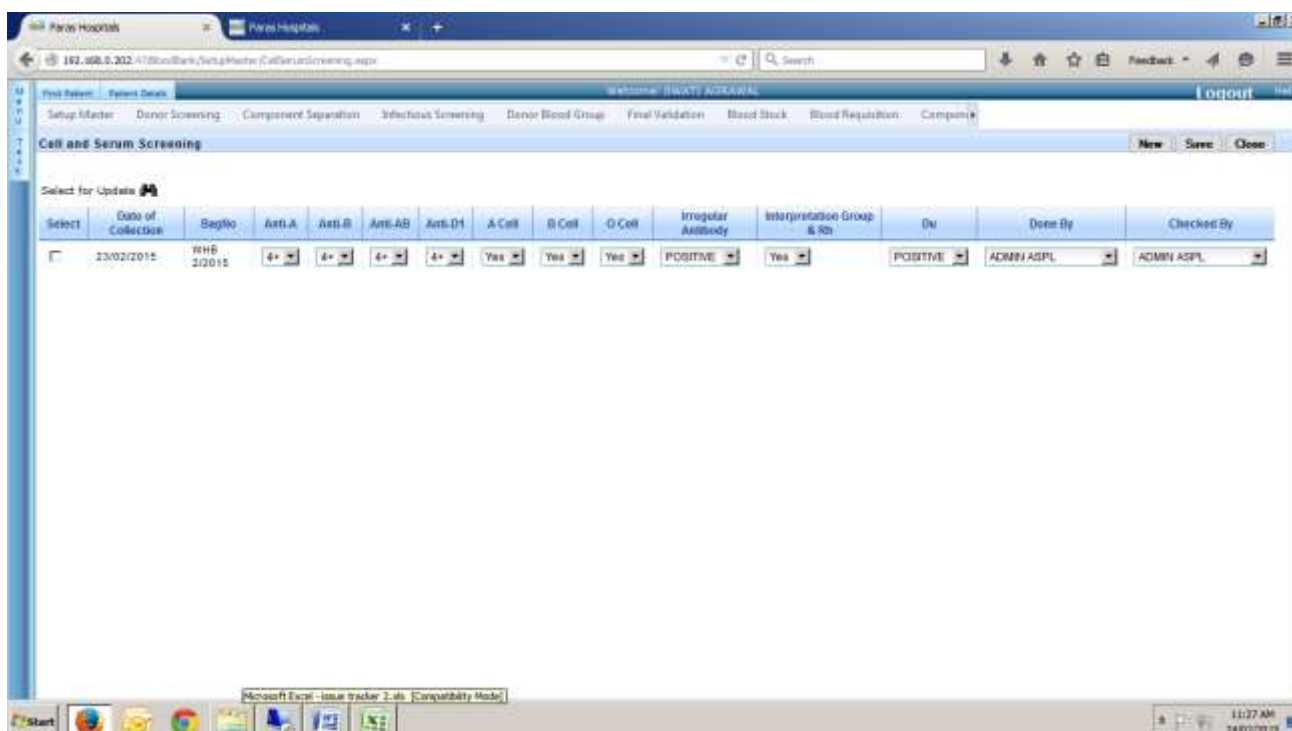
The screenshot displays the 'Infectious Screening' window of the Paras Hospital software. The interface includes a navigation bar with options like 'Setup Master', 'Donor Screening', 'Component Separation', 'Infectious Screening', 'Donor Blood Group', 'Final Validation', 'Blood Stock', 'Blood Requisition', and 'Component'. The main area shows a table for recording screening results. The table has columns for 'Select', 'BagNo', 'HBsAg', 'HCV', 'HIV1 And 2', 'EBP', 'SYPHILIS', 'Total Result', and 'Remarks'. A single row of data is visible, showing 'WB 2/2015' with 'REACTIVE' results for HBsAg, HCV, and HIV1 And 2, and 'Yes' for EBP, 'No' for SYPHILIS, and 'NON-REACTIVE' for Total Result.

Select	BagNo	HBsAg	HCV	HIV1 And 2	EBP	SYPHILIS	Total Result	Remarks
☐	WB 2/2015	REACTIVE	REACTIVE	REACTIVE	Yes	No	NON-REACTIVE	

Figure 9 Infectious screening

This step is equivalent to the step of pre donation tests in the process flow.

Donor blood group-



The screenshot displays the 'Cell and Serum Screening' window of the Paras Hospital software. The interface includes a navigation bar with options like 'Setup Master', 'Donor Screening', 'Component Separation', 'Infectious Screening', 'Donor Blood Group', 'Final Validation', 'Blood Stock', 'Blood Requisition', and 'Component'. The main area shows a table for recording blood group results. The table has columns for 'Select', 'Date of Collection', 'BagNo', 'Anti A', 'Anti B', 'Anti AB', 'Anti D', 'A Cell', 'B Cell', 'O Cell', 'Irregular Antibody', 'Interpretation Group & Rh', 'DN', 'Done By', and 'Checked By'. A single row of data is visible, showing '23/02/2015' with '4+' results for Anti A, Anti B, Anti AB, and Anti D, 'Yes' for A Cell, B Cell, and O Cell, 'POSITIVE' for Irregular Antibody, 'Yes' for Interpretation Group & Rh, 'POSITIVE' for DN, and 'ADMIN ASPL' for Done By and Checked By.

Select	Date of Collection	BagNo	Anti A	Anti B	Anti AB	Anti D	A Cell	B Cell	O Cell	Irregular Antibody	Interpretation Group & Rh	DN	Done By	Checked By
☐	23/02/2015	WB 2/2015	4+	4+	4+	4+	Yes	Yes	Yes	POSITIVE	Yes	POSITIVE	ADMIN ASPL	ADMIN ASPL

Figure 10 Donor blood group

This is to maintain record that which donor has which type of blood group.

Final validation-

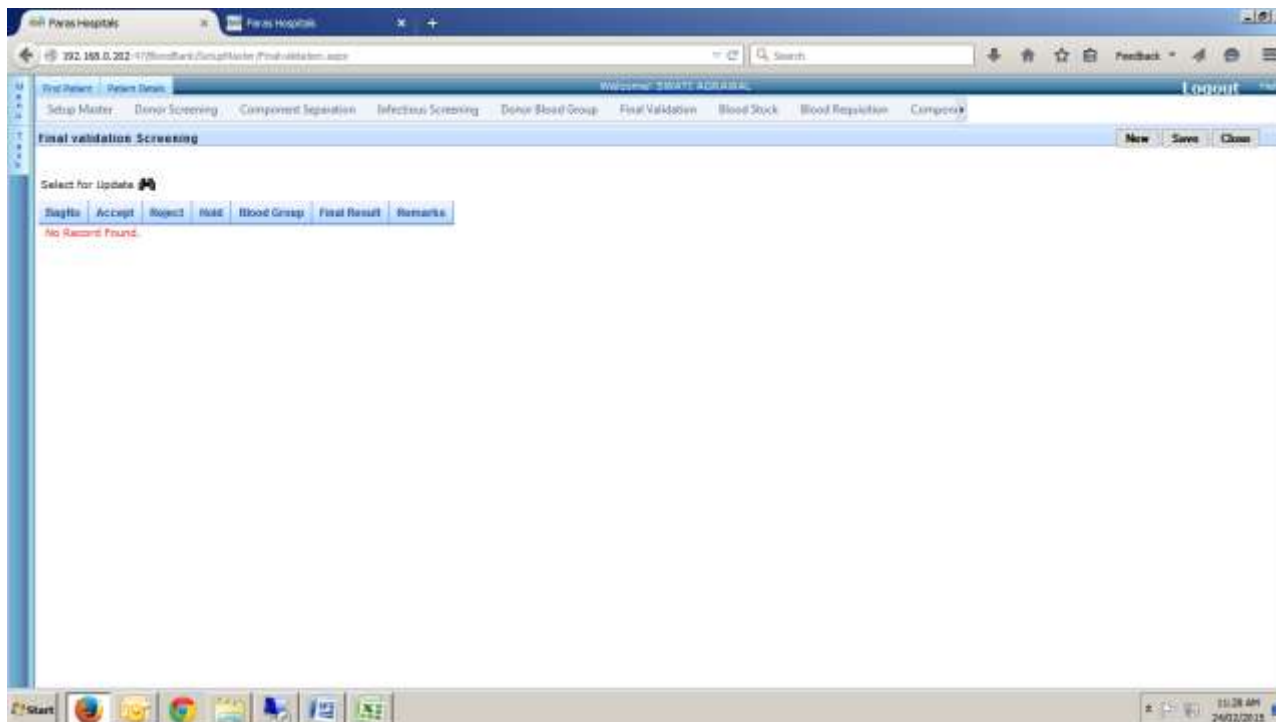


Figure 11 Final validation

In this one can again cross check the donor's blood group & if added wrong can rectify it, this is an added advantage of the software which usually consumes a lot of time in case of maintaining manual records.

Blood stock-

Reg No	Blood Group	Component Name	Quantity	Collection Date	Expiry Date
WHB 1/2015	A POSITIVE	PACKED RED CELL (300 ML)	100.00	23/02/2015	06/04/2015
WHB 1/2015	A POSITIVE	FRESH FROZEN PLASMA	100.00	23/02/2015	23/02/2016
WHB 1/2015	A POSITIVE	PLATELET CONCENTRATE	100.00	23/02/2015	28/02/2015
1/2015	A POSITIVE	PACKED RED CELL	150.00	21/02/2015	04/04/2015
1/2015	A POSITIVE	FRESH FROZEN PLASMA	100.00	21/02/2015	21/02/2016
1/2015	A POSITIVE	PLATELET CONCENTRATE	90.00	21/02/2015	26/02/2015
PLT/APH 6/2015	B POSITIVE	PACKED RED CELL	400.00	19/02/2015	02/04/2015
PLT/APH 6/2015	B POSITIVE	PLATELET CONCENTRATE	250.00	19/02/2015	16/03/2016
PLT/APH 6/2015	B POSITIVE	PACKED RED CELL - LEUCO DEPLETED	75.00	19/02/2015	24/02/2015
PLT/APH 1/2015	B POSITIVE	PACKED RED CELL	400.00	14/02/2015	28/03/2015

Figure 12 Blood stock

Component conversion-

Figure 13 shows the 'Component Conversion' web application interface. The interface includes a navigation bar with tabs like 'Setup Master', 'Donor Screening', 'Component Separation', 'Infectious Screening', 'Donor Blood Group', 'Final Validation', 'Blood Stock', 'Blood Requisition', and 'Component'. The main form area contains fields for 'Bag No.', 'Blood Group', 'Collection Date', 'Expiry Date', 'Available Qty', 'Component', and 'Component Date'. A dropdown menu is open, showing options: 'Component Requisition', 'Requisition Acknowledge', 'Cross Match', 'Blood Release Requisition', 'Release Acknowledge', and 'CrossMatch Cancel'. There is also a 'Child Component' section with a dropdown and a 'Qty' field. The bottom of the screen shows a Windows taskbar with various application icons and a system clock showing 11:39 AM on 24/02/2015.

Figure 13 Component conversion

Component requisition-

Figure 14 shows the 'Component Requisition' web application interface. The interface includes a navigation bar with tabs like 'Setup Master', 'Donor Screening', 'Component Separation', 'Infectious Screening', 'Donor Blood Group', 'Final Validation', 'Blood Stock', 'Blood Requisition', and 'Component'. The main form area contains fields for 'Request Type', 'Request from', 'Request Date', 'Patient Name', 'Guardian Name', 'Gender', 'DOB', 'DOB Age (Y-B-D)', 'Weight (Kg.)', 'Is Pediatric', 'Ward', 'Bed No.', 'HB', 'PB Count', 'PT', 'APTT', 'FIBRINOGEN', 'Coagulant', 'Provisional Diagnosis', 'Diagnosis', 'Charge Slip No.', 'Patient Blood Group', 'Mother Blood Group (In case of child)', 'Reason', 'Is Exchange Transformation', 'Haematocrit Required', 'Requisitioned Hospital', 'Indication for Transfusion', 'Consent Date', 'Consent Taken By', and 'Remarks'. There is also a table for 'Component Request for' with columns for 'Seq', 'Component', 'Unit', 'Request Date', 'Qty (ml)', and 'Edit'. The bottom of the screen shows a Windows taskbar with various application icons and a system clock showing 11:39 AM on 24/02/2015.

Figure 14 Component requisition

Component requisition acknowledge-

The screenshot displays the 'Requisition Acknowledge' form within the Paras Hospital software. The form is titled 'Requisition Acknowledge' and includes a 'Search Requisition Acknowledge' button. The form fields are organized into two columns. The left column contains: Request No., UHID, Patient Name, Patient Age, Ward No., Acknowledged By, Acknowledge Date, and Bill No. The right column contains: Request Date, IP No., Sex, Bed No., Sample Received, Acknowledge Type, and a dropdown menu for Acknowledge Type. The interface also shows a navigation menu at the top with options like 'Setup Master', 'Donor Screening', 'Component Separation', 'Infectious Screening', 'Donor Blood Group', 'Final Validation', 'Blood Stock', 'Blood Requisition', and 'Component'. The Windows taskbar at the bottom shows the Start button and several application icons, including Internet Explorer, Google Chrome, and Microsoft Office Outlook 2007.

Figure 15 Component requisition acknowledge

Cross match-

The screenshot displays the 'Cross Match Details' form within the Paras Hospital software. The form is titled 'Cross Match Details' and includes a 'Search Cross Match Details' button. The form is divided into three main sections: Patient Details, Component Details, and Other Details. The Patient Details section includes fields for Request No., Request Date, UHID, IP No., Patient Name, Patient Age, Sex, Ward No., Bed No., Patient Blood Group, Acknowledged By, Any Pregnancies, Diagnosis, and ICT. The Component Details section includes fields for Component, Request Units, Pending Units, Qty, Dose, Cross Match Units, Current, and Cross Match Units. The Other Details section includes checkboxes for Hb, APTT, Platelet, FIBRINOGEN, and INR/PT. The bottom section of the form shows a table with columns: Sc. No., Unit Number, Segment No., Tech. Cross Match, ABO, RH, Saline R.T., Coombs (G/C), Agglutination, Type Of Unit, and Compatibility. The table currently shows 'No Record Found'.

Figure 16 Cross match

Blood release requisition-

The screenshot shows a web application interface for 'Paras Hospitals'. The browser address bar displays '192.168.0.202-47/BloodBank/SetupMaster/RequestorReleaseAcknowledge.aspx'. The application has a top navigation bar with the following menu items: 'Find Patient', 'Patient Details', 'Setup Master', 'Donor Screening', 'Component Separation', 'Infectious Screening', 'Donor Blood Group', 'Final Validation', 'Blood Stock', 'Blood Requisition', and 'Company'. The 'Blood Requisition' menu item is currently selected. Below the navigation bar, the page title is 'Blood Release Requisition' and there is a 'Search Release Requisition' button. On the right side of the page, there are 'New (F2)' and 'Save (F3)' buttons. The main form area contains the following fields: 'Request No.' (text box), 'Request Date' (date picker), 'UHID' (text box), 'SP No.' (text box), 'Patient Name' (text box), 'Patient Age/Sex' (text box), 'Ward Name' (text box), and 'Bed No.' (text box). The Windows taskbar at the bottom shows the 'Start' button, several application icons, and the system clock displaying '11:31 AM' on '24/02/2013'.

Figure 17 Blood release requisition

Release acknowledge-

The screenshot shows the 'Released Acknowledge' form in the 'Paras Hospitals' web application. The browser address bar shows '192.168.0.202-47/BloodBank/SetupMaster/ReleaseAcknowledge.aspx'. The top navigation bar is identical to the previous screenshot, with 'Blood Requisition' selected. The page title is 'Released Acknowledge' and there is a 'Search Release Acknowledge' button. On the right side, there are 'New', 'Save', and 'Close' buttons. The form contains the following fields: 'Request No.' (text box), 'Request Date' (date picker), 'UHID' (text box), 'SP No.' (text box), 'Patient Name' (text box), 'Prescribed By' (text box), 'Patient Age' (text box), 'Sex' (text box), 'Ward No.' (text box), 'Bed No.' (text box), and 'Acknowledged By' (dropdown menu). The Windows taskbar at the bottom shows the 'Start' button, application icons, and the system clock displaying '11:31 AM' on '24/02/2013'.

Figure 18Release acknowledge

Cross match cancel-

Figure 19 Cross match cancel

Component issue-

Figure 20 Component issue

Component return-

Paros Hospitals

192.168.0.302:4770/BloodBank/SetupMaster/ComponentReturn.aspx

Welcome: SWATI AGRAWAL Logout

Setup Master Donor Screening Component Separation Infectious Screening Donor Blood Group Final Validation Blood Stock Blood Requisition Component

Component Return New (F2) Save (F3) Close (F4)

Issue No. Manual No. UHID Patient Name Ward No. Patient Blood Group Return Date Reason Issue Date IP No. Referred By Bed No. Mother Blood Group Return By Remarks

Sr. No.	Bag Number	Quantity	CrossMatchDate	Component	Blood Group	Return
No Record Found.						

Start 11:33 AM 24/02/2015

Figure 21 Component return

Component return acknowledge-

Paros Hospitals

192.168.0.302:4770/BloodBank/SetupMaster/ComponentReturn/Acknowledge.aspx

Welcome: SWATI AGRAWAL Logout

Setup Master Donor Screening Component Separation Infectious Screening Donor Blood Group Final Validation Blood Stock Blood Requisition Component

Component Return Acknowledge Search Component Return Acknowledge New Save Close

Issue No. Manual No. UHID Patient Name Ward No. Patient Blood Group Return Date Reason Issue Date IP No. Referred By Bed No. Mother Blood Group Return By Remarks

Sr. No.	Bag Number	Quantity	Return Date	Component	Blood Group	Acknowledge	AcknowledgeDiscard
No Record Found.							

Start 11:33 AM 24/02/2015

Figure 22 Component return acknowledge

Blood transfusion details-

The screenshot shows the 'Blood Transfusion Details' form in the Paros Hospitals system. The form is titled 'Blood Transfusion Details' and includes a 'Search Blood Transfusion' button. The form fields are as follows:

- Issue No. (text box)
- Issue Date (text box)
- Patient Name (text box)
- Patient Blood Group (text box)
- Remarks (text box)
- Checkboxes for ensuring:
 - Transfusion notes are completed
 - Units received have been checked for all details
 - Baseline vitals of patients are taken and recorded
 - Every unit is checked for any kind of leakage/Clot/Haemolysis or any other abnormality

Below the form is a table with the following columns: S. No., Component Name, Bag Number, Qty, Blood Group, Transfusion Start, Start Time, End Time, Reaction, and Reason. The table currently displays 'No Record Found'.

Figure 23 Blood transfusion details

Component conversion-

The screenshot shows the 'Component Conversion' form in the Paros Hospitals system. The form is titled 'Component Conversion' and includes 'New', 'Save', and 'Close' buttons. The form fields are as follows:

- Bag No. (dropdown menu)
- Blood Group (text box)
- Component (text box)
- Collection Date (text box)
- Expiry Date (text box)
- Available Qty (text box)
- Component Date (text box)

Below the form is a table with the following columns: Child Component, Qty, and Add New Row. The table currently displays 'Select Component' in the Child Component column and an empty row in the Qty column.

Figure 24 Component conversion

After implementing the software in hospital Operation Theatre system, they were made to enter all details related to patient in this software. While entering data they encountered certain discrepancies in the software. The work flow and pattern of recording the data were not found similar to the software provided.

Hence external agency made changes step by step from the back-end to make the system efficient. The changes, points to be added or modified were recorded in **Issue Tracker**.

4.6) Issue Tracker-

Issue tracker shows various problems which are being encountered by the staff of the department while using the software & our main role was to understand those problems first & afterwards to interact with the software agency to rectify those problems for the smooth functioning of the software.

ID	Category	Description	Status	Assigned To	Priority
21	BLOOD BANK	required compilly sticker at pt & donec component	ENH-H	DR. SONIA	PENDING
22	BLOOD BANK	DONOR REGISTRATION Remove external option from registration page	ENH-H	DR. SONIA	Done
23	BLOOD BANK	Phlebotomy Req. one more option Duration of collection in donor phlebotomy page	ENH-H	DR. SONIA	Done
24	BLOOD BANK	COMPONENT REGISTRATION Register hospital name filed required in component requisition page	ENH-H	DR. SONIA	Done
25	BLOOD BANK	CROSS MATCH Remove option from cross match - Saline (AC), Bovine (37C), Enzymes (37C)	ENH-H	DR. SONIA	Done
26	BLOOD BANK	CROSS MATCH Add one option Pt. antibody screening in below op Diagnosis on page of Cross match detail with drop down - Negative, Positive	ENH-H	DR. SONIA	Done
27	BLOOD BANK	DONOR BLOOD GROUP In cell group screening option Final Status option not required	ENH-H	DR. SONIA	Done
28	BLOOD BANK	DONOR BLOOD GROUP In cell group screening option of Anti A, Anti B, Anti ABO, should be in grading	ENH-H	DR. SONIA	Done
29	BLOOD BANK	DONOR BLOOD GROUP In Cell group screening RH should be negative & positive with grading	ENH-H	DR. SONIA	Done
30	BLOOD BANK	DONOR BLOOD GROUP In Cell group screening option of ABO should be show all blood group master	ENH-H	DR. SONIA	Done
31	BLOOD BANK	DONOR BLOOD GROUP In serum group screening Final status option not required	ENH-H	DR. SONIA	Done
32	BLOOD BANK	DONOR BLOOD GROUP In serum cell group options of A Cells, B Cells, O Cells should be grading vials	ENH-H	DR. SONIA	Done
33	BLOOD BANK	Infectious Screening In infection screening, not require rapid screening option it should be replace by NAT test option	ENH-H	DR. SONIA	Done
34	BLOOD BANK	Infectious Screening In infection screening, should add border line option in all drop down	ENH-H	DR. SONIA	Done
35	BLOOD BANK	COMPONENT RETURN After transfuse should not return component	BUG	IT	PENDING
36	BLOOD BANK	SETUP MASTER BLOOD BANK SERVICES TAGGING PROBLEM IN BLOOD COMPONENT MASTER	BUG	IT	PENDING
37	BLOOD BANK	COMPONENT REGISTRATION COMPONENT NAME NOT SHOW IN COMPONENT REGISTRATION	BUG	IT	PENDING
38	BLOOD BANK	SETUP MASTER ADJUSTMENT OPTION REQUIRED	ENH-H	IT	PENDING
39	BLOOD BANK	Registration IP number is mandatory in case of voluntary donor where as it should be in case of replacement	enh	manish.aj	pending
40	BLOOD BANK	physical examination options should be given as yes or no	enh	manish.aj	pending

Issue No.	Department	Issue Description	Status	Priority
42	BLOOD BANK	phlebotomy	pending	medium
43	BLOOD BANK	phlebotomy	pending	medium
44	BLOOD BANK	component separation	pending	medium
45	BLOOD BANK	screening	pending	medium
46	BLOOD BANK	Component Requisition	PENDING	Medium
47	BLOOD BANK	PHYSICAL EXAMINATION	PENDING	Medium
48	BLOOD BANK	phlebotomy	PENDING	Medium
49	BLOOD BANK	CROSS MATCH	PENDING	Medium
50	BLOOD BANK	DONOR BLOOD GROUP	PENDING	Medium
51	BLOOD BANK	physical examination	PENDING	Medium
52	BLOOD BANK	donor registration	PENDING	Medium
53	BLOOD BANK	component separation	PENDING	Medium

Figure 25 Issue tracker

Issue Tracker was sent to external agency and issue were discussed telephonically and through system sharing online, changes were made by them .The refined system was checked on regular basis and department were asked to enter details and report if they encounter new errors.

The staff was trained simultaneously to handle all data entries on time and maintain proper records on the system. User Manual for the system were made , so that system can be made user friendly.

4.7)KEY FINDINGS-

- Lack of coordination among IT department & Blood bank.
- Training regarding the use of software was not given properly by the software agency.
- Only one computer system was there in blood bank without power backup which instead of fastening the process of data entry was actually hampering it.
- Lack of well trained staff to use computers.
- Few steps in HIS were different from that of their routine process which again creates problem to use the software.

4.9) RECCOMENDATIONS

- HIS successful implementation requires two way approach i.e. both financial investment and management and changing software according to process flow, making software efficient and user-friendly.
- Evolutionary approach need to be taken to train staff in HIS. They should be part of software implementation from early stage. Employees need to be regularly updated about the software that is to be implemented and regular updates need to be taken from them to change software according to the need of department in hospital.
- Basic software should be designed after asking the requirement of blood bank department to reduce the discrepancies.
- System errors and failures in between need to be given priority and it should be solved on emergency basis , without delay.
- Supervision – Entries of the patient data made should be reviewed on regular basis and correct training is to be provided to new staff employed in the department.
- Regular report generation – Reports should be generated monthly or weekly basis to evaluate and check efficiency of system.
- User manual should be provided before hand by the software agency for the convenience of staff.

5)RESULTS

- All details regarding patients and hospital were computerized
- The staff was able to record and retrieve data in less time
- Data analysis of the records made easy
- The issues raised by department were sorted and all the changes were made
- The system was made user friendly and staff was trained to use system efficiently
- Various report can now be generated easily

5.1)CONCLUSION

The hospital required HIS Phase 2 implementation in departments like- Blood bank, OT, CSSD, Linen and Laundry, MRD „EHR , Equipment maintenance, Housekeeping departments. . For this external agency provided basis set-up for software. Due to the discrepancies in software and pattern of record maintenance in the department, changes were made. Department raised issues while recording the data related to patient and report generation, and the changes to be made were recorded in Issue Tracker. The changes were made and

implemented and staff was trained and was supplied with User Manual to make system User-friendly. Hence the data entry system helped to make workflow easy , effective and efficient. When implementing HIS in developing countries, context-specific circumstances, barriers, and needs must be taken into account. System implementation should be seen in the wider context of organizational change, of which software development is but one part.

The key factor that led to user acceptance was the practical usage of the system. It seems to have worked well to “release” the system in its infantile stage of development thereby engaging the users early in the development process leading to their “real” involvement. Only when the technical staff experienced using the system did they realize its value. They were then able to identify how it could be improved, which was critical in the development of a system that was suited to the local requirements. Early involvement also put the users at the leading end. Enabling them to help develop the system, rather than being at the receiving end where the end users are imposed an “externally” developed system. All this worked in favor of user acceptance. It is important to note that an “evolutionary” approach was taken throughout the implementation process where both staff and the system evolved and matured together.

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