Assessing the capabilities of Patient Information Management System – a module of VistA E.H.R. for implementation in Indian Healthcare

(A qualitative study)

Sub title:

Assessing the capabilities of Patient Information Management System – a module of VistA E.H.R. for implementation in Indian Hospital

A Dissertation Proposal for

Post Graduate Diploma in Health and Hospital Management and specialization in Healthcare Information Technology

By

Variyata Bagre

PG/09/57

Under the guidance of

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Organization: DELL SERVICE

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Designation: HOD of HIT

Organization: IIHMR, New Delhi

International Institute of Health Management Research

New Delhi

Date

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2010

CERTIFICATE OF INTERNSHIP COMPLETION

Date:……..

TO WHOM IT MAY CONCERN

This is to certify that Mr. /Ms. /Dr. "**Variyata Bagre**" has successfully completed his/her 3 months internship in our organization from August 9, 2010 to November 9, 2010. During this intern he/she has worked on……. (task performed) under the guidance of me and my team at……. (Organization).

…….

(Any positive/negative comment)

We wish him/her good luck for his/her future assignments.

(Signature)

_____ (Name)

_____Designation

CERTIFICATE OF APPROVAL

The following dissertation titled "**Assessing the capabilities of Patient Information Management System – a module of VistA E.H.R. for implementation in Indian Healthcare"** is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of Post- Graduate Diploma in Health and Hospital Management for which it has been submitted. It is Understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

Name	Signature
_____	_____
_____	_____
_____	_____

CERTIFICATE FROM DISSERTATION ADVISORY COMMITTEE

This is to certify that Mr. /Ms. Variyata Bagre, a participant of the Post- Graduate Diploma in Health and Hospital Management has worked under our guidance and supervision. He/She is submitting this dissertation titled "**Assessing the capabilities of Patient Information Management System – a module of VistA E.H.R. for implementation in Indian Healthcare**" in partial fulfillment of the requirements for the award of the Post- Graduate Diploma in Health and Hospital Management.

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Faculty Advisor	Organizational Advisor
Designation	Designation
IIHMR	Organization
New Delhi	Address
Date	Date

Assessing the capabilities of Patient Information Management System – a module of VistA E.H.R. for implementation in Indian Hospital

ABSTRACT

By Variyata Bagre

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This project is based on the qualitative study of the PIMS module in which capabilities of various implementation processes were assessed.

VistA Patient Information Management System (PIMS)[5] consists of functionalities related to admission/discharge/transfer, clinic scheduling and patient tracking module. It allows professionals in the medical field to organize, schedule, and analyze patient information. Presently the hospital is using HIS (Health information system) which is a customized product. Considering the commercial, operational and financial requirements of the provider, it has been decided that, the HIS functionalities would be retained at the front-end and PIMS would be managed from the back-end. Therefore interphasing would be done between the relevant modules of HIS and PIMS.

The methodology adopted for this project was:

- Collection of primary data.
- Collection of secondary data

Primary data sources were interaction and interview with HER[6] implementation team. Information related to departments in DELL services, overview of implementation[3], overview of other modules (LIS, PIS, and RIS), overview of VistA, PIMS features, configuration and enhancements of PIMS and integration of PIMS with HIS was collected.

Secondary data sources were requirements recording template, gap analysis[11] template, VistA[7] module (PIMS)[5], workflows of ADT[8] and data collection template

The capabilities of implementation of PIMS module were assessed through detailed study and working on PIMS module. The challenges faced during implementation(3) were assessed through interaction with the PIMS configuration(1), technical and HIS team.

ACKNOWLEDGEMENT

I owe my deep sense of gratitude to **Mr.Tushar Nair**, (Sr.Consultant) for giving me an opportunity to learn various aspects of Healthcare Information Technology with special emphasis on PIMS module of VistA EHR.

My special thanks to **Dr. Rajesh Gupta**, Principal consultant and Manager in Dell Services, for his guidance, support, interest, involvement and encouragement. He left no stone unturned in updating us about the subject.

I also thank Prof. Indrjit Bhattacharya for his guidance throughout the dissertation period.

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ABBREVIATIONS

CPRS-COMPUTERIZED PATIENT RECORD SYSTEM

EHR-ELECTRONIC HEALTH RECORD

HIS-HEALTH INFORMATION SYSTEM

VistA-VETERANS HEALTH INFORMATION SYSTEM AND TECHNOLOGY ARCHITECTURE

LIS-LABORATORY INFORMATION SYSTEM

RIS-RADIOLOGY INFORMATION SYSTEM

PIMS-PATIENT INFORMATION MANAGEMENT SYSTEM

NABH-NATIONAL ACCREDETITION BOARD FOR HEALTH

CPOE-COMPUTERIZED PATIENT ORDER ENTRY

HL7-HEALTH LEVEL 7

HIPAA-HEALTH INFORMATION PORTABILITY AND ACCOUNTABILITY ACT

ICD-INTERNATIONAL CLASSIFICATION OF DISEASE

CPT-CURRENT PROCEDURE TERMINOLOGY

PIS-PHARMACY INFORMATION SYSTEM

ADT-ADMISSION/DISCHARGE/TRANSFER

SSN-SOCIAL SECURITY NUMBER

SKDD-SAKET DEVKI DEVI

IT-INFORMATION TECHNOLOGY

SME-SUBJECT MATTER EXPERTISE

IP-INFORMATION TECHNOLOGY

FO -FRONT OFFICE

UAT-USER ACCEPTANCE TEST

DCW-DATA CHART WORKFLOW

PART I

1.INTERNSHIP REPORT

1.1ORGANIZATION PROFILE

1.1.1HISTORY

Dell Services is an information technology services provider based in Plano, Texas, USA. Peter Altabef has served as president and chief executive officer since 2004. On September 21, 2009, Perot Systems agreed to be acquired by Dell for $3.9 billion. H. Ross Perot and eight associates founded Perot Systems in June 1988 after having sold electronic data system (EDS) to General Motors. Before its acquisition by Dell Inc., Perot Systems was a Fortune 1000 corporation with more than 23,000 associates and 2008 revenues of $2.8 billion. The company maintains offices in more than 25 countries around the world, including the United States, Europe, India, China and Mexico

As a top-five finisher for the third consecutive year, Perot Systems was named to the Fortune magazine "Most Admired Companies in America" list for IT Services in 2008.The acquisition---Dell has acquired Perot systems for $3.9 billion, creating comprehensive, customer-focused IT-solutions Company. The acquisition will result in a compelling combination of two iconic information technology brands.

The expanded Dell will be even better positioned for immediate and long-term growth and efficiency driven by:--

- Providing a broader range of IT services and solutions and optimizing how they're delivered
- Extending the reach of Perot Systems' capabilities, including in the most dynamic customer segments, around the world
- Supplying leading Dell computer systems to even more Perot Systems customers.

Location: Express Way, Noida

Corporate Office Plot No. 3 Sector 125

Noida- 201301

1.1.2VISION OF DELL SERVICES

Dell services will be the most trusted industry leader in global information technology and business process services.

1.1.3MISSION OF DELL SERVICES

- Dell services will be a vital contributor to the overall success of Dell.

- They will develop and deploy advanced and differentiated support and next generation services, and will expand the geographic depth and presence.

- They will always deliver real and measurable results to their customers.

- They will invest in training and development for their team, value and will respect one another, focus maniacally on serving their customers and will have fun doing it.

- The CIO organization will be recognized for technical excellence and industry, leading efficiency, planning and execution

1.1.4TEAMS OF EHR IMPLEMENTATION

FIG: 1 EHR Departments in Dell Services

1.1.4.1Clinical Transformation for Healthcare Providers

The measurable benefits of the transformation for clinicians, and patients include:

Increased safety through reduction of adverse medical events

Increased quality through implementation of clinical best practices

Decreased costs through identification of opportunities for improved operational efficiency

Improved clinical adoption by effectively engaging clinicians

Well defined metrics for success

Improved clinical decision making, leading to accelerated process improvements throughout the organization

Dell Perot[15] Systems helps the organization to meet its strategic and clinical objectives by using an exclusive compilation of methodologies, tools, processes and best practices called the ADOPTS framework: ADOPTS (Access, Define, Optimize, Prepare, Transform and Sustain).

1.1.4.2Electronic health record (EHR)

EHRs were originally envisioned as an electronic file cabinet for patient data from various sources (eventually integrating text, voice, images, handwritten notes, etc.). Now they are generally viewed as part of an automated order-entry and patient-tracking system providing real-time access to patient data, as well as a continuous longitudinal record of their care.

1.1.4.3Training

This department deals with assessing & planning the training needs of physician, nurses, paramedic, front office, and support staff.

Roles and responsibilities of the training team and the users:

Super User

- They shall be well versed with the module.
- They should be efficient at handling routine problems related to product and should also be good at clearing doubt.
- They should be able to train new super users and end users.
- They should be approachable and expressive.

End Users

- They should be familiar with the working of the system; they should be able to access, retrieve and enter data in VistA

Trainers

- Trainers are responsible for making both end users as well as super users acquainted with the entire system. Hence, they should be knowledgeable, approachable and expressive.
- Trainers should understand the need of the hospital as well as the staff and should deliver the knowledge in the best possible way.

1.1.4.4Technical

The technical Architecture for any EHR Implementation in a Hospital must be reliable, secure, must ehave a good Business Continuity Plan and must be fault tolerable. The Infrastructure Planning for EHR covers the Network Architecture, Application

Architecture, Disaster Recovery Plan and Hardware requirements for Implementation of EHR in a Hospital.

1.1.4.5System Integration

Complex technologies and changing business environments are among the main challenges faced by organizations on the path of growth. Taking these elements into account, we need to integrate the latest technology components that can seamlessly align with the business and drive organizational efficiency. Understanding the complexities of the IT environment the system integration expertise to ensure that the technology is in line with the business objectives regardless of the size and nature of organization.

1.1.4.6 HIS

HIS stands for health information systems[10], it is a customized product used by the client hospital. It includes following modules:

FIG2: Starting screen in HIS

The HIS product was more focused on administrative modules, so there was a need for the implementation of HER(6) to cover the clinical aspect.

PIMS, Lab, Radiology, CPRS and Pharmacy modules in VistA(7) are already HL7 integrated with each other, but these modules need to be integrated with HIS.

At the front end, the staff will be working in CPRS (VistA) HIS and scheduler and at the back end, PIMS (Admissions Discharge Transfer and Scheduling), Radiology, Lab, Pharmacy will work.

Making changes in PIMS EHR is very difficult because EHR is a open source system, so if any changes will be done in coding, it will impact on other features as the vendor is not the owner of the product.

ADMISSION DISCHARGE TRANSFER IN HIS

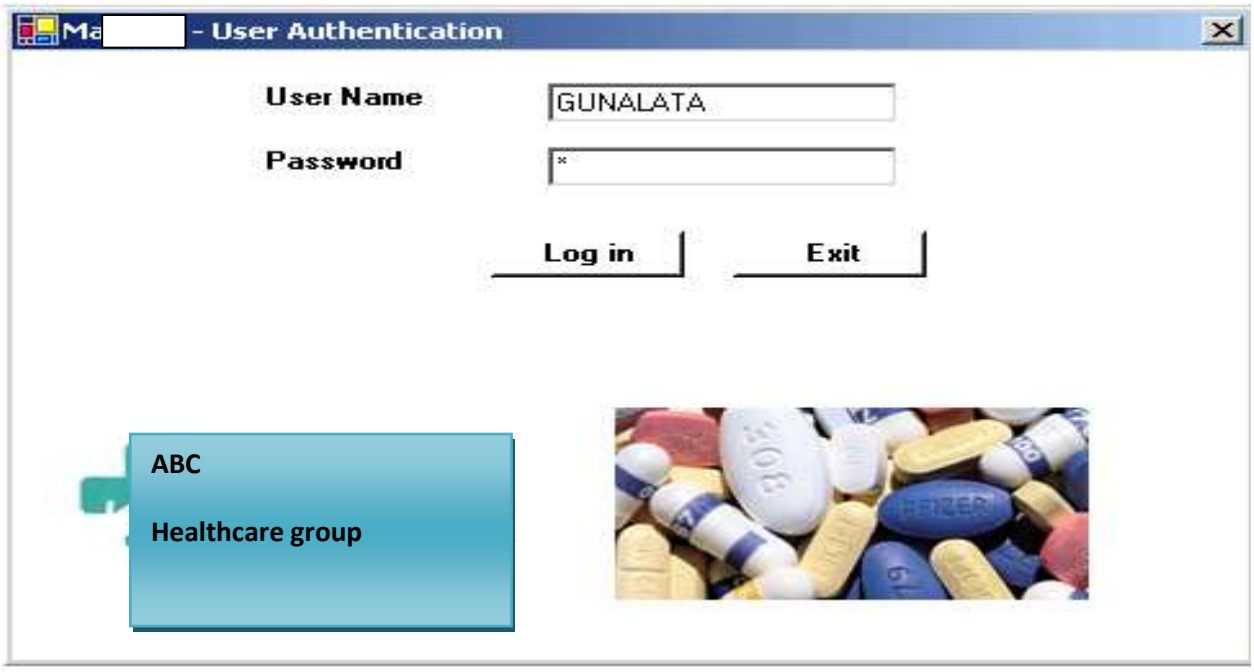


FIG 3: The user authentication screen

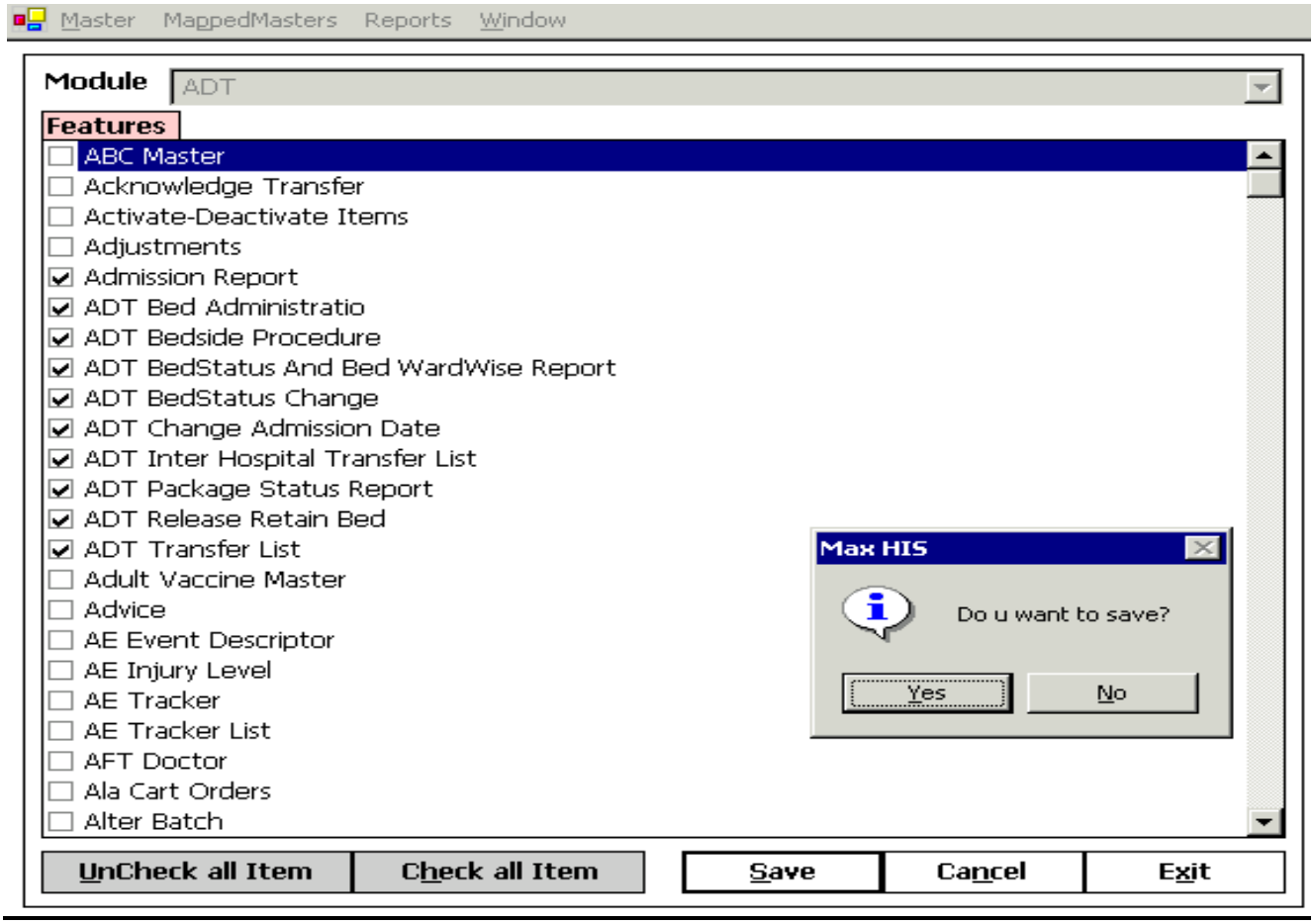


FIG 4: Features screen

Select the "Module" from the dropdown list.

The entire feature list under the selected module will be listed in the grid

- Select the features from the list by ticking in the checkboxes and click on "Save" button

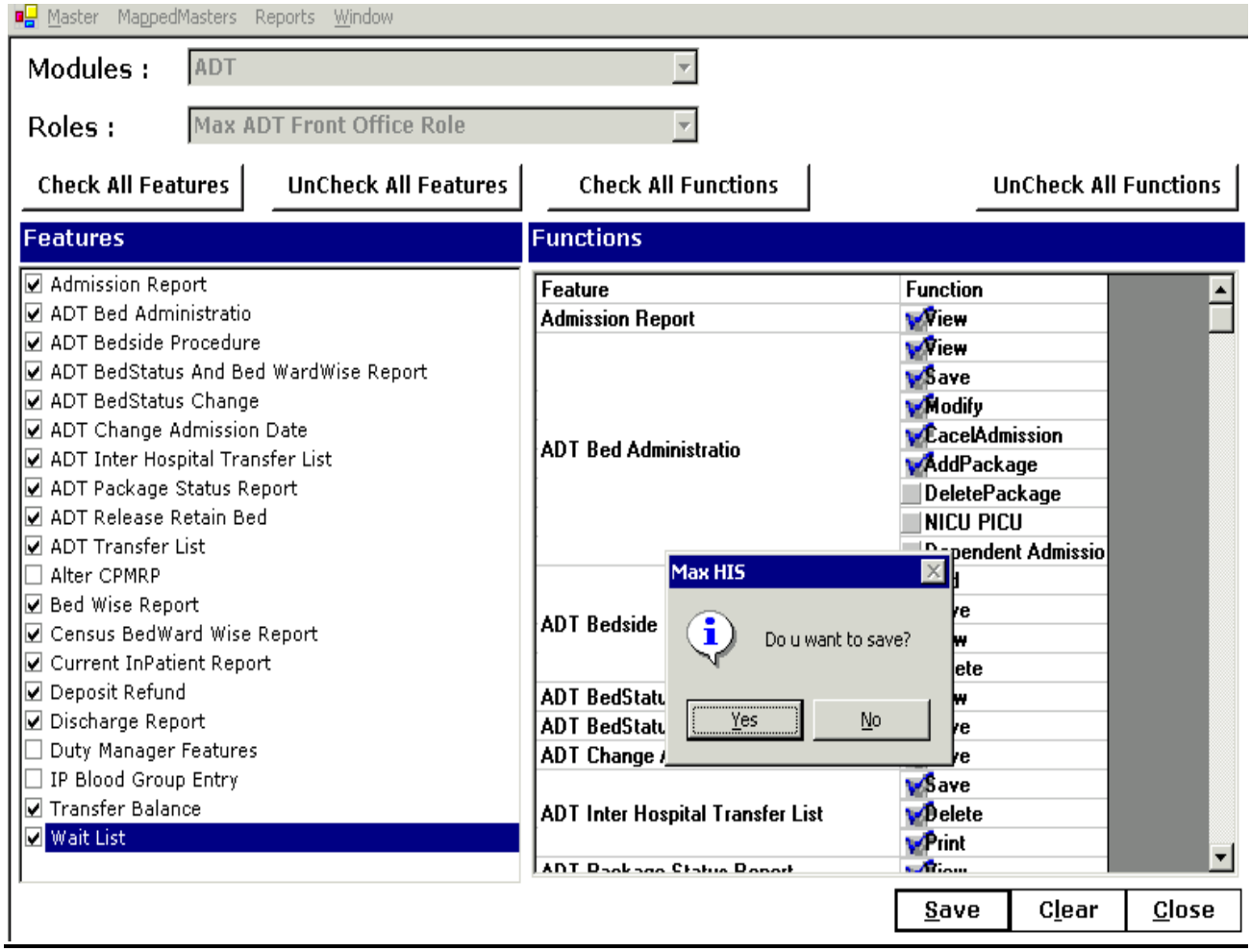


FIG 5: Features and functions screen

1.2 BACKGROUND OF THE CLIENT HOSPITAL

ABC Healthcare is one of top India's reputed hospitals delivering first class services to patient. It is an integrated health care services provider in India.

It is committed to the highest standards of medical and service excellence, patient care, scientific knowledge and medical education.

It's an 800 bedded healthcare organization with 33 departments. It provides international patient service. It's a NABH, NABL and ISO accredited organization.

THERE ARE 8 BRANCHES OF CLIENT HOSPITAL AT DIFFERENT LOCATIONS :

FIG 6: Branches of client hospital

I was engaged in the PIMS department. PIMS is the primary module to be implemented in EHR. It deals with the admission discharge transfer and scheduling.

1.3 REPORT ON MANAGERIAL TASK:

I was given a task of understanding the whole project of PIMS implementation, getting the data and conversing with the staff of various departments like HIS, Pharmacy Integration and Technical team related to the project and task of doing configuration of PIMS.

1.4 REFLECTIVE LEARNING:

I had learnt the various phases of implementation, integration of one module with the other, brief technicalities of the implementation, configuration - making templates in CPRS, and quick orders in radiology.

Part II –A

2. DISSERTATION OVERVIEW

2.1PROBLEM STATEMENT

Problem identified is to assess, that how US based software (PIMS), gets implemented in Indian hospital and what all challenges are faced during its implementation.

2.2GOAL AND OBJECTIVE

Assessing the implementation capabilities of the module (PIMS)

2.3 SPECIFIC GOALS AND OBJECTIVES

1. Assessing the security issues.
2. Gaps analysis of PIMS implementation.
3. Assessing the PIMS customization.
4. Assessing the successful integration of PIMS with HIS.
5. Assessing the challenges faced during implementation.

2.4 SCOPE OF THE STUDY

This implementation process being an ideal comprehensive process for the chain of multi-specialty hospitals, gives an excellent example which can be used in the implementation of PIMS in the Indian healthcare

2.5 NEED FOR THE STUDY

The need of this project is to assess the capabilities of PIMS implementation and the challenges faced by the team during its implementation.

Thus, the main rationale behind this study is to understand the capabilities of a US based product, being implemented in Indian healthcare.

2.6 BENEFITS

1. This study will give the idea that what all challenges can be faced ,when a US based software gets implemented in Indian Hospital. So that one can avoid those mistakes.
2. Improved flow of admission discharge and transfer, leading to accelerated process improvements throughout the organization.
3. Well defined metrics for success.
4. This study on whole helps both the Service provider and the client.
5. Increased quality through implementation of clinical best practices.

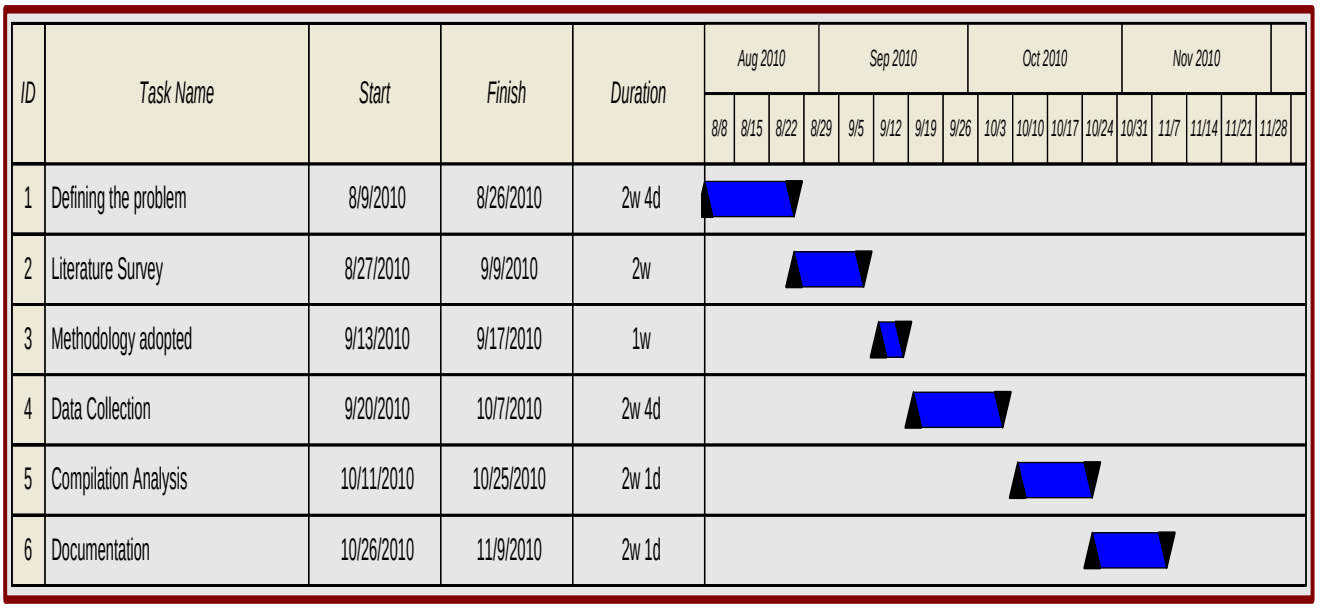
2.7 ASSUMPTIONS

1. All the secondary data given is considered true to my knowledge.
2. Basic computing skills to be known by the staff to be trained.
3. Working knowledge of English Language should be there.
4. Definitive clinical role in clients' hospital to be well defined.
5. Basic infrastructure to be provided by clients hospital like, training labs , PC etc
6. Cooperation of the staff.

2.8 DATA SOURCES

1. ABC Hospital.PIMS Administration
2. ABC Hospital.PIMS Workflow
3. Gap Analysis Document of VistA-EHR PIMS Module v1.0 (Dell)
4. Data Collection Document of VistA-EHR PIMS Module v1.0 (Dell)
5. Requirement Document of VistA-EHR PIMS Module v1.0 (Dell)
6. VistA –FILEMAN
7. ADT BED CONTROL.DOC
8. ADT SETUP.DOC
9. ADT OUTPUT.DOC
10. PIMS MANUAL
11. Setup of Multidivisional.DOC
12. HIS.DOC

2.9 WORK PLAN



ID	Task Name	Start	Finish	Duration
1	Defining the problem	8/9/2010	8/26/2010	2w 4d
2	Literature Survey	8/27/2010	9/9/2010	2w
3	Methodology adopted	9/13/2010	9/17/2010	1w
4	Data Collection	9/20/2010	10/7/2010	2w 4d
5	Compilation Analysis	10/11/2010	10/25/2010	2w 1d
6	Documentation	10/26/2010	11/9/2010	2w 1d

2.10 LIMITATIONS

1. The secondary data collected were allowed to be used in a limited amount.
2. Questionnaire made was not allowed to be used.
3. Certain readings of the client hospital were not allowed to be documented because of confidentiality issues.

PART II-B

3. PROJECT OVERVIEW

3.1 BACKGROUND

With the increased advent of information technology in every work field, the question of its implementation in medical field is the need of the hour. The use of computers for medical record keeping, point of care, integration of net based communications with daily practice and involvement of computerized applications for clinical work has led to an inescapable reality that EHR implementation has become really important.

“Electronic Medical Record—A computer-based patient medical record. An EMR facilitates access of patient data by clinical staff at any given location; accurate and complete claims processing by insurance companies; building automated checks for drug and allergy interactions; clinical notes; prescriptions; scheduling; sending to and viewing by labs. The term has become expanded to include systems which keep track of other relevant medical information. The practice management system is the medical office functions which support and surround the electronic medical record".

In 2009 the ABC healthcare signed a contract with DELL Services, for the EHR implementation. VistA[(7)] which is an open source system was selected for the EMR implementation by the client in India. This software is part of the VistA[(7)] Public Domain software, and does not require licensing and users cost.

Presently the hospital is working on HIS (Health information system) which is a customized product. There will be integration of HIS with PIMS and after the integration the HIS will be working at frontend, and PIMS will work at backend.

3.1.2 PRODUCT TO BE IMPLEMENTED –VistA

The US Veterans Administration developed the most widely distributed Electronic Health Record used in the US, the Veterans Health Information Systems and Technology Architecture (VistA). In an effort to make the system widely available to institutions outside the Veterans Administration health system, the software code was placed in the Public Domain under the Freedom of Information Act.

In 2006, WorldVistA EHR VOE/ 1.0 was the only open source EHR that met Certification Commission for Healthcare Information Technology (CCHITSM) ambulatory electronic health record (EHR) criteria, and in January 2008, it was released with full CCHITSM EHR.

As a free product developed in co-operation with the US government, WorldVistA is not marketed in a similar fashion to commercial EHRs.

VistA[(7)] includes a whole range of data in comprehensive or summary form, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, and billing information. It supports both ambulatory and inpatient care.

VA FileMan can be used as a standalone database, as a set of interactive or "silent" routines, or as a set of application utilities; in all modes, it is used to define, enter, and retrieve information from a set of computer-stored file.

Programmer access in VistA is defined as DUZ =1. It grants the privilege to become a programmer in VistA It enables access to all VA FileMan files, access to modify data dictionaries, et

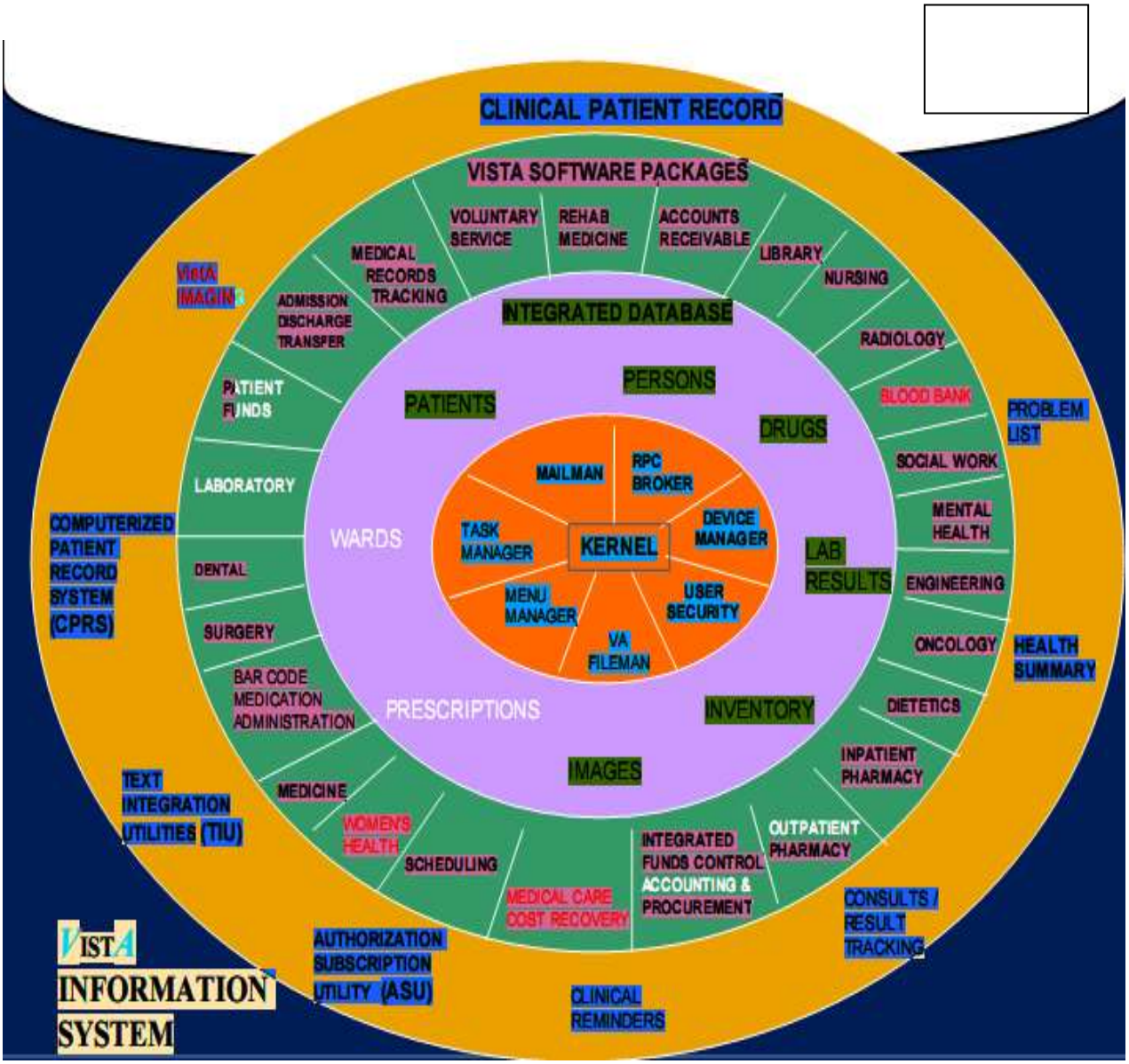


FIG: 8 VistA Information Systems

Database contains all these data files

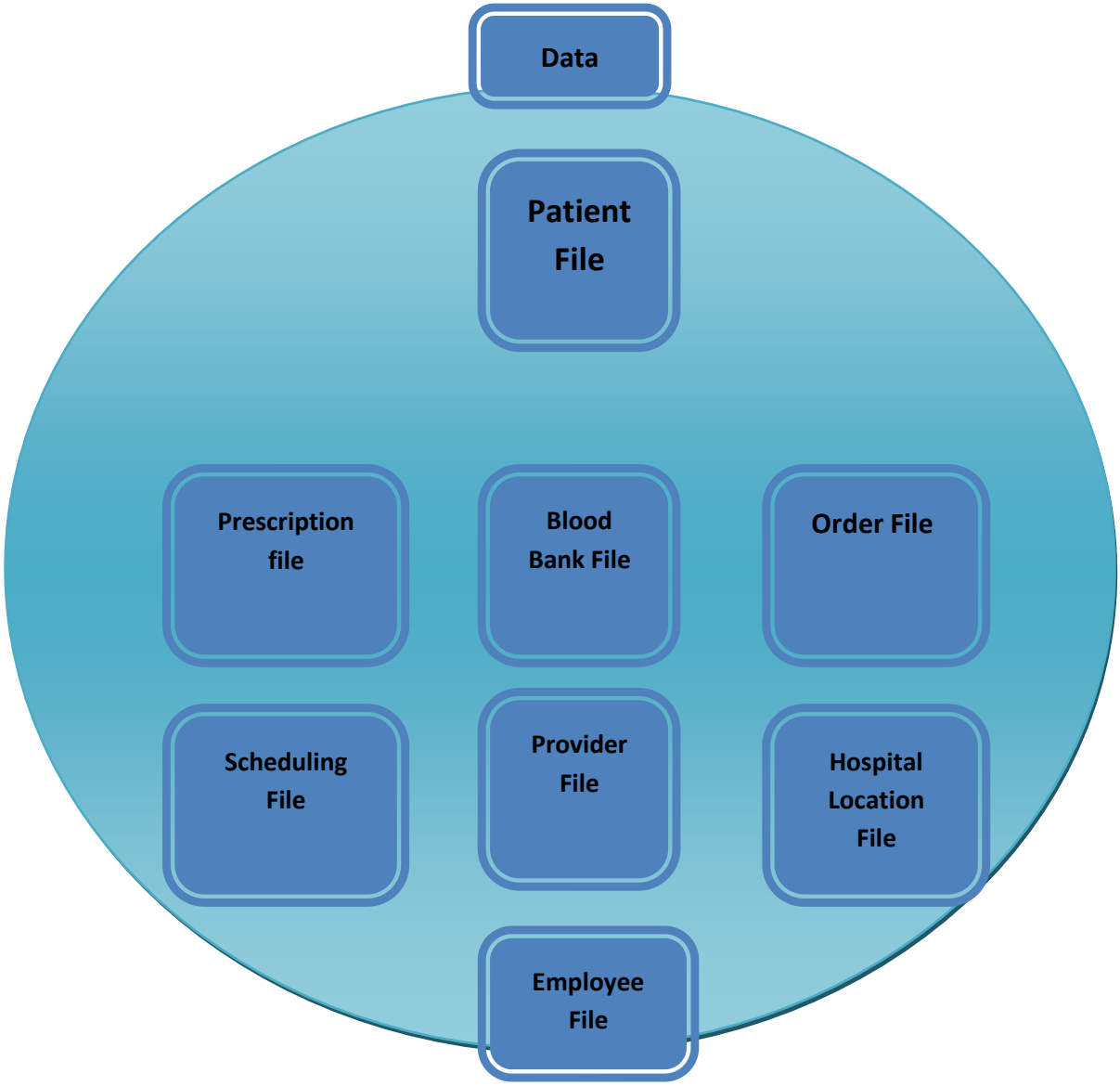


FIG 9: VistA Files

3.1.3MODULES VistA OFFERS:

1) Clinical
2) Infrastructure
3) Financial-administrative
4) Healthevet

CLINICAL

CPRS

DENTISTRY

LABORATORY

RADIOLOGY

PHARMACOLOGY

SURGERY

PIMS etc

INFRASTRUCTURE

CAPACITY MANAGEMENT TOOLS

FILEMAN

HL7 (VistA MESSAGING)

MAILMAN

NATIONAL PATCH MODULE

SURVEY GENERATOR etc

FINANCIAL-ADMINISTRATIVE SECTION

ACCOUNTS RECEIVABLE

CLINICAL MONITORING SYSTEM

FEE BASIS

INTEGRATED BILLING

RECORD TRACKING etc

HEALTHEVET

CLINICAL INFORMATION SUPPORT SYSTEM

ELECTRONIC SIGNATURE

PERSON SERVICES

REGISTRIES

3.1.4 AUTHENTICATION AND ACCESS SECURITY OF VistA.

AUTHENTICATION

- Process to prove the identity of user accessing the application.
- Each user accessing EHR will have an entry in NEW PERSON file in database. The EHR application will authenticate the user entry in NEW PERSON file when he attempts login in system.

SENSITIVE RECORD ACCESS

- Critical Patient records can be made sensitive and any user attempting to access these records will get recorded as audit log

WHEN YOU USE VA FILEMAN WITHIN THE KERNEL'S MENU SYSTEM, YOU ARE SUBJECT TO THE SECURITY REQUIREMENTS:

- You must enter correct Access and Verify Codes.
- You can only use menus and options to which you have been granted access
- You must have the proper keys to use certain locked options.

3.1.5 PIMS

VistA Patient Information Management System (PIMS) consists of functionalities related to admission/discharge/transfer; clinic scheduling and patient tracking module .PIMS enhances the patient flow from admission to discharge by developing a shared electronic record that contains all of the required information on a patient's progress report. It enables clinicians to view the demographics, making tracking a patients a far easier and quicker process.

3.1.5.1 THE PIMS MODULE HAS FOUR MAIN COMPONENTS:

1. **The Admission/Discharge/Transfer (ADT) application includes:**

   - Basic bed control functions (admissions, transfers, discharges)
   - Inpatient listings and reports
   - Scheduled visits (admissions, outpatient visits from outside the area).

2. **The Clinic Scheduling application provides:**

   - Outpatient appointment management
   - Tracking patients on waiting lists
   - Various reports on clinic capacity and workload.

3. **The Sensitive Patient Tracking (SPT) module**

   - It allows a facility to track access to patient records, either those designated as sensitive or all records. Accessing sensitive records warn users that they are accessing a restricted record. Non-sensitive records can be tracked with no warning to computer users. The product tracks which menu option the user was executing when he/she selected a patient along with date and time.

4. The Patient Record Flag module

- It is used to alert medical staff and employees of patients whose behavior and characteristics may pose a threat either to their safety, the safety of other patients, or compromise the delivery of quality health care. These flag assignments are displayed during the patient look-up process

3.1.5.2 THE FOLLOWING MODULES WILL BE IMPLEMENTED IN EHR IN CLIENT HEALTHCARE ALONG WITH PIMS

Brief information of other modules to be implemented in the client hospital along with PIMS .The patient admitted at front end HIS will be reflected in CPRS through PIMS and when any order is made through CPRS the patient information will be reflected in that module respectively (LIS ,PIS,RIS)

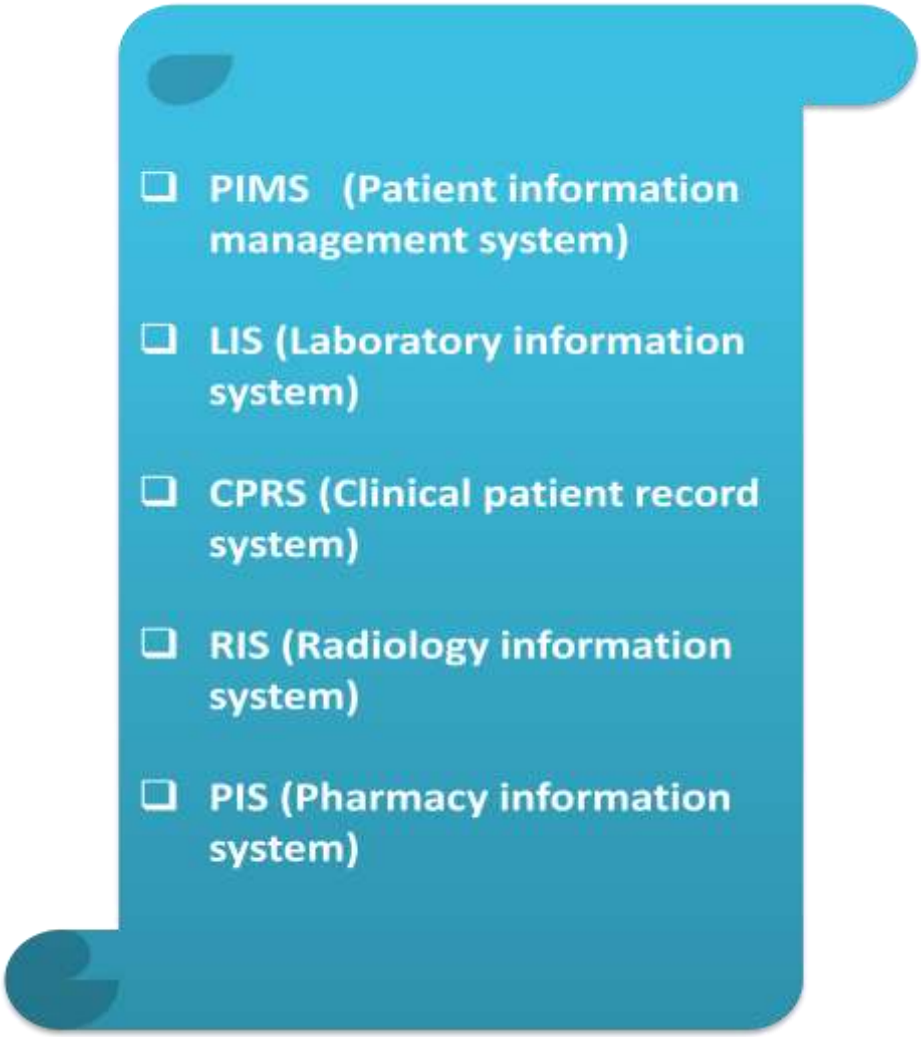


FIG 10: VistA module

CPRS (computerized patient record system)

It is a comprehensive VistA program, which allows clinicians and others to enter and view orders, progress notes and discharge summaries, problem list, view results, reports, etc.

CPRS organizes and preset all relevant data on a patient in a way that directly supports clinical decision making. The comprehensive cover sheet displays timely, patient centric information, including active problem, allergies, current medications, recent laboratory results, vital signs, hospitalizations and outpatient clinical history.

CPRS capabilities include:

a) Real – Time Order Checking System
b) Notification System
c) Patient Posting System
d) Clinical Reminder System
e) Remote Data View

Laboratory

Laboratory module enables the user with Ordering of tests and procedures on both patient and non-patient specimens, Collection and Accessioning of specimens into the Laboratory database, Processing and analysis in appropriate department or work areas, review and verification of results, Reporting of results and/or diagnoses for clinical health care treatment, Analysis and reporting of quality control data used in generating results and Providing management statistical data as well as requirements for accreditation by regulating bodies and agencies

Radiology Module

Radiology / Nuclear Medicine package is a comprehensive system package, designed to assist with the functions related to processing patients for imaging examinations. The Radiology / Nuclear Medicine package automates the entire range of diagnostic functions performed in imaging departments, including request entries by clinical staff, registration of patients for exams, processing of exams, recording of reports/results, verification of reports on-line, displaying/printing results for clinical staff, automatic tracking of requests/exams/reports, and generation of management statistics/reports, both recurring and ad hoc. The Radiology / Nuclear Medicine package automates many tedious tasks previously performed manually, providing faster, more efficient and accurate data entry and more timely results reporting. One of the important features provided by VistA is

VistA Imaging

The Veterans Administration has also developed VistA Imaging, a coordinated system for communicating with PACS (radiology imaging) systems and for integrating others types of image-based information, such as, pathology slides, and scanned documents, into the VistA electronic medical records system. This type of integration of information into a medical record is critical to efficient utilization.

Pharmacy Module

The Pharmacy package provides a method of management, dispensing, and administration of inpatient drugs within the hospital. Hospital Medications combines clinical and patient information that allows each medical center to enter orders for patients, dispense medications by means of Pick Lists, print labels, create Medication Administration Records (MARs), and create Management Reports. Hospital Medications also interacts with the Computerized Patient Record System (CPRS) and the Bar Code Medication Administration (BCMA) packages to provide more comprehensive patient care.

3.1.5.3 THE FEATURES OF PIMS MODULE:

1. **ADMIT A PATIENT**

   This option is used to admit a patient to the medical center or edit/delete a previously entered admission.

2. **CANCEL A SCHEDULED ADMISSION**

   This option is used to cancel previously scheduled admissions which are not automatically cancelled by the system. Patients who expire or exceed the ABC minimum number of days are automatically cancelled by the system.

3. The system has the ability to do pre-admission activities like :
   a. Block bed
   b. Book medical equipment
   c. Book operation room

4. The system has the capability to record all medical staff involved in the patient's care process.

5. Against each admission, after the update in the CPRS the system records and displays all the details including orders, results, surgeries, procedures, medications and all patient encounter information in CPRS.

6. **TRANSFER**-Once a patient has been admitted to a ward it is possible to transfer the patient. This means that a patient can be transferred to another ward, bed, consultant, other hospital or they can be transferred home for a home leave stay. As with admissions it is possible to make a planned transfer by adding a future date to the transfer.

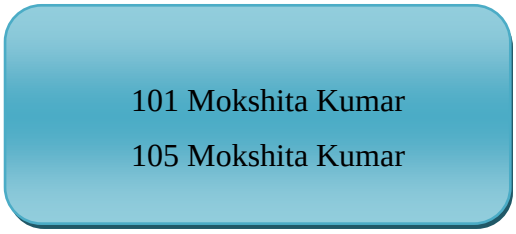
    a. **TRANSFER A PATIENT**
    b. This option is used to enter a patient's interward transfers, and corresponding returns.

7. The system is compatible with HL7 [13]standard.

8. **DEDUPLICATION:** The system has the ability to do the deduplication.

    EXPLANATION: The patient demographic contains name, age, sex, date of birth, patient registration number etc. When the patients name is registered for the appointment .(e.g.) diabetic clinic, he get registered with name "Mokshita Kumar" now after one month this patient gets admitted in endocrinology ward and this time in the database a duplicate name of the same patient gets created.

    If the doctor wants to see the patient event, about his visit to the diabetic clinic.
    He gets information as follow:



In HIS following attribute is used

: "**LINK"**

The 105 patient ID becomes duplicate entry and a link is created at 101 patient ID.

In PIMS following attribute is used for deduplication:

"SEARCHING"

"MERGING"

a) AUTO

b) MANUAL

Searching option will search the patient E.g. Mokshita Kumar and will merge both the patient record.

It will save the merged record and if we want to delink these records it will delink the record.

9. **SCHEDULING**

10. **Outpatient Management**

It offers a comprehensive set off scheduling options to assist staff in booking a range of appointments including:

a) Single appointment

b) Multiple appointments on one day for different clinics/providers/specialties from a single point saving the hospital and the patient time and effort.

11. **WARD MANAGEMENT -** This allows patients to get admitted to a ward without having to specify the projected bed category or the actual bed category for the patient
12. **WARD MANAGEMENT/BED CATEGORY -** This option allows wards to have beds attached to specialties and enables the hospital to capture the projected and actual bed category for the patient.

13. **REAL TIME BED MANAGEMENT** - This option allows the hospital to define the actual number of beds attached to each ward and actually admit patients into actual beds.

14. **WARD MANAGEMENT-** The Ward view functionality enables users to view information relating to the patients that are currently occupying the wards and planned events for those wards such as admissions, discharges and transfers.

15. **DELETE WAITING LIST ENTRY**

    This option is used to remove a patient from the admission waiting list.

16. **DETAILED INPATIENT INQUIRY**

    This option is used to view patient movement information.

17. **PROVIDER CHANGE**

    This option is used to enter changes in provider during an inpatient stay for a selected patient.

18. **SERIOUSLY ILL LIST ENTRY**

    This option is used to place patients onto or remove them from the medical center's Seriously Ill List.

19. **SWITCH BED**

    This option is used to record a patient's transfer from one room-bed to another on the same ward.

20. **TREATING SPECIALTY TRANSFER**

This option is used to record the change of a patient's treating specialty when the patient does not physically move to a different location.

21. **WAITING LIST ENTRY/EDIT**

This option is used to place patients on the waiting list for admission to the facility and to edit waiting list entries.

22. **DISCHARGE** -Once all the relevant details are entered such as the date and times of actual and medical discharges the outcome and destination are required. If the solution is configured to do so it links to other modules dependant on the value selected as an outcome of the inpatient stay. If the outcome is that a follow-up appointment is to be booked the system automatically displays the appointment booking module and the waiting list if a value of waiting list is entered as the outcome.

The system can also generate a discharge summary based on the details available in the System.

The system automatically releases the bed when a patient is discharged or transferred out to be handed over to the housekeeping department for cleaning and disinfections

3.2 LITERATURE SURVEY

1. VistA Intro.doc

By 2003, the VHA was the largest single medical system in the United State providing care to over 4 million veterans, employing 180,000 medical personnel and operating 163 hospitals, over 800 clinics, and 135 nursing homes. About a quarter of the nation's population is potentially eligible for VA benefits and services because they are veterans, family members, or survivors of veterans

By providing electronic health records capability, VistA is thereby one of the most widely used EHRs in the world. Nearly half of all US hospitals that have a full implementation of an EMR are VA hospitals using VistA.

2. Case Studies of VistA Implementation United States and International VHA ís integrated health information system, including its framework work for using performance measures to improve quality, is considered one of the best in the national Institute of Medicine (IOM) Report,

Leadership by Example: Coordinating Government Roles in Improving Health Care Quality, 2002

The VistA system is a proven product and can be readily adapted for use in acute care, ambulatory and long-term care settings. It has been used in public and private healthcare provider organizations across the United States and in a number of international settings.

3. Down in the (Data)base(ment): Supporting Configuration in Organizational Information Systems

Stuart Anderson, Gillian Hardstone, Rob Procter and Robin Williams School of Informatics and Institute for the Study of Science, Technology and Innovation, University of Edinburgh

PiMS (Patient Information Management System) is a computer-based patient information management system currently being implemented. Patient information management systems are a key technology at the heart of healthcare strategy aimed at generating new knowledge to guide a variety of healthcare processes (e.g., clinical decision making, resource allocation and clinical governance). At the heart of most Patient Information Systems, users are asked to take classification decisions about a variety of different situations. The qualities of the classification and of the classification activity are key to the quality of the knowledge being generated by the system.

4.Olmeda, Christopher J. (2000). Information Technology in Systems of Care. Delfin Press. ISBN 978-0-9821442-0-6

Computers in hospitals perform a wide range of activities, such as processing and storing the data necessary to support daily operations, facilitating clinical and financial decision making, and satisfying internal and external documentation requirements. These computer systems are variously referred to as hospital, health, and medical information systems. The term *hospital information system* [(9)] (HIS) encompasses both patient care and patient management systems, which support healthcare delivery, and financial and resource management systems, which support the business and strategic operations of a hospital. In countries that have hospital-based healthcare systems, the term HIS can imply information systems with broader functions, including applications that support ambulatory (out-patient) care. The increasing emphasis on primary out-patient care and home care, the merger and incorporation of healthcare institutions and the use of computer networks that span geographically distant healthcare facilities have led to the expansion of HIS into large integrated healthcare delivery systems in which services are extended beyond the physical boundaries of a single hospital.

5. Testing & Integration Issues in implementation of Advanced Health Information Management System

Udai Singh, Ashutosh Pandey, Amit Kumar

.With the introduction of AHIS into hospitals, improvement in patient care as well as hospitals management, collection and retrieval of accurate and complete medical information, lower operational and treatments costs, less time to reach patient medical data, interpretation of clinical data and warnings for exceptional medical cases such as drug to drug interaction were expected from AHIS. AHIS implementation is more difficult than the implementation of other e-Governance application systems, due to the critical nature of working of a hospital and adaptation in hospitals is a complicated task compared to other information systems in different business areas. System infrastructure design, requirement specification, master data collection and definition, integration with other systems, localization, and training and final system test are the main activities of implementation.

6. What Is the Patient Information Management System?

By Kyra Bartolomei, eHow Contributor Updated: April 28, 2010

Patient information management systems have helped doctors' offices become more efficient. Instead of writing everything down by hand, medical staff can input information directly into a system that will do all the storing and filing for them. Also, patient information management systems [(2)] make patient data easily accessible.

7. Implementation and Use of a Patient Data Management System in the Intensive Care Unit: ATwo-YearExperience

SP Nelwan, TB van Dam,SH Meij,NHJJ van der Putten Thorax center, Erasmus MC, Rotterdam, TheNetherlands

Patient Data Management Systems (PDMS) [1, 2, 3] have traditionally formed the amalgam between the patient monitoring system and hospital information system. A

PDMS automatically collects and stores vital parameters from the patient monitor, provides a digital patient chart and is often considered as the primary system for nurses and physicians in the intensive care setting. The Thoraxcenter, a combination of the cardiology and thoracic surgery departments of the Erasmus MC, set out to replace a

mixture of paper-based registration sand in-house developed applications for the intensive care units with a new digit al information system

3.3 DATA COLLECTION

Primary data sources:

Methodology: Interaction and interview with EHR implementation team.

Information related to departments in DELL services, overview of implementation, overview of other modules (LIS, PIS, and RIS), overview of VistA, PIMS features, configuration and enhancements of PIMS and integration of PIMS with HIS was collected.

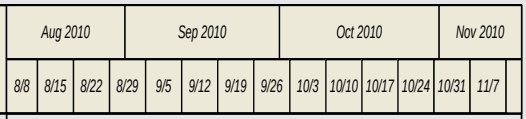
Secondary data sources:

Requirements recording template, gap analysis[11] template, VistA module (PIMS)[5], workflows of ADT[8] and data collection template

The study involves the analysis of the primary as well as secondary data. Study also involves examining the current scenario of the admission discharge and transfer process of the client hospital. For this study all the features of the VistA PIMS and HIS are studied carefully and mapped with the requirements of the client.

3.4 PROJECT ROLL OUT PLAN

ID	Task Name	Start	Finish	Duration
1	**Defining the Problem**	**8/9/2010**	**8/26/2010**	**2.8w**
2	Study Implementation Project Details	8/9/2010	8/12/2010	.8w
3	Studied Worldwide Implementation aticles	8/13/2010	8/18/2010	.8w
4	Discussion with mentor	8/19/2010	8/20/2010	.4w
5	Finalizing the Dissertation Topic	8/23/2010	8/25/2010	.6w
6	Defining the need .scope and objective.	8/26/2010	8/26/2010	.2w
7	**Literature Survey**	**8/27/2010**	**9/9/2010**	**2w**
8	Finding Articles/ Manuals	8/27/2010	8/31/2010	.6w
9	Sorting Articles/ Manuals	9/2/2010	9/3/2010	.4w
10	Reading Articles/ Manuals	9/6/2010	9/10/2010	1w
11	**Methodology Adopted**	**9/13/2010**	**9/17/2010**	**1w**
12	Studying Various Project Methodologies	9/13/2010	9/14/2010	.4w
13	Discussion with Mentors About Methodology	9/15/2010	9/16/2010	.4w
14	Finalizing Methodology	9/17/2010	9/17/2010	.2w
15	**Data Collection**	**9/20/2010**	**10/7/2010**	**2.8w**
16	Client site visit	9/20/2010	10/1/2010	2w
17	Technical and integration team Interview	9/21/2010	10/1/2010	1.8w
18	Development team Interview	10/4/2010	10/7/2010	.8w
19	**Compilation Analysis**	**10/11/2010**	**10/25/2010**	**2.2w**
20	Data Compilation	10/11/2010	10/13/2010	.6w
21	Data Analysis	10/14/2010	10/22/2010	1.4w
22	Reviewing Analysis to Mentor	10/25/2010	10/25/2010	.2w
23	**Documentation**	**10/26/2010**	**11/9/2010**	**2.2w**
24	First Draft Preparation	10/26/2010	11/3/2010	1.4w
25	First Draft Review	11/4/2010	11/5/2010	.4w
26	Final Draft Preparation	11/8/2010	11/8/2010	.2w
27	Report Finalized	11/9/2010	11/9/2010	.2w



PROJECT IMPLEMENTATION

This project is a phased implementation project in which at first phase PIMS will be implemented.

First Phase `	PIMS "GO LIVE" in all ABC facilities.
Second Phase	Incremental EHR Lab Rollout in each ABC facility.
Third Phase	Incremental EHR Radiology Rollout in each ABC facility.
Fourth Phase	Incremental EHR Pharmacy Rollout in each ABC facility.
Fifth Phase	Incremental EHR CPRS Rollout in each ABC facility.

FIG 7: Roll out Plan

3.4.1 PIMS IMPLEMENTATION PROCESS

FIG 11: Implementation Process

3.4.2DEMONSTRATION OF THE PRODUCT

Before signing the agreement, a high level presentation of the product is given by the marketing team of the company where in all the features of the product are shown to the client and the capabilities and salient features are highlighted, then the client asks the vendor to give the following information.

LICENSE
SERVICE EXCLUDING IMPLEMENTATION
HARDWARE
SOFTWARE
IMPLEMENTATION COST

FIG 12: Agreement Information

3.4.3REQUIREMENT GATHERING

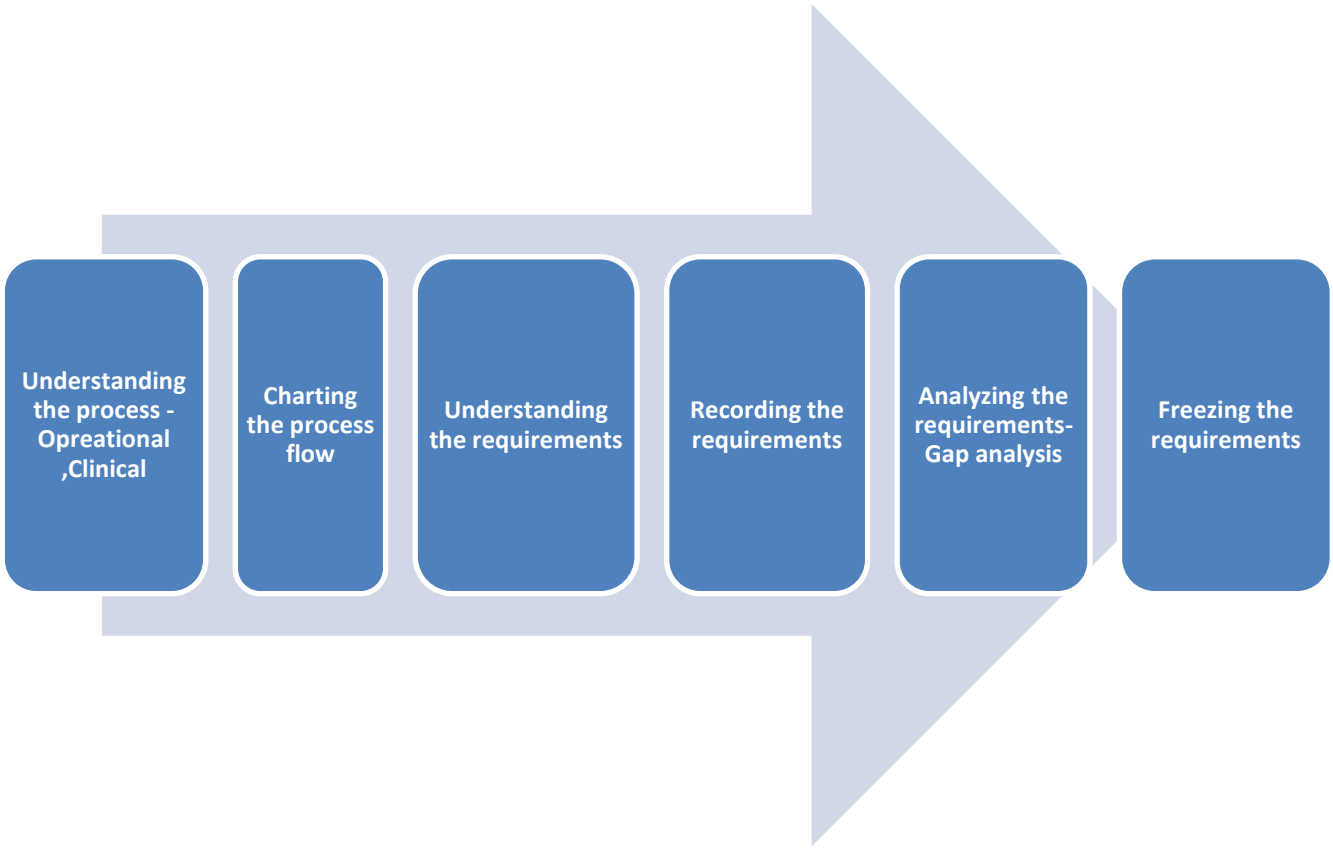


FIG13: Flow of the process of requirement gathering

A thorough analysis of the expectations and the requirements put forth by the client via group discussions, site assessments and personal interviews are analyzed, the requirements are also collected by various other means for e.g., a comprehensive assessment of what the product can provide and what the client is expecting is done and the gaps are-re figured out.

The requirements were gathered by the BA (business analyst) from the relevant stake holders .The BA explained what the product is capable of , he notes the requirements, and the requirements which are out of scope are explained to the client.

After collecting the requirements, it was divided into three categories by the Business Analyst:

1. Available in VistA.
2. Not available in VistA.

3. Available with configuration or minimum customization.
4. Ownership clarity.
5. To be discussed with client.

	Colour	**Description**	**No. of Requirements**
	Red	Not Available in VistA	24
	Green	Available in VistA	22
	Yellow	Available with configuration or minimum customization	05
	White	Ownership clarity	10
	Peach	To be discussed with client.	05

FIG 14: Colour codes used in depiction of requirement of PIMS

3.4.3.1 ANALYZING THE REQUIREMENTS-GAP ANALYSIS

There are two types of gaps closed gaps and open gaps. The closed gaps are those which are not available in VistA, and are marked as red in requirements .The open gaps are those which are available in VistA but need some customization and configuration.

The gap template entitles the following:

- Module

- Gap
- Description
- Critical
- Status
- Clubbed with.

Module	Gap	Gap Description	Critic	Status	Clubbed with
Billing	Billing for 2 CPT codes together	Orderable item in VistA associated with multiple CPT codes	2	Open	Integration
Billing	Billing of modalities	Billing should happen at the same facility where the test is being executed.	2	Open	Integration

FIG 15: Gap template

1. SSN NO. It is a nine digit field.

Client: SSN .No. should have following format:

Location code Registration number.
SKDD. 12345

2. Date: The date format is mm/dd/yy.

Client: The date should be in the following format:

dd/mm/yy

4. Pin code: pin code is a 4 digit field.

Client: The pin code should have 6 digits.

3.4.3.2 FREEZING THE REQUIREMENTS

After a thorough discussion with the stakeholders about the gaps that which requirement is Unrealistic, need HIS Enhancements, is not a product gap, and currently not in scope, the final requirements are frozen .The frozen requirement gets signed off by the authoritative person.

3.4.4 MASTER DATA COLLECTION

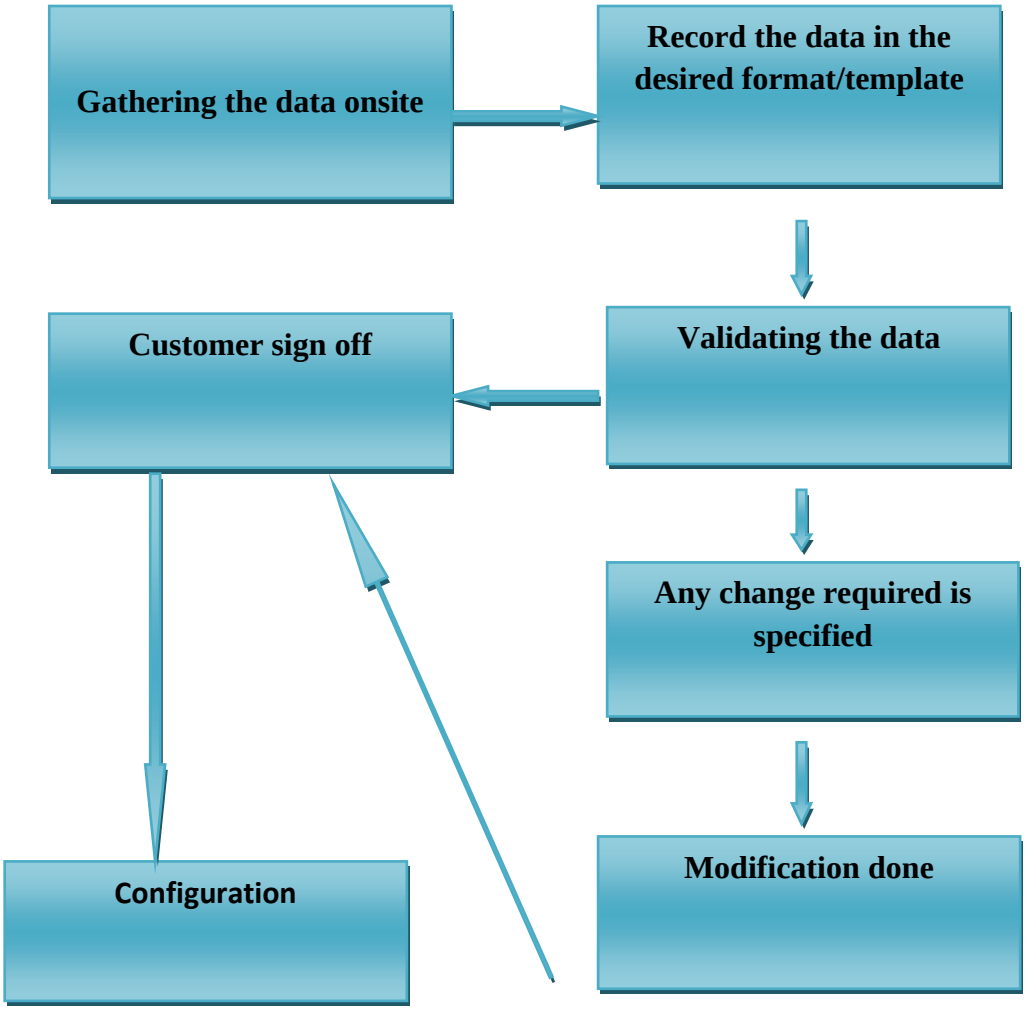


FIG16: Flow of data collection

PRIMARY DATA COLLECTION:

The person from whom the data is collected should be an authorized person and should be having a complete and correct knowledge of all the data. This data is provided by the hospital in the form of worksheets called as DCW i.e. Data Content Worksheets.
This data collection was done by the PIMS team

Following data was collected:

Name of data	Data collected	Data collected
Name of floor	GROUND FLOOR	FIRST FLOOR
Name of ward	2nd Floor Nursing Station (MSSH)-SKT	4th Floor Pediatrics Day Care(MSSH)
Name of bed	DAY CARE-01	ICU-01
Type of beds	Classic deluxe	Economy
Department	Orthopedic	Neurology
Name of clinics	Psychiatry	ENT
Appointments of healthcare provider	Physician – 9:00AM to 3:00PM 3:00PM to 9:00PM 9:00PM to 9:00PM	Nursing- 8:00AM to 2:00PM 2:00PM to 8:00PM 8:00PM to 8:00PM
Specializations of healthcare providers	Arthritis	Physiotherapist
Location of hospital	Saket (MSSH)	Saket (DD)
Name of providers	DR.Subhash	DR. Tarun
Personal information of providers:	Name: Address: PH no:	

FIG17: Data collected

Organization	Location-HMS	Floor	Department Onsite	Station-HMS	Sub_Location	Beds	Actual Nomenclature	Bed Type	Specialty (Onsi
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-01	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-02	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-03	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-04	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-05	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-06	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	Ground Floor	Emergency	Triage Nursing Station-(ALPS) - GGN	NA	Triage-07	Emergency Bed	Triage	Emergency
ALPS Hospital Ltd	Gurgaon	First Floor	ICU	ICU Nursing Station-(ALPS) - GGN	NA	ICU-01	ICU BED	ICU	Multispecialty
ALPS Hospital Ltd	Gurgaon	First Floor	ICU	ICU Nursing Station-(ALPS) - GGN	NA	ICU-03	ICU BED	ICU	Multispecialty

FIG18: DCW of departments and bed

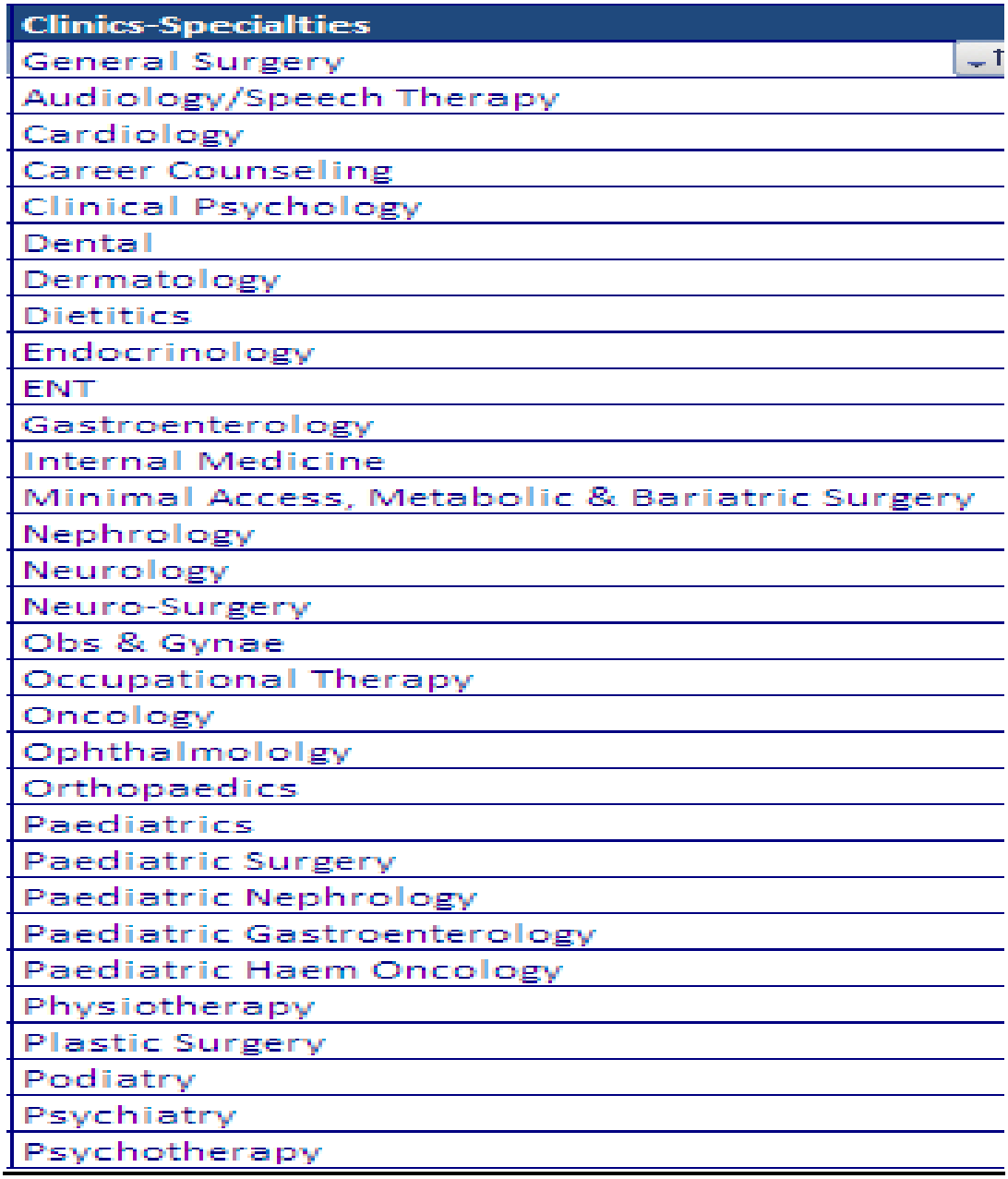


FIG 19: DCW of clinics and specialties

Time				
MHW/DD	Saket MSSH	Ggn	Noida	PPG
Physicians---9 A.M TO 3 P.M 3 P.M TO 9 P.M 9 P.M TO 9 A.M Nursing--- 8 A.M TO 2 P.M 2 P.M TO 8 P.M 8 P.M TO 8 A.M Front Desk---8 A.M TO 4 P.M 12 NOON TO 8:30 P.M 8 P.M TO 8 A.M				
Physicians---8 A.M TO 5:30 P.M Paramedic---7 A.M TO 2 P.M 2 P.M TO 8 P.M 8 P.M TO 7 P.M	Physicians---8 A.M TO 5:30 P.M Paramedic---7 A.M TO 2 P.M 2 P.M TO 8 P.M 8 P.M TO 7 P.M	Physician---8 A.M TO 4 P.M , 4 P.M TO 9 P.M SUNDAYS--- 9A.M TO 8 P.M		
Physicians---8 A.M TO 5:30 P.M Paramedic---8 A.M TO 8 P.M 8 P.M TO 8 P.M Nursing--- 8 A.M TO 2 P.M 2 P.M TO 8 P.M 8 P.M TO 8 A.M		Physician---10 A.M TO 1 P.M, 5 P.M TO 8 P.M TECHNICIANS- 9 A.M TO 5 P.M, 12 NOON TO 8 P.M		Physicians- 9AM to 5PM (all six days)
	Physicians---8 A.M TO 5:30 P.M 8 A.M TO 12 NOON	Physicans --- 8 A.M TO 2 P.M		Physician - Tue Thur Sat 6PM to 8PM

FIG 20: DCW of shift timings of providers

3.4.5 DATA VALIDATION

After the completion of the data collection process, the data is validated by an authoritative person and signed off.

If any change is required in the data, it is specified in the data collection template and after making the specified changes the data gets signed off.

3.4.6 FUTURE STATE WORKSHOP

Following workflows were demonstrated to the client:

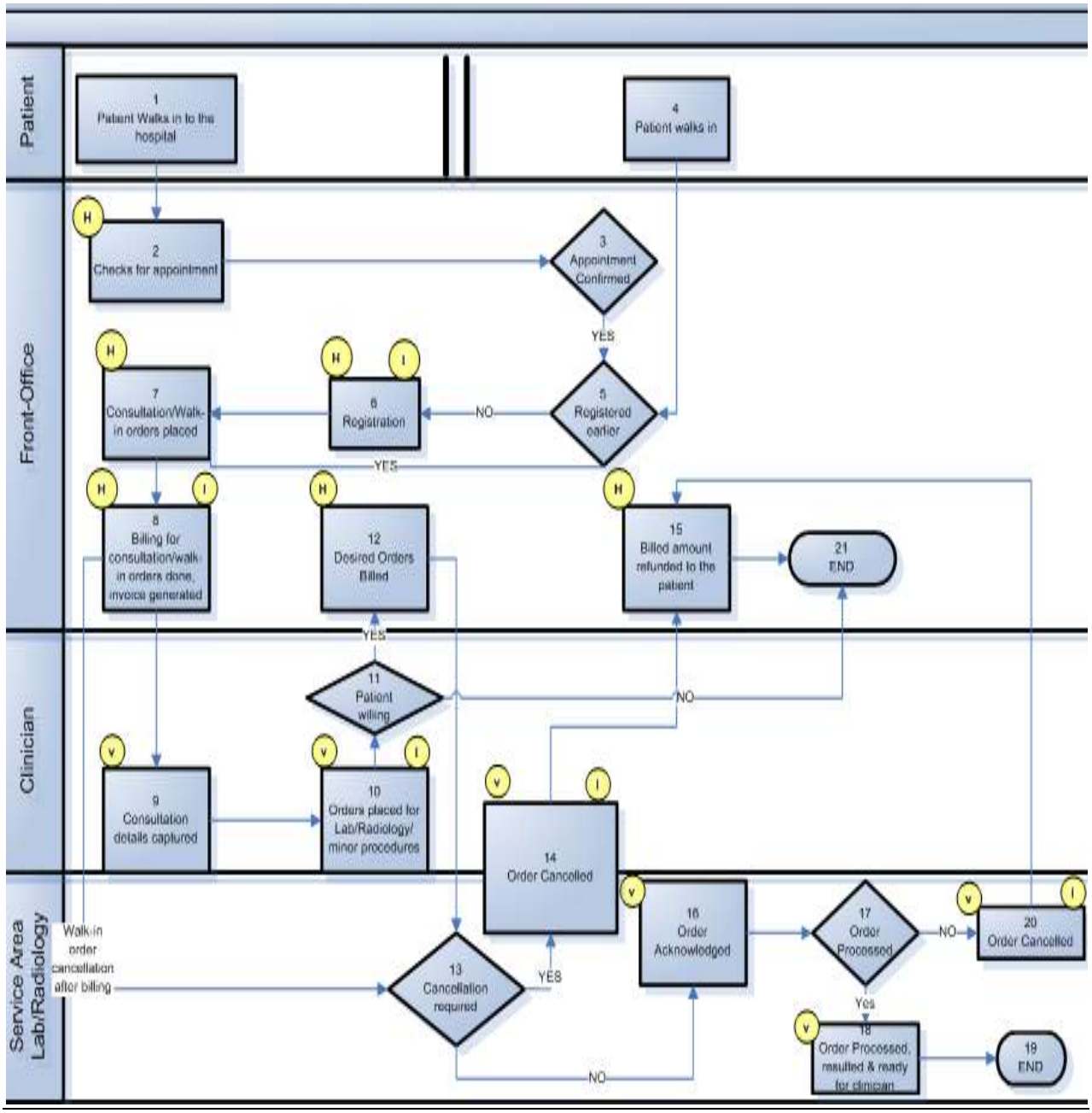


FIG 21: OPD work flow process

3.4.6.1PATIENT REGISTRATION

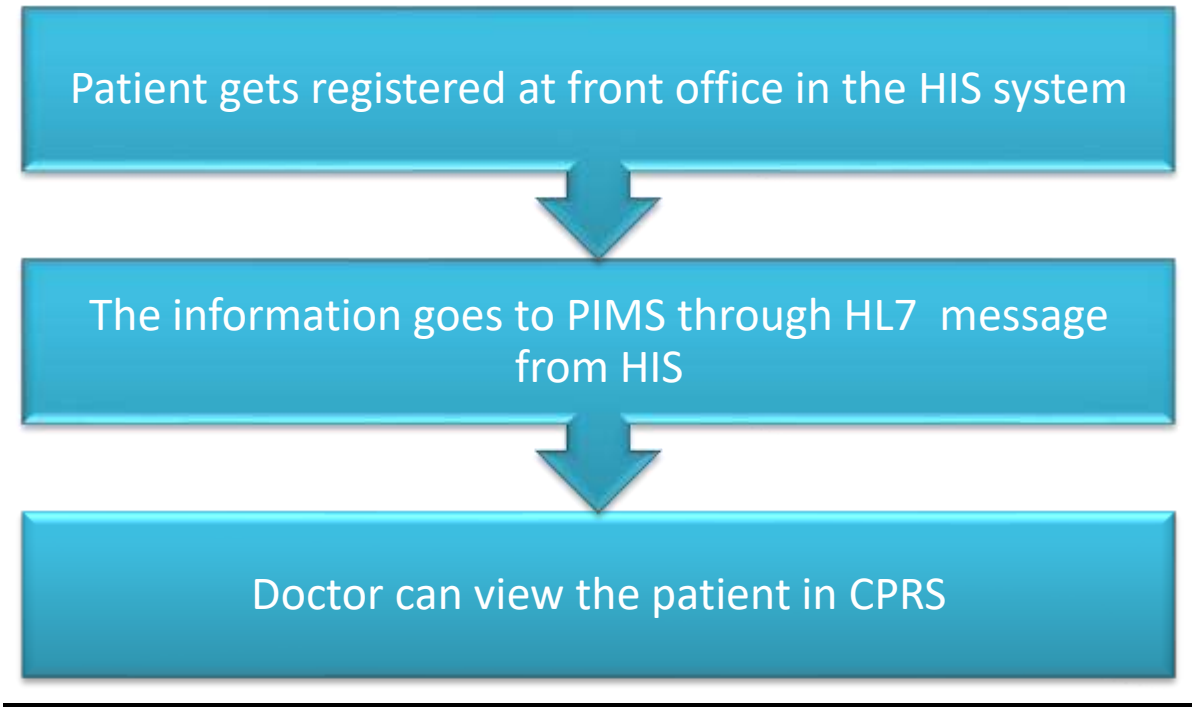


FIG 22: Patient Registration

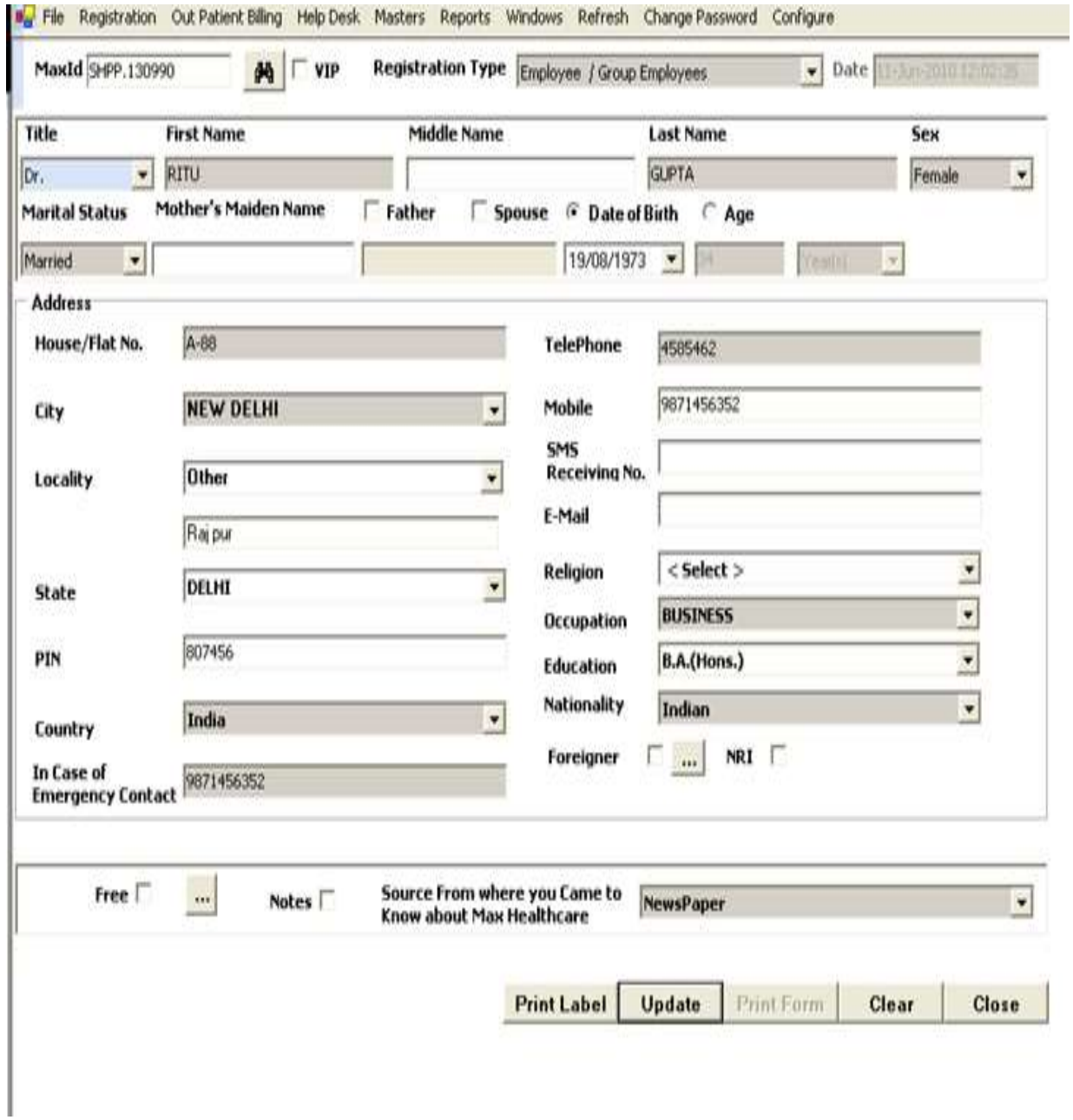


FIG 23: Registration screen in HIS

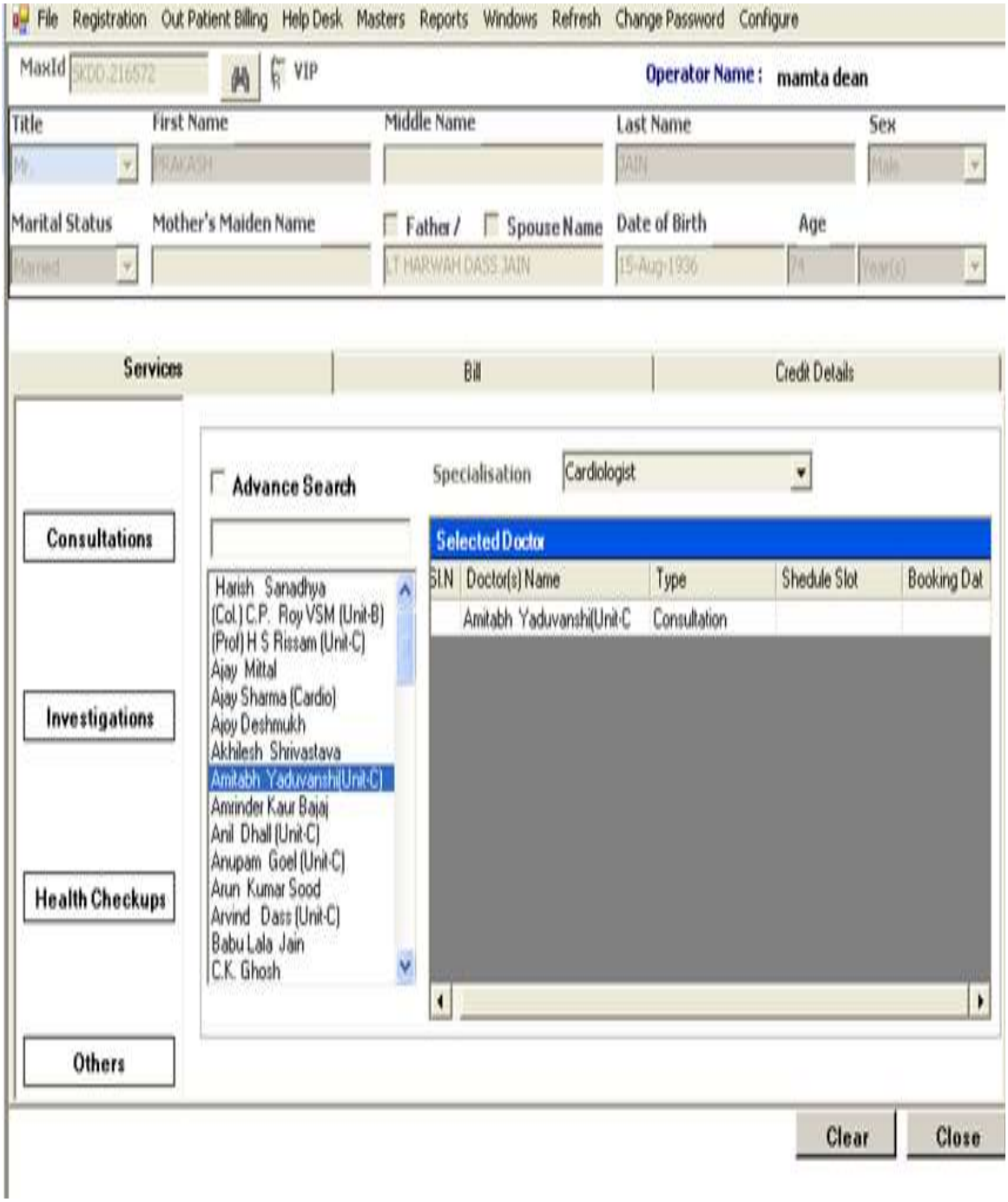


FIG 24: OPD consultation screen

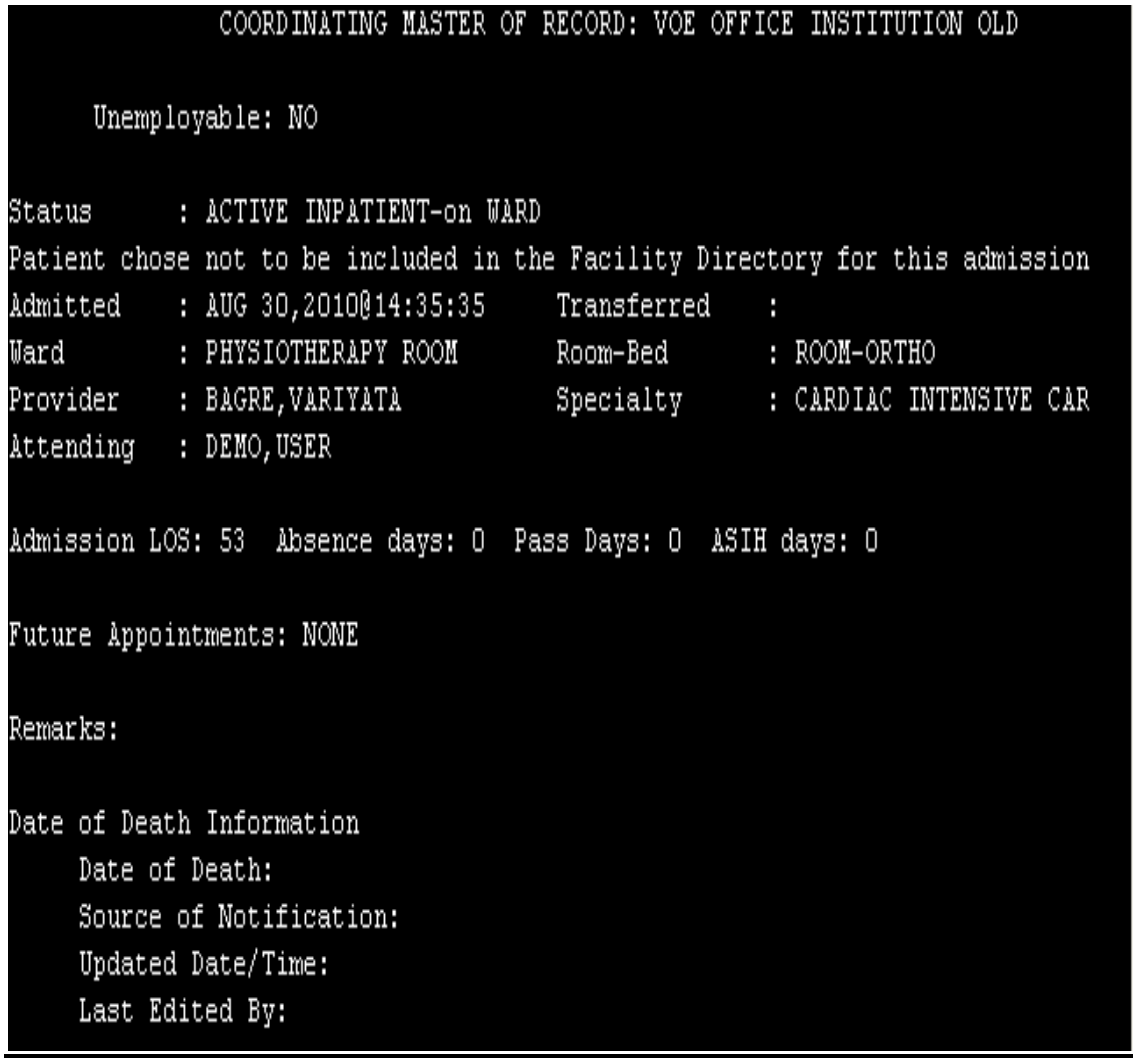


FIG 25: Registration screen in PIMS at backend

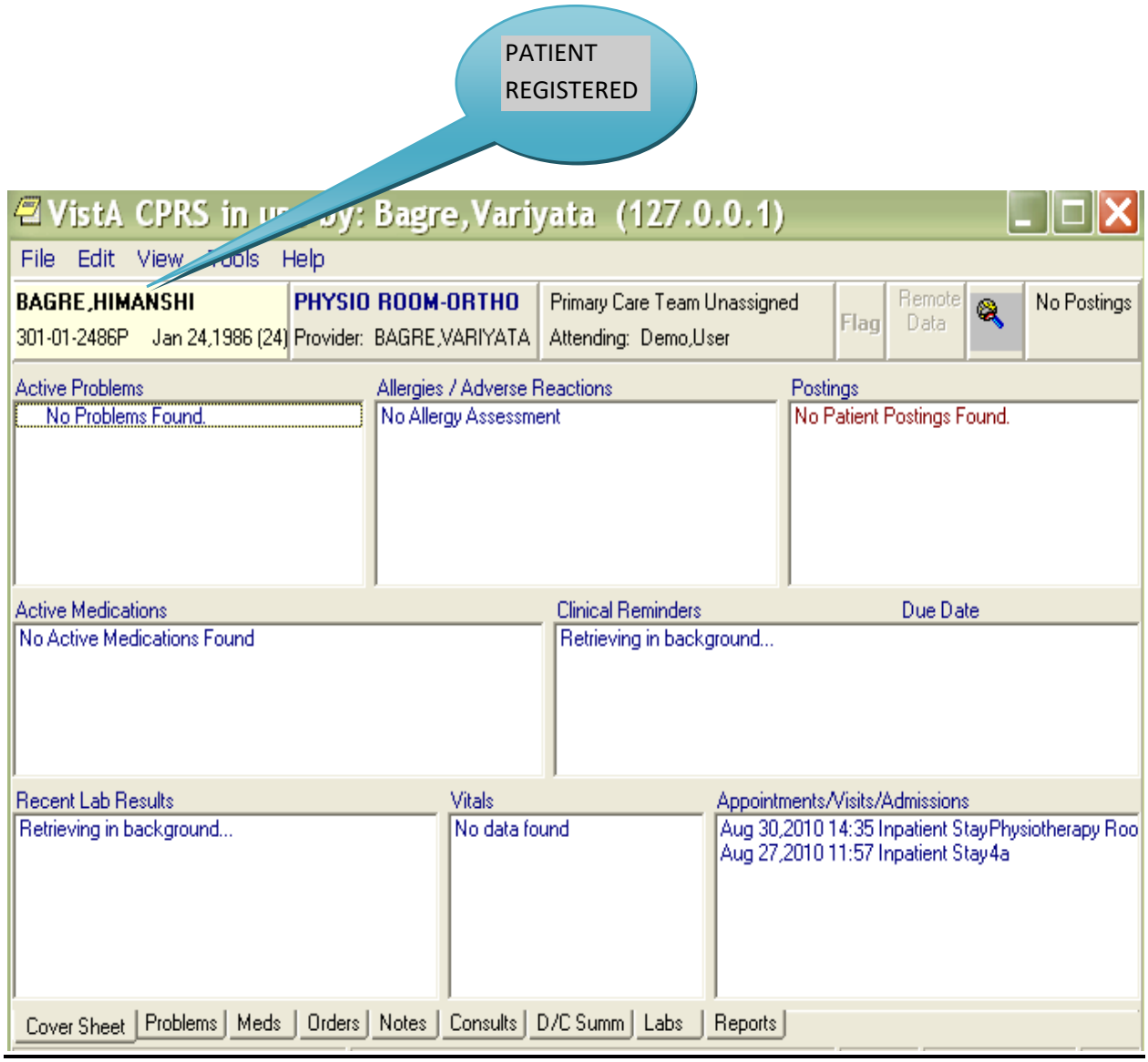


FIG 26: CPRS Screen in (VistA)

3.4.6.2 DISCHARGE PROCESS:

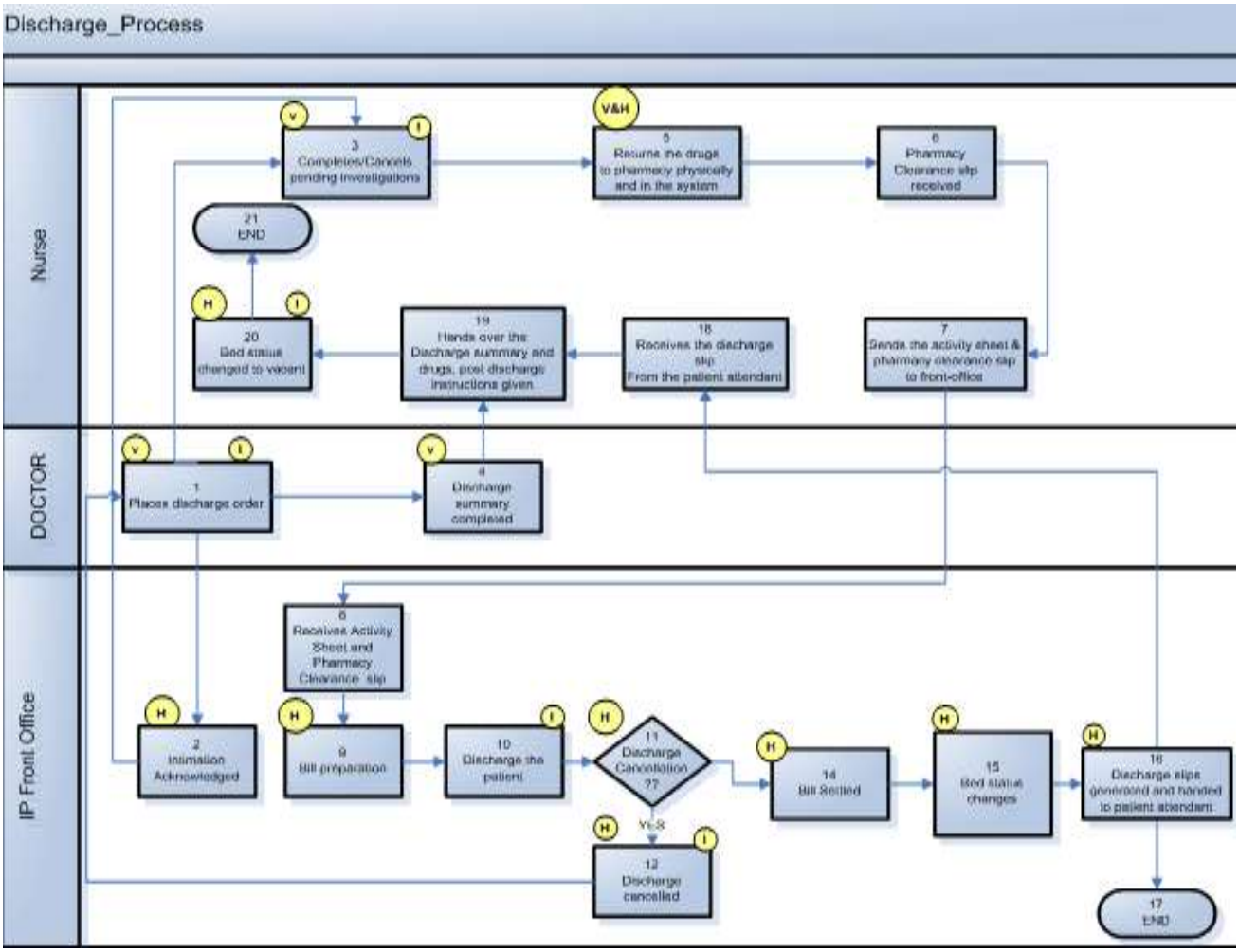


FIG 27: Workflow of discharge.

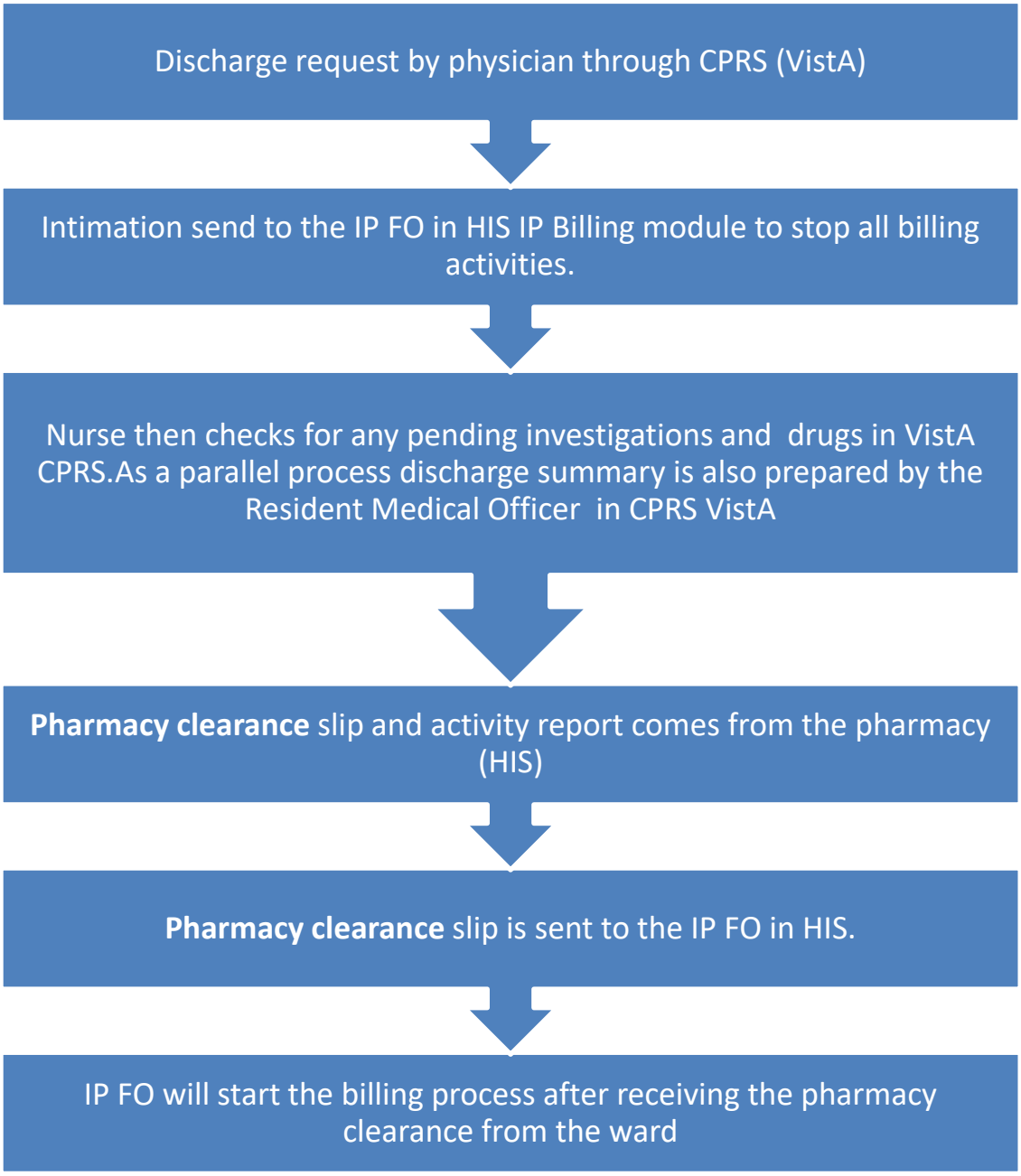


FIG28: Discharge process

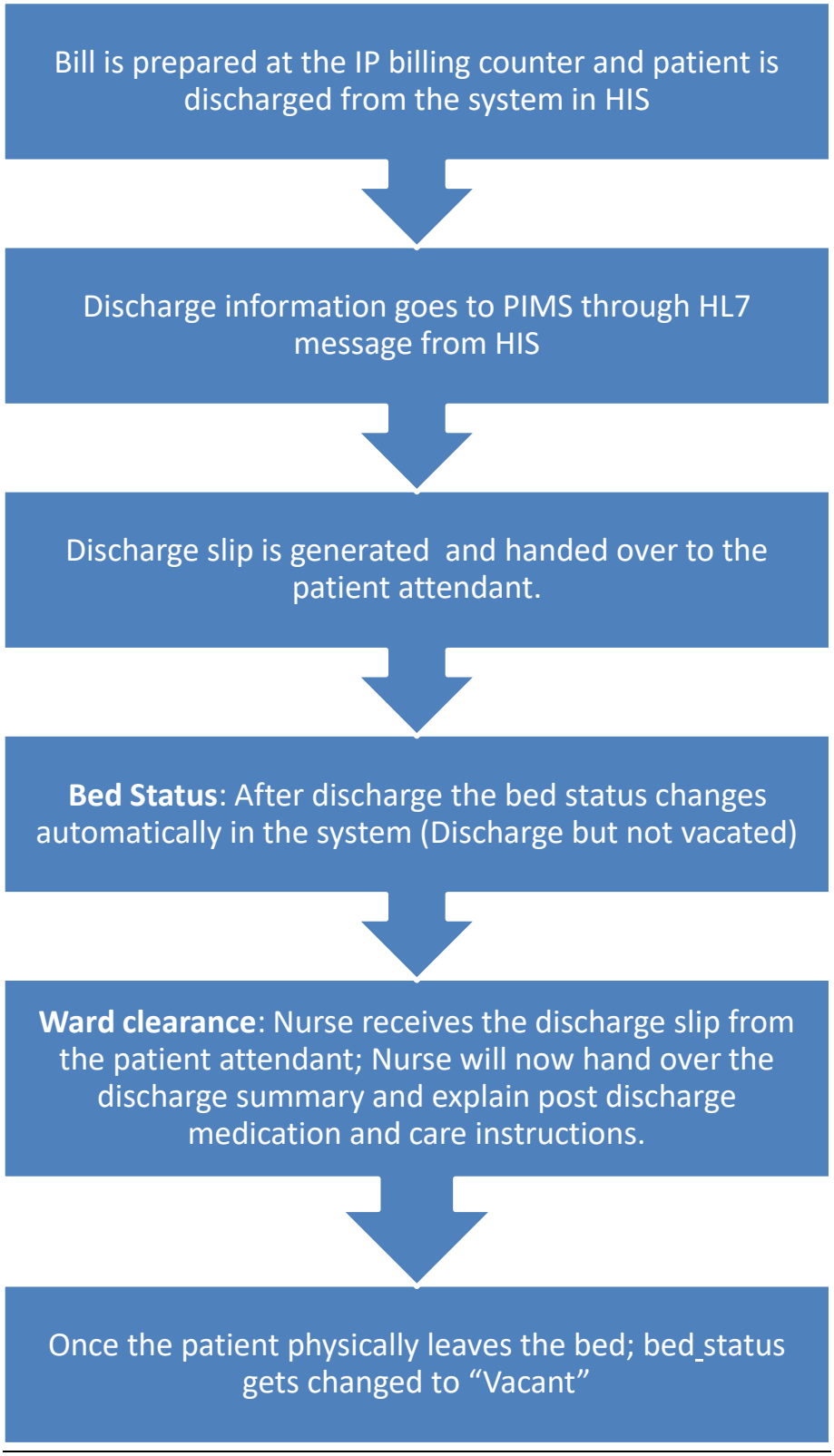


FIG 29: Discharge Process

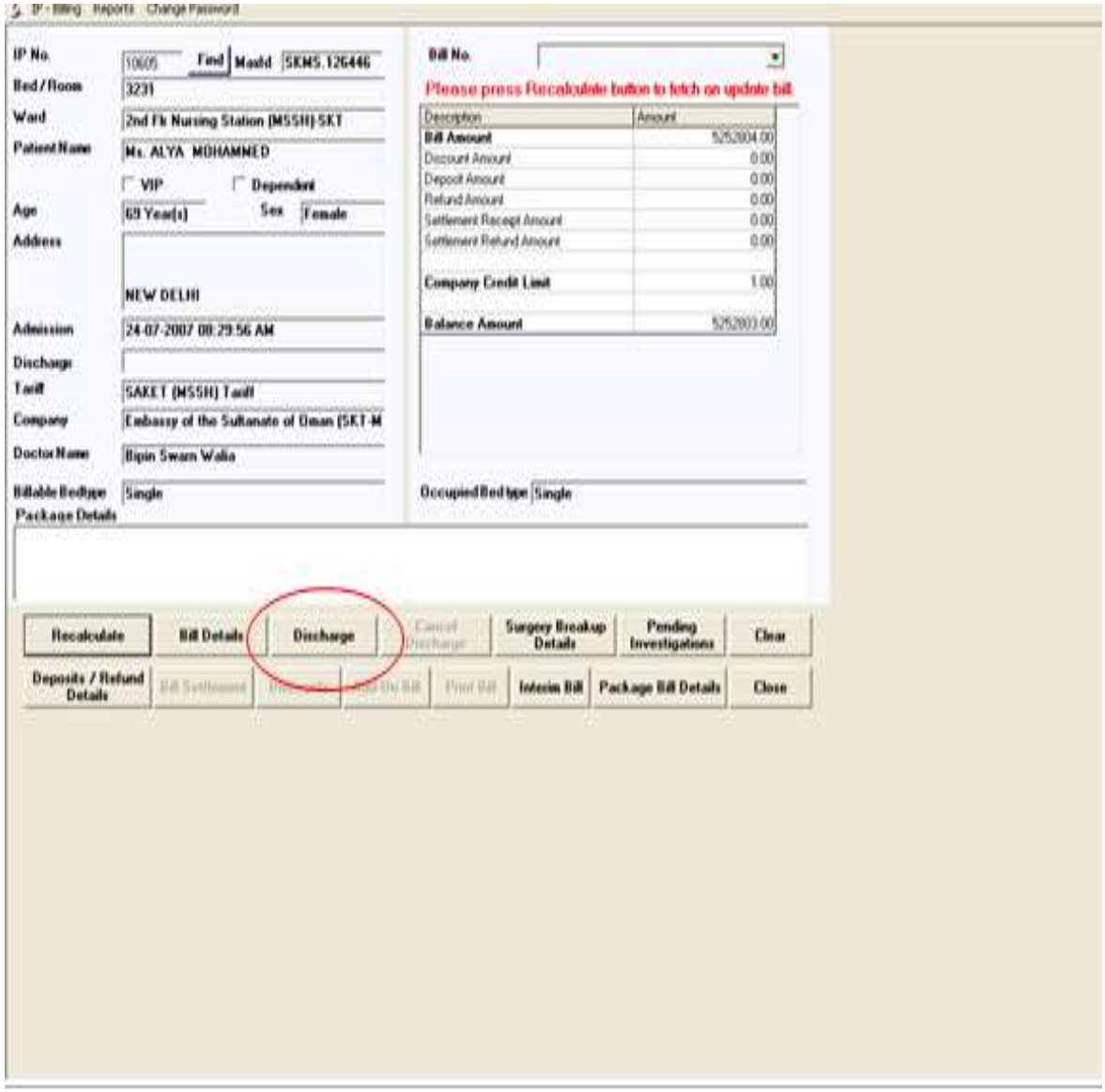


FIG 30: HIS Discharge Screen.

FIG 31: Bed status screen in HIS

Bed Status: After discharge is given the bed status automatically changes to ‘Discharge but not vacated’

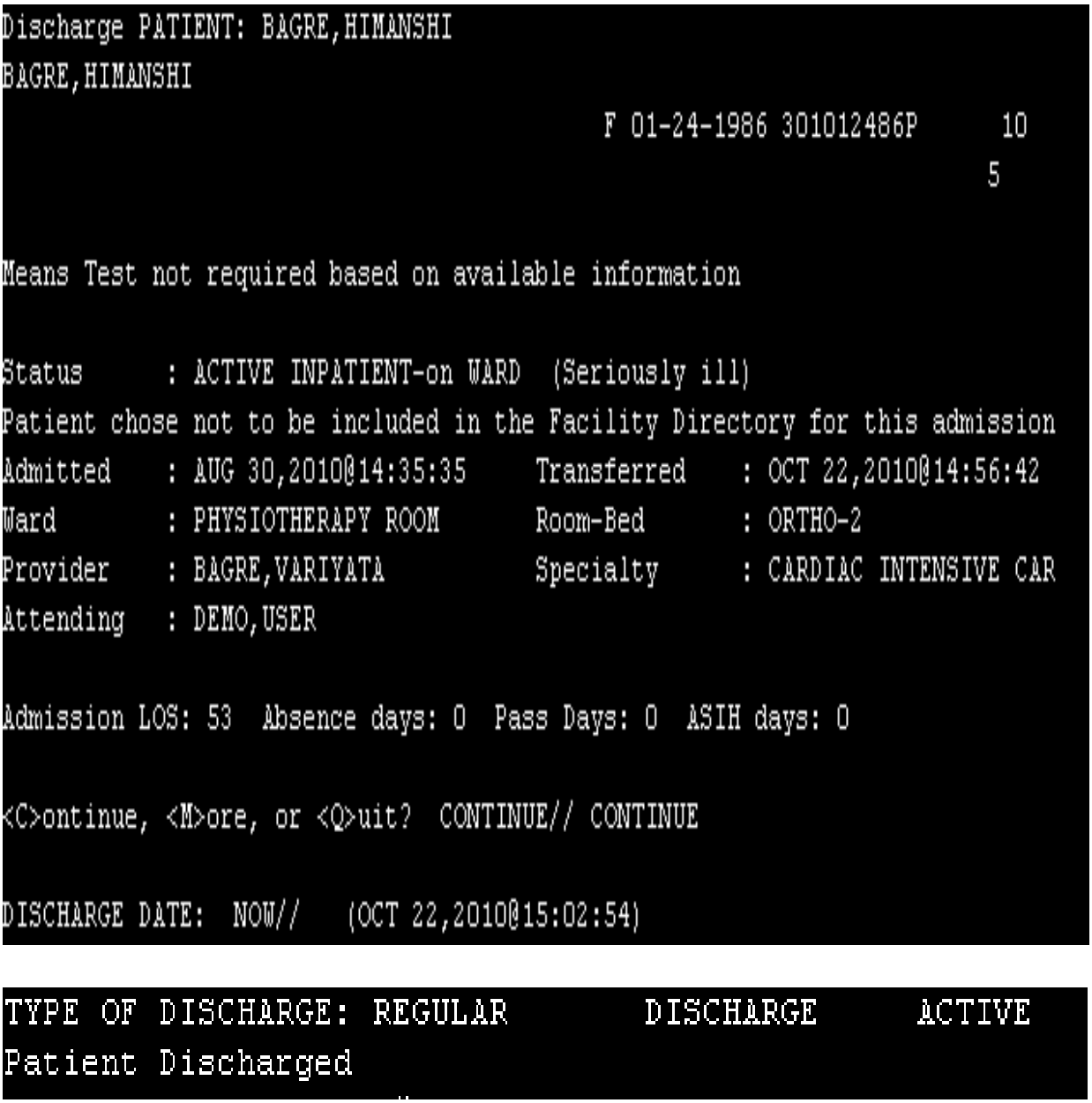


FIG 32: Discharge screen in PIMS

3.4.6.3TRANSFER

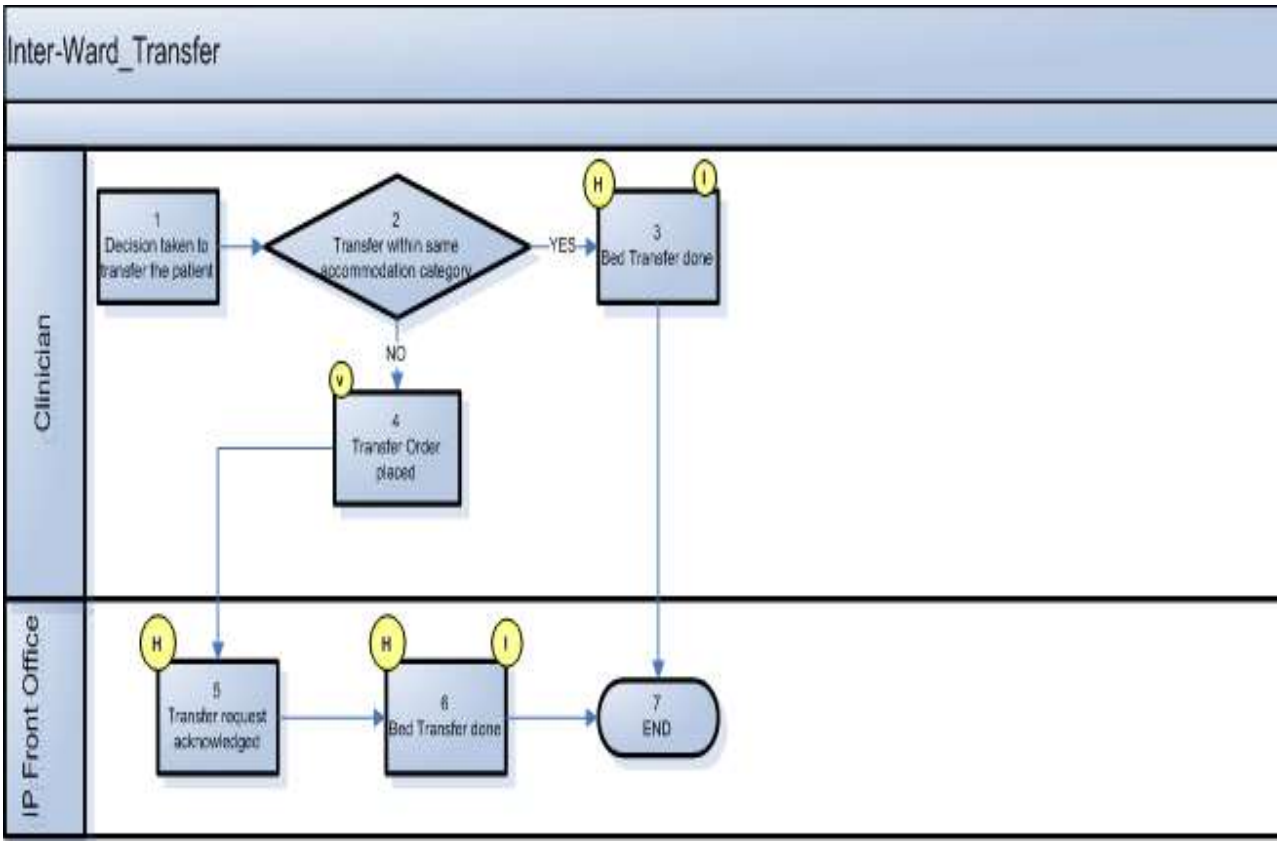


FIG 33: Workflow of patient transfer

Patient Transfers: In following situations:

1. Patient moved from ward to ICU etc
2. Patient desire to upgrade or down grade the room/bed category
3. If the desired bed category was not available at the time of admission; desired room category allotted later
    - If Patient is moved to same bed category
    - Nurse shifts the patient in HIS
    - Shifting information goes to PIMS through HL7 message.
    -

Bed transfer of patient

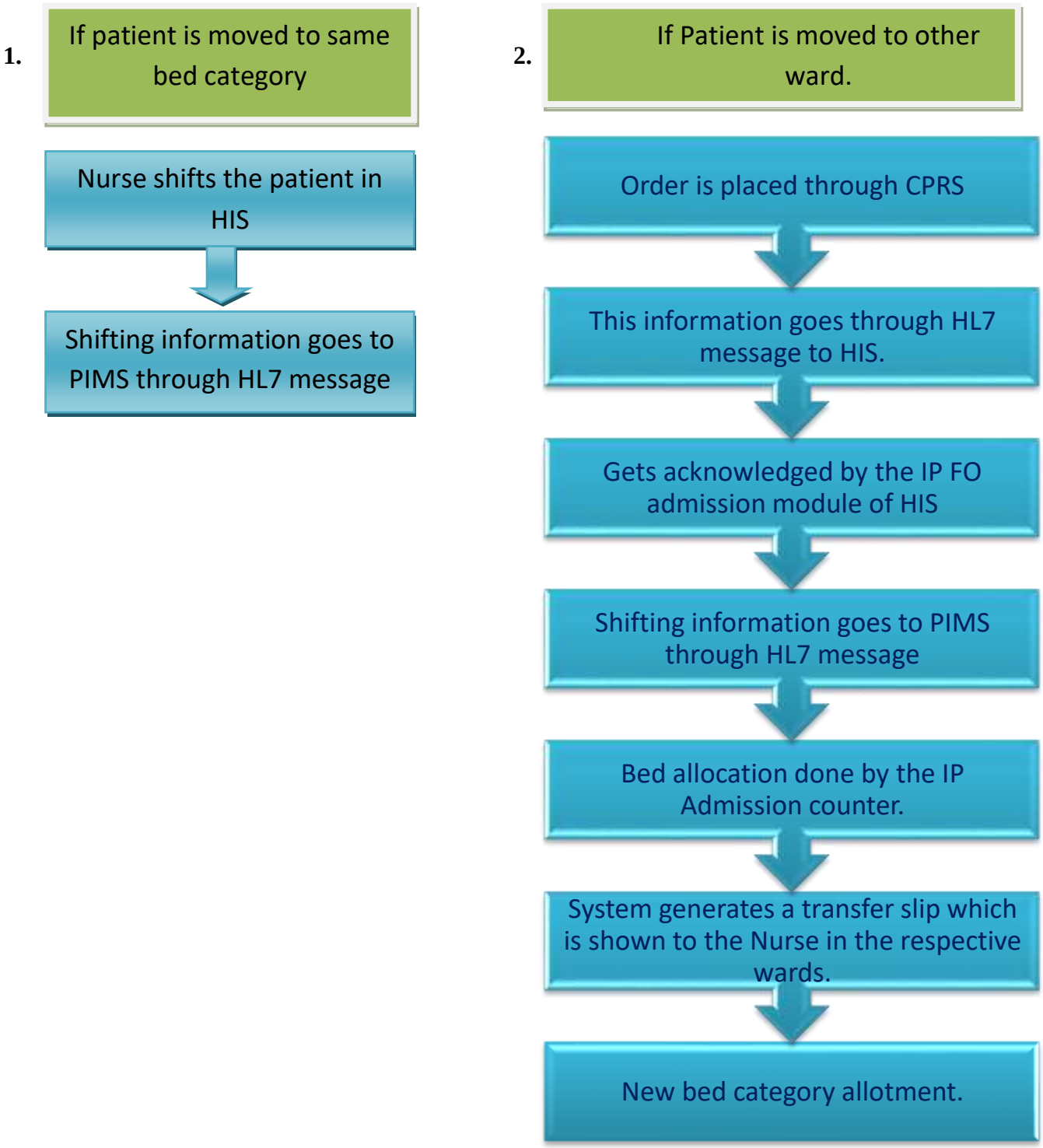


Fig 34: Inter-ward patient transfer

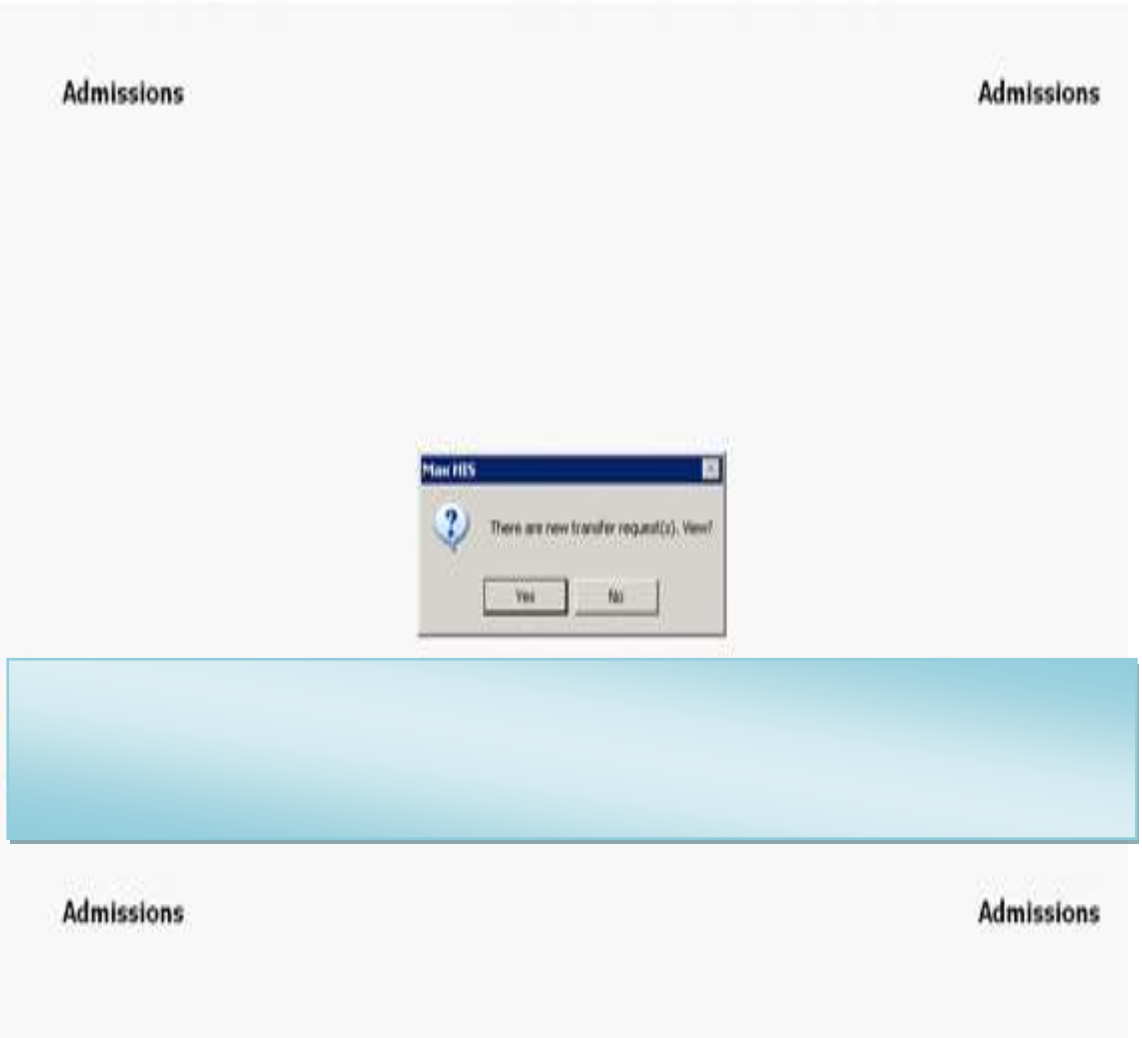


FIG 35: Transfer request screen in HIS

Transfer request which comes to the IP FO is acknowledged after selecting ‘Yes’

User may cancel the request by right click on the request.

FIG 36: Transfer screen in HIS

For giving the available bed access in the HIS ADT[8] module, there would be a pop up then select **"yes"** and after acknowledgement the details are available. The present bed location and the desired bed location are mentioned

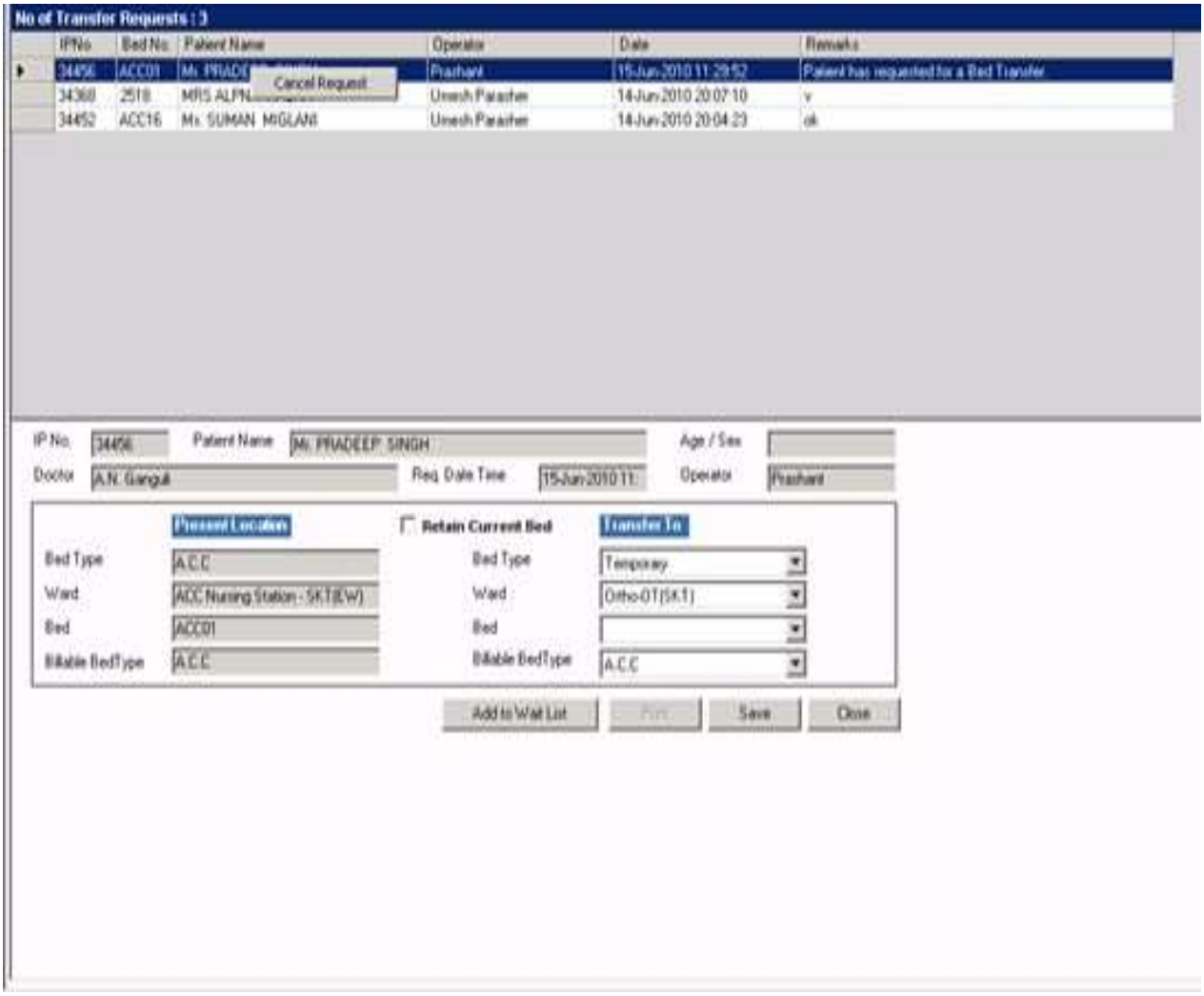


FIG 37: Transfer request screen in HIS

The present bed location is available and the new bed location is also mentioned.

Retain Current Bed: This option is used to retain the original bed of the patient. If the patient is moved to the OR for surgery or some other location for any procedure/Test etc

Add to wait List: If the desired bed category is not available

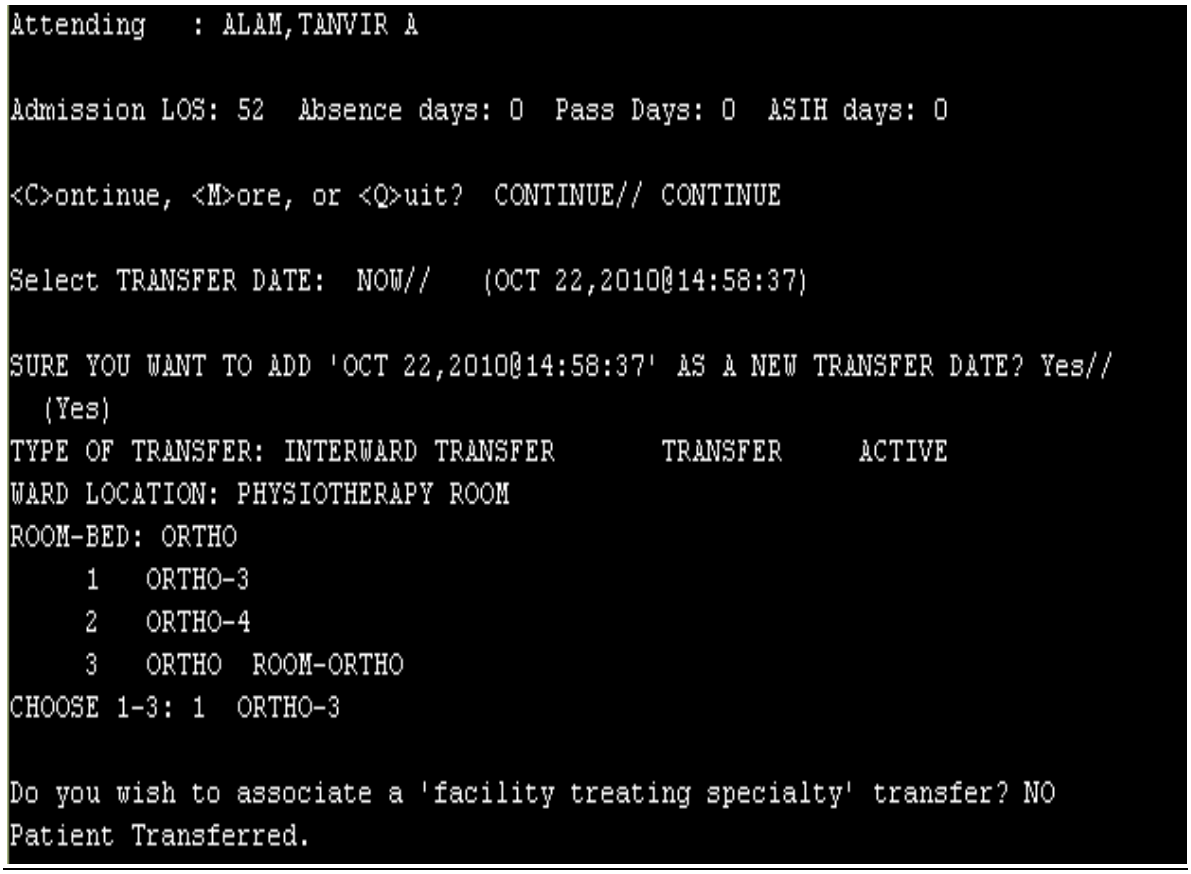


FIG 38: Transfer screen in PIMS

3.4.7 RECOMMENDATIONS

- The client assesses whether the demo system is able to fulfill the requirements.
- New recommendations were noted from the client side by the vendor.
- Those requirements were marked as, realistic or unrealistic.

  Examples of registration:

  1. Making SSN non mandatory and populating Pseudo SSN at time of registration.
  2. Using MRN field in VistA to store Patient Identifier.
  3. MRN to be configured to store long patient ID (up to 13 length) and will be alphanumeric.

3.4.8 CONFIGURATION AND INTEGRATION-PIMS

3.4.8.1Configuration:

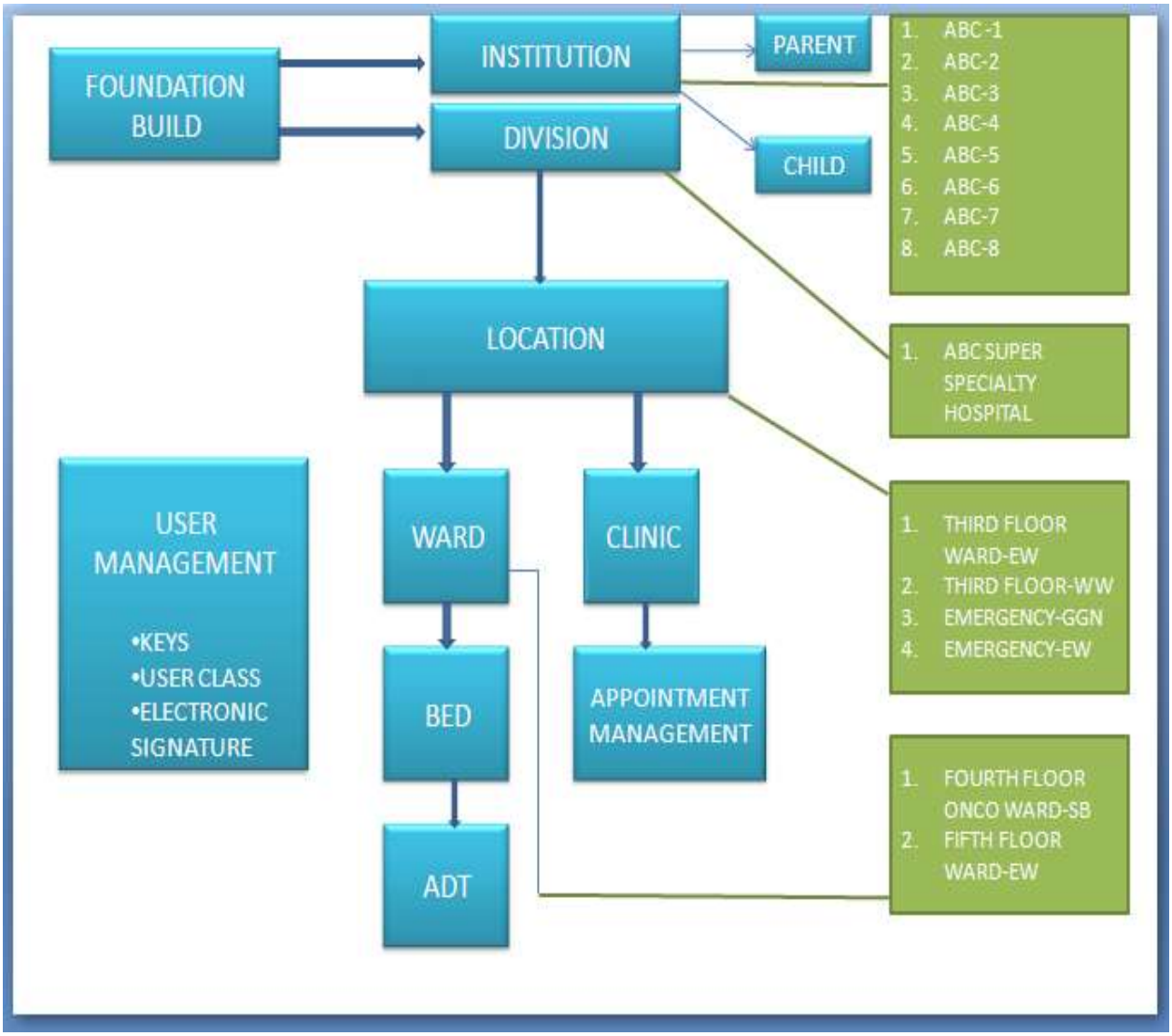


FIG 39: Configuration of PIMS

3.4.8.2MANDATORY FIELDS IN PIMS CONFIGURATION

1. WARD

SPECIALTY

BEDSECTION

SELECT AUTHORIZED BED DATE

NUMBER AUTHORIZED BED

2. HOSPITAL LOCATION

STOP CODE NUMBER

SERVICE

TREATING SPECIALTY

LENGTH OF APPOINTMENT

DISPLAY INCREMENTAL PER HOUR

3. ADT

DESCRIPTION

4. CLINICS

ALLOWABLE CONSECUTABLE NO SHOWS

MAX DAY FOR FUTURE BOOKING

MAX DAY FOR AUTO-REBOOK

OVERBOOK/DAY MAXIMUM

LENGTH OF APPOINTMENT

FIG 40: Configuration screen (PIMS)

3.4.8.3 INTEGRATION OF HIS (ADT AND SCHEDULLING) WITH VistA (PIMS)

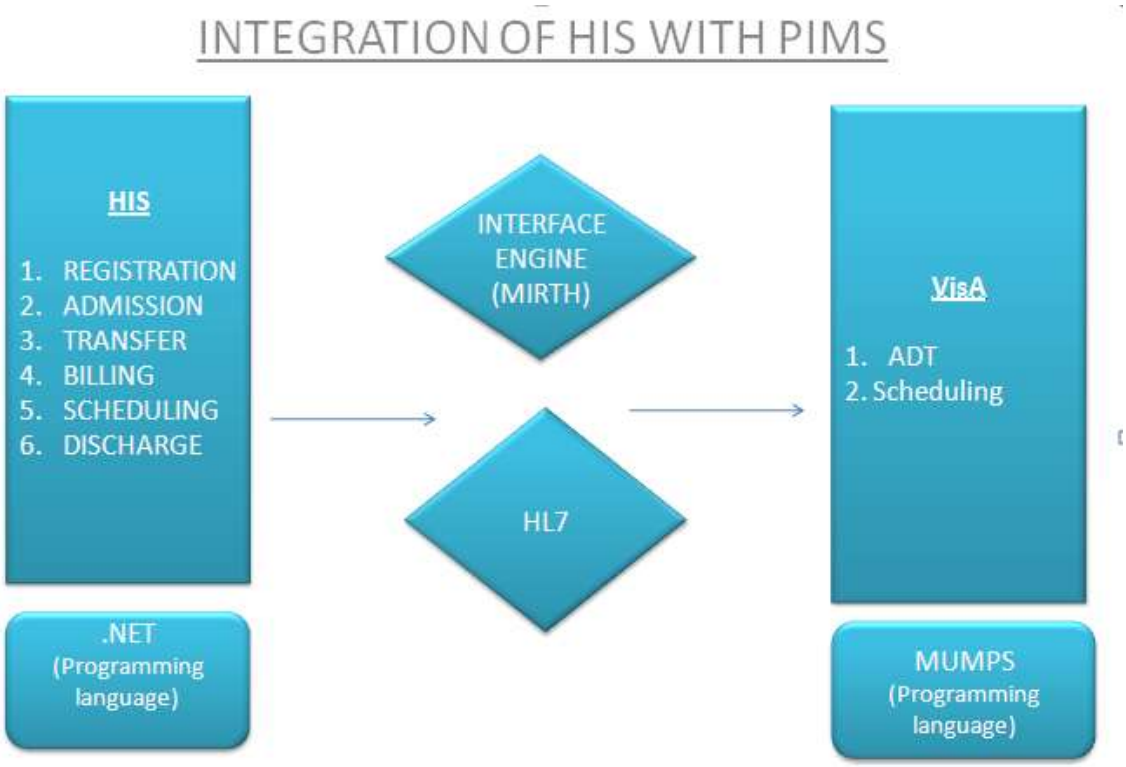


FIG 41: Integration of HIS with PIMS

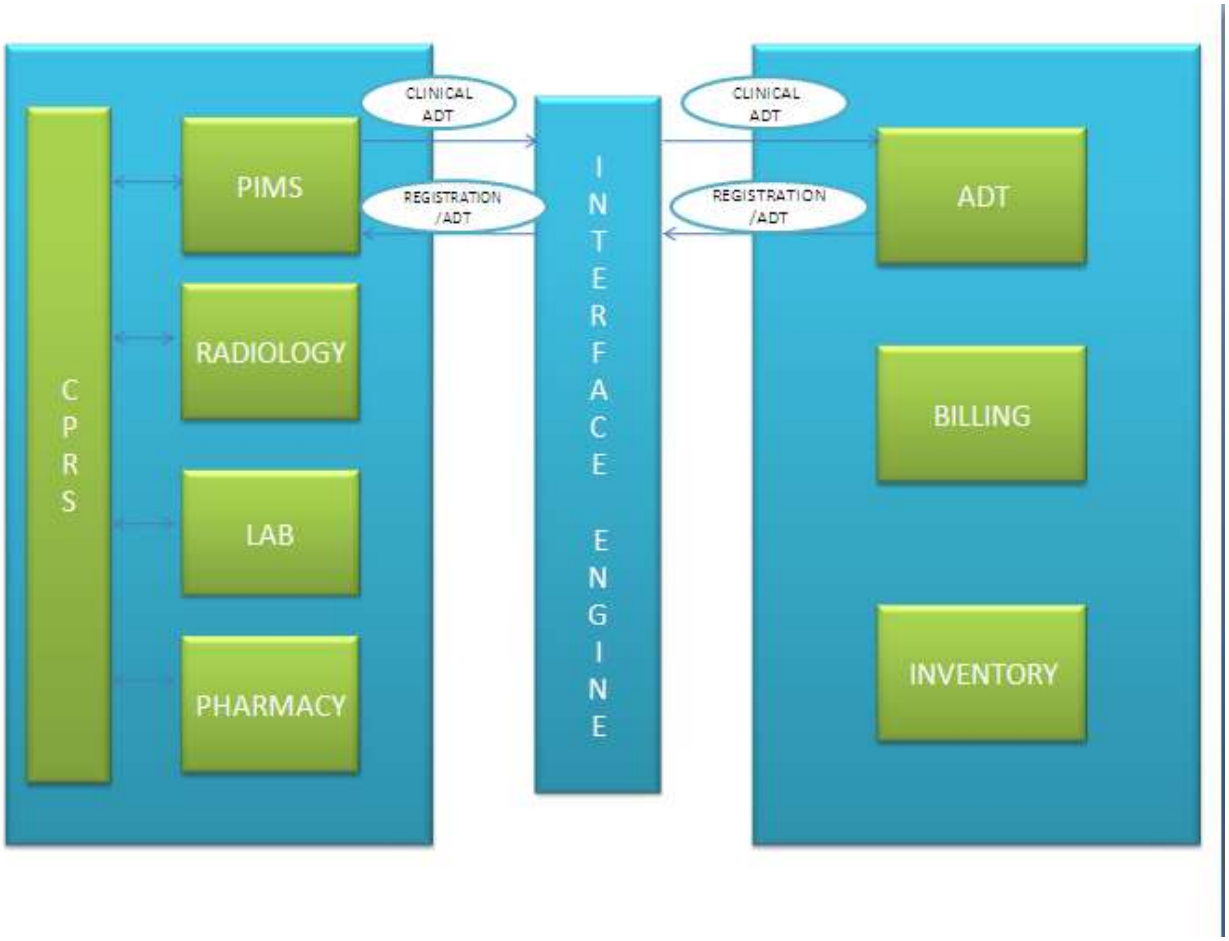


FIG: 42 Integration of VistA with HIS

Integration is like two foreign people talking to each other that need an interpreter that can understand their language. The client hospital is using HIS currently. So in the implementation, the existing HIS will remain and will be integrated with PIMS.

EHR has already HL7 integrated modules in it namely, PIMS, CPRS, Lab, Pharmacy, Radiology. So for the successful implementation, each module needs to be integrated with HIS. There is a separate integration team for this task.

Here the interpreter is **MIRTH ENGINE** and the two foreign people are HIS and EHR. HIS and EHR have lot of modules; here the ADT [(8)]and SCHEDULING module of HIS will be integrated with PIMS module of EHR.

The integration task needs mapping of the fields of, ADT and SCHEDULING module of HIS and PIMS module of EHR.

The **RDBMS** is being used for the HIS data and the **FILE SYSTEM** is being used for the EHR. When mapping is done a primary key in the RDBMS automatically gets encrypted for the particular field and the same number is fed in the file system database.

3.4.9TESTING

All new system products, upgrades and patches should be thoroughly tested before releasing them in the live environment. Otherwise, something as simple as installing a new patch could cause the hospital's EHR[16] to malfunction during the middle of a busy workday.

3.4.9.1Types of Testing:

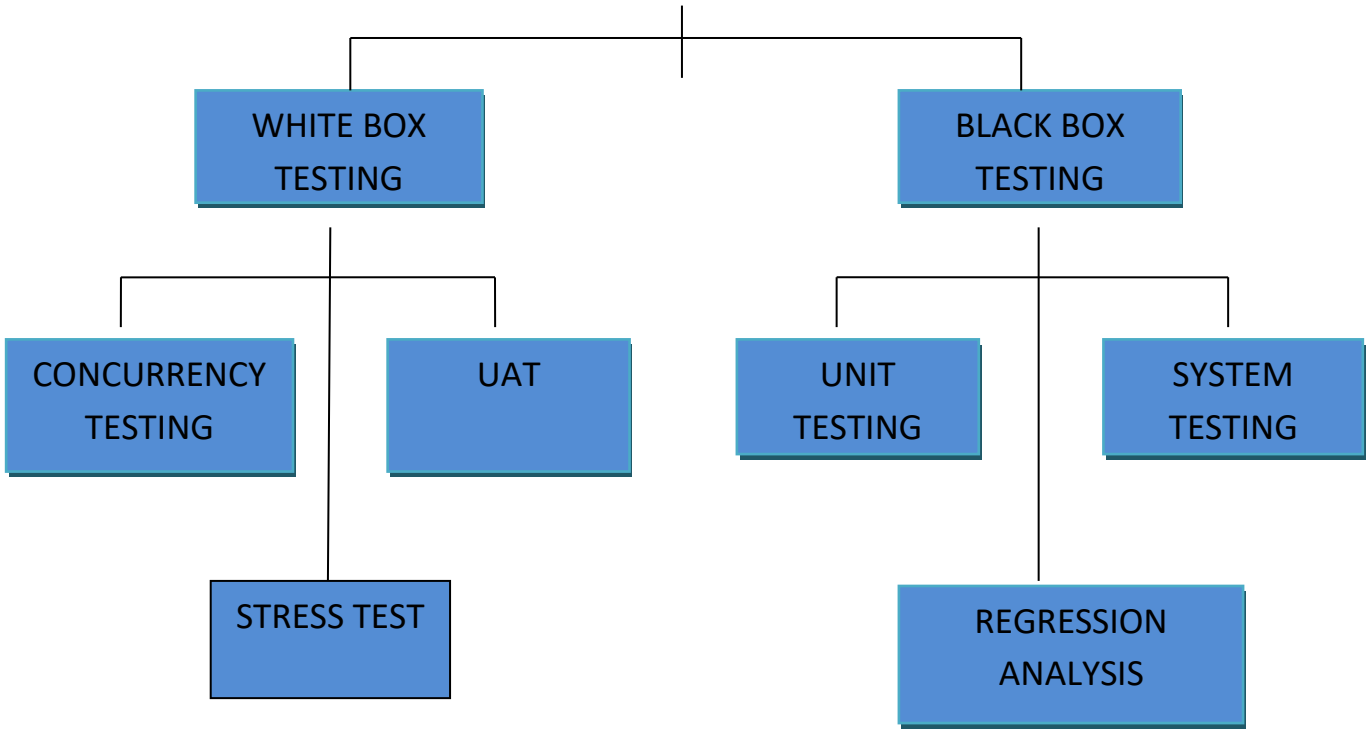


FIG 43: Types of Testing

WHITE BOX TESTING

It tests the internal structure and working of an application, it is applied at integration levels of the system.

USER ACCEPTANCE TEST (UAT)

After the users are fully trained in using the various modules which they are supposed to, then a user acceptance test is taken, just to ensure that the system is totally compatible and easy to use by the staff of the hospital. A series of hypothetical test case scenarios are built by the super users and the understanding and acceptability of the users are checked with the help of these scenarios, these cases help us check the knowledge of both the users as well as the super users since they are the ones who design the scenarios.

The case scenarios include different flows of the system and work just to ensure that the system behaves the way it is expected to.

CONCURRENCYTESTING

Multiple users (e.g.100) login at one time and the time of response of the system is assessed by the team that it doesn't hang and function smoothly.

STRESS TESTING:

It is done to test the capacity of the load taken by the system.

BLACK BOX TESTING

It is done by the developers of the system. It tests the functionality of the application. It is built around specifications and requirements[14]. It derives the test cases.

UNIT TESTING

In this testing module is tested one by one. For example PIMS

SYSTEM TESTING

In the integrated modules are tested. Example PIMS, CPRS, RADIOLOGY.

Testing will be done by development and configuration team. Testing team will own all the testing environments. The first environment will be maintained for doing VistA application testing in isolated mode which is a unit testing. The second environment will be used for doing end to end System Testing. Then system integration testing will be performed in which integration of HIS and VistA will be tested and after all these testing the user acceptance testing will be performed.

When a new patch is fixed, regression testing will be done to ensure that there shouldn't be any conflict between the local patch and new patch, in regression testing all the existing features will be tested again.

Performance testing environment is exact replica of production environment in terms of server capacity and application setup. Snapshots from production shall be applied on this environment before conducting stress and performance load testing.

3.4.10 GO LIVE

The system gets ready to be used by the users in the live environment.

There are a number of things that one should think of, during the Go Live phase with a new system:

- **Preparations are important**. The success of Go Live directly depends on good preparations. All resources involved must be aware about the role, responsibility and what is expected from them before one enters the Go Live phase.

- **Correct resources**. Correct resources that can solve difficult issues directly if needed should be present .at the time Go Live. Also one should have backups for all the most important roles during the Go Live.

- Identify the risk and mitigate them.

3.5RESULTS

3.5.1 CHALLENGES IN PIMS IMPLEMENTATION:

1. Code-changes in an open-source system are always a big challenge. Changing codes may/may not impact various modules across the product, therefore enhancements are not generally recommended. Some cases have been catered to as they could have been potential show-stoppers like:

    a) Alteration of the date format in VistA
    b) Conversion of Zip Code format to Pin code in VistA

2. PIMS module has been developed according to the US veteran servicemen and hence its functionalities, data-elements and attributes are different from that of Indian healthcare, so it is a challenge to implement it in the Indian healthcare scenario. Some examples are:

    a) **Example 1. Pin code :**
    VistA: Pin code is a 4 digit field.
    Indian scenario: Pin code is of 6 digits
    b) **Example2.Date:**
    VistA: Date format is mm/yy/dd.
    Indian scenario: The date format is dd/mm/yy

3. To configure the health-org structure for a network of hospitals in the system with complex business rules is a challenging task.[12]

4. Ensuring that local patches, doesn't get affected when a new patch is fixed in a system and, the local patch and new patch be conflict free is a challenge.

3.6CONCLUSION

It is an integrated approach to complete administrative healthcare management solution that adopts a common user interface which empowers interdepartmental synergy functioning at backend.

The quality of current and historic patient information is improved. It serves as a gateway to all other modules in VistA.

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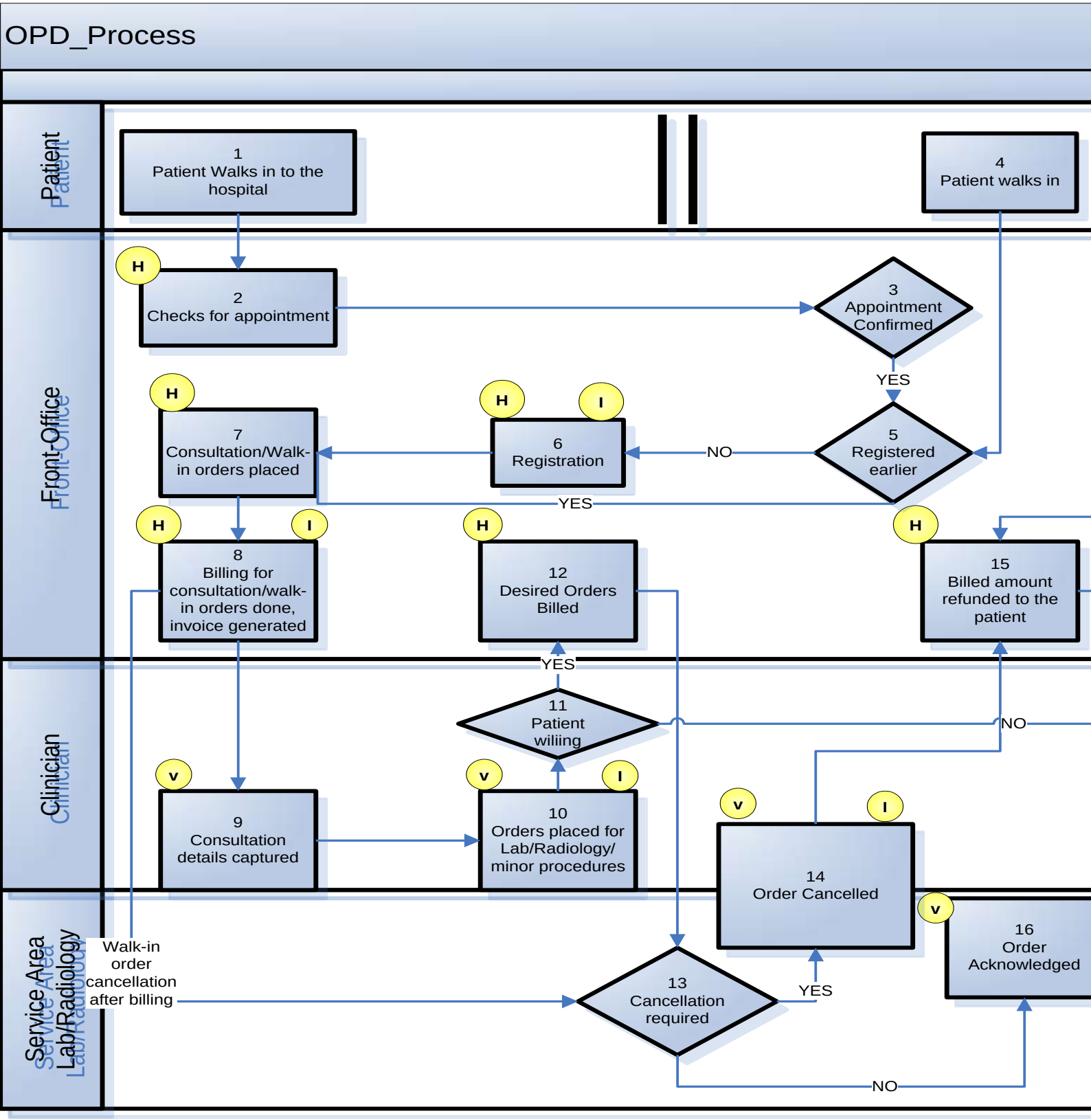
D.ANNEXURES


OPD_Process
Patient
Front Office
Clinician
Service Area
Lab/Radiology
1
Patient Walks in to the hospital
4
Patient walks in
H
2
Checks for appointment
3
Appointment Confirmed
YES
5
Registered earlier
NO
H
I
6
Registration
H
7
Consultation/Walk-in orders placed
YES
H
I
8
Billing for consultation/walk-in orders done, invoice generated
H
12
Desired Orders Billed
H
15
Billed amount refunded to the patient
YES
11
Patient wiliing
NO
v
9
Consultation details captured
v
I
10
Orders placed for Lab/Radiology/ minor procedures
v
I
14
Order Cancelled
v
16
Order Acknowledged
Walk-in order cancellation after billing
13
Cancellation required
YES
NO

HISCode	HISDescription	VistaCode	VistaDescription		
1	Emergency (HL7)	48	EMERGENCY	FILE-405.1	
2	Accident (HL7)	we have to add in vista			
3	Labor/Delivery (HL7)	we have to add in vista			
4	Routine (HL7)	1	DIRECT		
5	Elective Procedure	we have to add in vista			
6	Further Investigations	we have to add in vista			
7	Clinical Trail	we have to add in vista			
8	emergency	we have to add in vista			

Bed Name Code:

HIS Bed Name Code	HIS Description	VistA Code	VistA Description
Paed HDU-02			
Paed HDU-01			
Paed.Step Down03			
Paed.Step Down02			
Paed.Step Down01			
Paed.HDU 04			
Paed.HDU 03			
Paed.HDU 02			
Paed.HDU 01			
Medical ICU12			
Medical ICU11			
Medical ICU10			
Medical ICU09			
Medical ICU08			
Medical ICU07			
Medical ICU06			
Medical ICU05			
Medical ICU04			
Medical ICU03			
Medical ICU02			
Medical ICU01			
CTVS HDU04			
CTVS HDU03			
CTVS HDU02			

Types of Discharge:

HISCode	HISDescription	VistaCode	VistaDescription
Absconding	Absconding	Absconding	Absconding
Expired	Expired	Expired	Expired
LAMA	LAMA	LAMA	LAMA
Normal	Normal	Normal	Normal

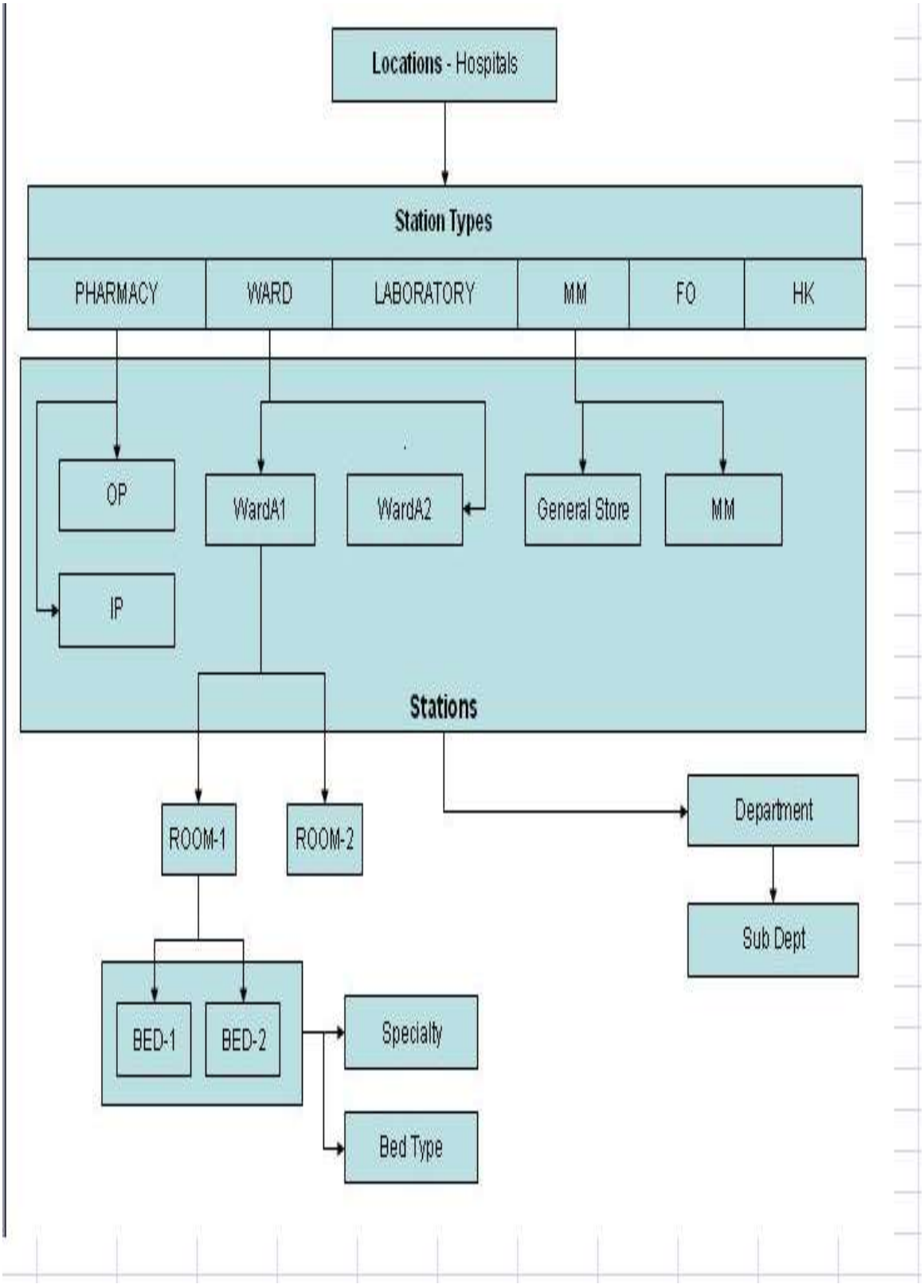
Hardware required:

Hospital Area	Sub Area	Desktops	Laptops	Wall/Bed Mounted PCs	Tablet PC	COWs	Barcode Reader	Normal Scanner	VISTA Printer	Wrist band Printer	Lab Label Printer	Green Sheet Printer	IV Zebra Printer	BCMA Scanner
OPD(per wing)	Front Office	2						1	2	1				
	Billing	2					1		2					
	Doctors Chambers	1							1					
	Nursing Stations	2					1	1	1					1
Emergency	Patient bays			1/Bay										
	Reception	1							1	1				
	Nursing Station	2				2	1	1	1		1			1
	Doctors Chamber	2							1					
IPD (Per ward/ICU/HDU)	Admissions Desk	2					1	1	1	1				
	Ward Nursing Stations (40 Bedded or Floor)	4				6	1	1	2	1	1			
	Ward Doctors Lounge	2							1					
	ICU Nursing Station	4		1/Bed			1	1	1	1	1			1
	ICU Doctors Lounge	2							1					
	HDU Nursing Station	4		1/Bed			1	1	2	1	1			1
	HDU Doctors Lounge	2							1					
	OT Complex	1		1/OT		1	1	1	1		1			1
	Pre / Post OP Area	1				1	1		1		1			
	OT Doctors Lounge	2							1					
Labor Room						1	1			1				
Mortuary		1								1				
Pharmacy (Per Site)	Ward-Narcotic	1					1					1		

Gap Analysis:

Module	Gap	Gap Description	Critic	Status	Clubbed with
Billing	Billing for 2 CPT codes together	Orderable item in VistA associated with multiple CPT codes	2	Open	Integration
Billing	Billing of modalities	Billing should happen at the same facility where the test is being executed.	2	Open	Integration
Billing	Cancellation of orders at various stages		1	Closed	Integration
CPRS	Physical areas to be used must meet JCI standards for privacy and dignity (FSW - 22nd June)		7	Closed	GAP for Max establishement
CPRS	Where and by whom will results be printed using php-reports (FSW - 22nd June)		7	closed	PHP
CPRS	Blood bank orders from CPRS		2	Open	Integration
CPRS	Chief Complaints and Diagnosis should be coded with ICD10		2	Open	
General	SSN (FSW - 22nd June)	SSN, this number is displayed in a range of screens and reports. It may be confusing the user and patient as it is NOT the patient number. As of now it is unique number. Decision needs to be made if the existing alphabets need to be prefixed. For e.g. SHPP, SKDD etc.	1	Open	
General	Date Format (FSW - 22nd June)	VistA has hard coded date format of MM/DD/YY	1	Open	
General	Radiology and Lab report dispatch tracking(FSW - 22nd June)	How will the user know which report to print out? Specially if the report is processed by another facility or outside lab?	1	Duplicate	
General	Single screen for doctor	Separate screen for imaging will need to be used if VistA Imaging is not used.	9	Closed	Vista Imaging
General	Single screen for nurses		2	Open	
General		Stopping orders after patient discharge	2	Open	
General		Dummy beds/Virtual beds/ Real beds for both	3	Closed	

Specialization	Department
ORTHOPEDICS	ORTHOPEDICS
INTERVENTIONAL CARDIOLOGIST	Endocrinology
CHEST SPECIALIST1	Radiology
DENTIST	Dental
DERMATOLOGIST	Dermatology
E N T SPECIALIST	ENT
ENDOCRINOLOGIST	Endocrinology
Gastroenterology and Hepatology	Gastroenterology
General Surgeon.	General Surgery
Obs. and Gyn.	(Old)Obs& Gynae
NEPHROLOGIST	Nephrology
NEURO SURGEON	NEUROLOGY
NEUROLOGIST	NEUROLOGY
ONCOLOGIST	ONCOLOGY
ONCOSURGEON	ONCOLOGY
OPHTHALMOLOGIST	Ophthalmology
Paediatrician	Pediatrics
PLASTIC SURGEON	PLASTIC SURGERY
Psychitrist.	Mental and Health
INTERNAL MEDICINE	Internal Medicine
SURGICAL GASTROENTROLOGIST	Gastroenterology
NUCLEAR MEDICINE	Nuclear Medicine
SPINAL SURGEONS	Hub Manager's Office
Physiotherapist	Physiotherapy
Primary Care Provider	
Pathologist	Pathology
Radiologist	Radiology


Locations - Hospitals
Station Types
PHARMACY
WARD
LABORATORY
MM
FO
HK
OP
IP
WardA1
WardA2
General Store
MM
Stations
ROOM-1
ROOM-2
BED-1
BED-2
Specialty
Bed Type
Department
Sub Dept

WARD	ROOM	BED	BEDTYPE	SPECIALTY
1st floor Onco-Daycare	Day Care Onco	Day Care 08	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 09	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 10	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 11	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 12	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 14	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 15	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	Day Care Onco	Day Care 16	Day Care	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare01	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare02	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare03	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare04	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare05	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare06	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare07	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare08	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare09	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare10	Four Bed	ORTHOPEDICS
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1st floor Onco-Daycare	oncoDaycare	Daycare12	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare13	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare14	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare15	Four Bed	ORTHOPEDICS
1st floor Onco-Daycare	oncoDaycare	Daycare16	Four Bed	ORTHOPEDICS
2nd Floor Onco HDU NSG	2nd floor HDU Nsg1	HDU - 01	C.T.V.S(HDU)	ORTHOPEDICS
2nd Floor Onco HDU NSG	2nd floor HDU Nsg1	HDU - 02	C.T.V.S(HDU)	ORTHOPEDICS
2nd Floor Onco HDU NSG	2nd floor HDU Nsg1	HDU - 03	C.T.V.S(HDU)	ORTHOPEDICS
2nd Floor Onco HDU NSG	2nd floor HDU Nsg1	HDU - 04	C.T.V.S(HDU)	ORTHOPEDICS
2nd Floor Onco HDU NSG	2nd floor HDU Nsg1	HDU - 05	C.T.V.S(HDU)	ORTHOPEDICS

S.No.	Location	Clinic-Specialties
1	Saket-MSSH-West	Orthopaedics
2	Saket-MSSH-West	Paediatric Orthopaedics
3	Saket-MSSH-West	Neurology
4	Saket-MSSH-West	Spine
5	Saket-MSSH-West	Obs & Gynae
6	Saket-MSSH-West	Pulmonology/Chest Medicine
7	Saket-MSSH-West	Gastroenterology
8	Saket-MSSH-West	Paediatrics
9	Saket-MSSH-West	Paediatric Cardiac Intensivist
10	Saket-MSSH-West	Paediatric Nephrology
11	Saket-MSSH-West	Paediatric Gastroenterology
12	Saket-MSSH-West	Paediatric Neurology
13	Saket-MSSH-West	Paediatric Endocrinology
14	Saket-MSSH-West	Paediatric Surgery
15	Saket-MSSH-West	Neuro-Surgery
16	Saket-MSSH-West	Rheumatology