DISSERTATION REPORT

AT

NARAYANA SUPERSPECIALITY HOSPITAL, GURUGRAM

STRUCTURE PROCESS AND OUTCOME OF DIGITAL ADOPTION AT NARAYANA SUPERSPECIALITY, GURUGURAM

BY

DR. NIHARIKA BANSAL

PG/19/054

UNDER THE GUIDANCE OF

MR. LUCKY GOYAL

DR. A.K. KHOKHAR

POST GRADUATE DIPLOMA IN HOSPITAL AND HEALTH MANAGEMENT

BATCH: 2019 – 2021

IIHMR DELHI | INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH

This certificate is awarded to

Dr Niharika Bansal

In recognition of having successfully completed her Disseratation in the Operations Department

And successfully completed her project on

STRUCTURE PROCESS AND OUTCOME OF DIGITAL ADOPTION AT NARAYANA SUPERSPECIALITY, GURUGURAM

11th Feb 2021 to 30th May 2021

At

NARAYANA SUPERSPECIALITY HOSPITAL, GURUGRAM

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MR. LUCKY GOYAL
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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr Niharika Bansal** student of Post Graduate DIploma In Hopsital and Health management (PGDHM) from International Institute of Health Management Research, New delhi has undergone dissertation training at **Narayana Superspeciality Hospital**, from **11th Feb 2021 to 31St May 2021.**

The candidate has successsfully carried out the study designated to her during dissertation and her approach to the study has been sincere and analytical.

The internship is in fullfilltment of the course requirements. We wish her all the success in all her future endevors.

Mrs. Divya Aggarwal
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Certificate of Approval

The following dissertation titled

STRUCTURE PROCESS AND OUTCOME OF DIGITAL ADOPTION

AT

NARAYANA SUPERSPECIALITY, GURUGURAM

is hereby approved as a certified study in management carried out and presented in a manner satisfactorily 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.

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Certificate from Dissertation Advisory Committee

This is to certify that Dr Niharika Bansal, graduate student of the Post Graduate Diploma In Hospital and Health management has worked under our guidance and supervision. She is submitting this disserattaion titled " Structure, Process and Outcome of Digital Adoption" at Narayana Superdpeciality Hospital, Gurugram, in partial fullfilment of the requirements for the award of the Post Graduate Diploma in Hospital and Healthcare Management. This dieeratation has the requiste standards and to the best of our knowledge no part of it has been reporduced from any other dissertation, monograph, report or book.

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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation tited

"**Structure, Process and Outcome of Digital Adoption"**

SUBMITTED BY: **DR NIHARIKA BANSAL**

Enrollment Number: PG/19/054

Under the supervision of **Mr Lucky Goyal, Deputy General Manager** and **Dr A.K. Khokhar Adjunct Faculty, IIHMR Delhi** for award of Post Graduate Diploma in Hospital and Health Management carried out during the period from 11th Feb 2021 to 31st May 2021 embodies my original work and has not formed the basis for the award of any degree diploma associate ship, feelowship, titles in this pr any other Institute or other similar institution of higher learning.

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Last but not least I am extremely grateful to my parent for their love, prayers, caring for educating and preparing me for my future.

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Chapter 1: About Narayana Health Group

Narayana Hrudayalaya, An Indian chain of multispecialty hospitals, heart centres and primary care facilities with its headquarters in Bengaluru, India was founded in the year 2000.

As on May 2021, NH has 21 hospitals, 6 heart centres, and 19 Primary care facilities in India along with 1 international hospital in Cayman Islands. There are currently 5,859 operational beds. NH policy is to come with Greenfield as well as brown field projects.

Mission of Narayana Health group is acronymed as iCare which stands for:

innovation

Compassionate care

Accountability

Respect for All

Excellence as a culture

Mission is to deliver High Quality, Affordable healthcare services to the broader population by leveraging on economies of scale, Skilled doctors along with an efficient business model.

NH centres provide advanced levels of care in more than 30 specialities which include Cardiology and cardiac Surgery, cancer Care, Neurology ad Neurosurgery, Orthopaedics, Nephrology and urology, gastroenterology.

NH group is perceived as low-cost healthcare provider however it is not just low cost but an effort to provide patient with a journey of top-notch quality at the lowest cost.

Ideology of NH includes KEEPING THE GREENFILED PROJECTS ASSET LIGHT, reinvesting the accruals and then engaging with government for land and assisting in providing affordable healthcare as promised by the government to their citizens.

About Narayana Super speciality, Gurgaon: It is a 250 bedded hospital with more than 20 super specialities like Liver Transplant Unit, Kidney Transplant unit, Cardiac Surgery, Orthopaedic surgery, Neurosurgery and many more. In NH Gurgaon we have a developed a dedicated COVID ward, COVID ICU and COVID Critical Unit as well.

As a part of Corporate Social Responsibility, NH Gurgaon is conducting Vaccination drives for various co-corporates like DLF, Fortum, Concentrix. A dedicated COVID Care facility has been set up for DLF Employees where our team of doctors is visiting on daily basis along with dietician consultation.

Chapter 2: About NDHM

National Digital Health Mission is a highway to connect various stakeholders of healthcare services in India. The stakeholders include:

The Citizens of the country at the centre. Then includes a various provider, allied healthcare entities, healthcare professionals, non-profit organisations, administrators, and policy makers.

Figure 1 NDHM Ecosystem

NDHM aims to create a seamless online platform through the provision of a wide range of data, information, and infrastructure services, duly leveraging open, interoperable, standards based digital systems, all this is being done while ensuring the security, confidentiality, and privacy of health-related personal information.

NDHM is trying to develop an infrastructure which is efficient, accessible, inclusive, affordable, provides data in timely fashion, and is safe keeping in mind the vulnerability in case the data is lost.

NDHM aims to strengthen the accessibility and equity of health services which includes providing continuum of care with citizens having the ownership of their data. The goals shall be achieved by leveraging IT and associated technologies. The approach to be citizen centric and shall envisage all the objectives of National health Policy (2017)

Goals of National Health policy Include:

1. "Attainment of highest possible level of health and wellbeing for all ages, through a preventive and promotive health care orientation in all developmental policies, and universal access to good quality health care services without anyone having to face financial hardship therefore."
2. In a follow up of the NHP's specific goals for adopting digital technologies, the ministry of Health and Family welfare, constituted a committee to develop a framework for implementation for the National Health Stock. This committee only produced the building blocks and an action plan to implement digital health comprehensively and holistically.
3. Taking forward the NDHB, this document describes the broad context, rationale, scope, and implementation arrangements for a digital ecosystem for healthcare services across the country.

Since the implementation is the goal therefore the initiative is called as:

NATIONAL DIGITAL HEALTH MISSION

- NDHM was rolled out on 15th August 2020 by Hon'ble Prime Minister.
- The AIM of this mission is to have Unique Health ID for all the citizens.
- As on 27th May'21, 11.9 Lakh Health IDs have been created under NDHM
- 3,106 doctors and 1,140 facilities have been registered on the platform.
- It has been envisaged that, Unified Health interface (UHI), an open and interoperable IT network for digital health should been soon rolled out. This interface shall allow public and private solutions and apps to plug in and be a part of National Digital Health Ecosystem.
- The interface will allow users to look for doctors, book, and avail necessary healthcare services such as tele-consultations or laboratory tests.
    - Only the verified healthcare providers will join the ecosystem.
- **Building blocks of NDHM include**:
    1. Health ID
    2. Digi Doctor
    3. Health Facility Registry
    4. Personal Health Record
    5. Electronic Medical Record
    6. Telemedicine, e-pharmacy

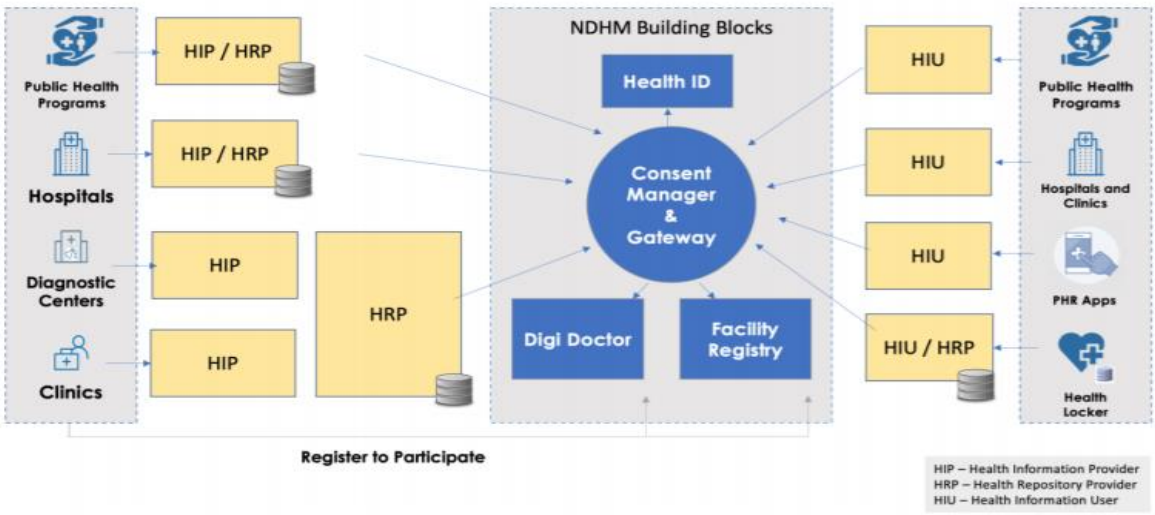

Figure 2 NDHM Building Blocks

Chapter 3: Obligations of Hospitals towards NDHM

Hospitals are one of the health information providers. They have to commit to a few obligations when in order to register to NDHM. Now or later all the healthcare providers are expected to become Healthcare Information Provider.

All the reports provided to the patients must be according to the architecture provided by NDHM, instead of print out and/or handwritten records.

The registry will issue them a digital key that needs to be configured in the platform used by the facility that certifies compliance with NDHM.

HP commit to the following when they agree to become Healthcare information providers:

- **Collection of Health ID during Registration:** During registration in the hospital, the facilitators shall check for Health ID of the patient if there. Correct process of capturing and verifying of Health IDs needs to be utilised.
- **Issue Health IDs to Interested patients**: healthcare information providers can also educate the patients and help them create their health IDs. Health IDs created should be AADHAR linked. Printed card with Health ID mentioned to be provided to the patients. Hospital can use both hospital unique IDs along with UHID.
- **Link the health ID to their health records and notify on new records:** Hospitals must integrate the Hospital unique health records along with the UHID. Creation of new health records should be notified by the hospital to the patient via SMS or Consent manager.
- **Operate a HIP Service:** This is an online manager that responds to requests for data from the consent manager. There must be compliance to NDHM open APIs. The service is in place to ensure that any health records are shared only after patient's consent. Any record being shared

should meet the minimal health data interchange standards. The hospital shall meet the security and privacy guidelines specified by NDHM. The hospital's platform for sharing the health records must first undergo NDHM sandbox certification thereafter it can be integrated with NDHM.

- **Maintain OPD and IPD records digitally for long term:** According to EHR Standards 2006, All the EMRs must be preserved indefinitely and never destroyed during the lifetime of the individual. For large files like CT scans and MRIs, preservation for short time is suggested in order to allow the patient to download and save the files in their health locker.
- **Share aggregated data for public health:** Hospital also needs to provide feed with information that is beneficial for public health purposes. This feed could include:
    - Number of patients treated
    - Count of treatments provided
    - Number of tests conducted
- **Migrate health data on change of status:** During migration/closure/change of any hospital proper migration of data to an alternate provider is mandatory.

Chapter 4: Objectives:

General Objectives:

- To understand and manage the EMR implementation process in consonance with NDHM 2020 Guidelines.

Specific Objectives:

- To understand the structure of EMR utilised in NH Group
- To facilitate in the process of the EMR implementation process
- To analyse the data generated and study the outcomes achieved

Chapter 5: Methodology

An interventional study which involves understanding the structure, facilitating the process and analysing the outcomes and thereafter modifying the process to achieve improved compliance. The study involves both primary and secondary data collection. Primary data is the feedback and recommendations collected from stakeholders, in depth analysis of the digital platforms and the modules are created in order to ease out the process. Whereas, the data on compliance is collected from reporting section of EMR.

Chapter 6: Literature Review

EMR (Electronic Medical Records) are a part of day-to-day functioning of western medical and healthcare centres. In our country, with the government's efforts and private sector's initiatives, Smart hospitals, Digital adoption in hospitals is ramming up.

These initiatives not only benefit the patients but also the consultants therefore all the end users or we can call them the stakeholders benefit from Digital adoption of hospital services. Right from booking appointments to procuring the investigation reports, all is possible with Digital platforms.

The core of digitalising the operations of the hospital is EMR. And the core of implementing EMR and securing its benefits in a small family practice or a large corporate hospital is by having a solid implementation plan.

The implementation plan should always begin with securing a good service provider i.e., good software and back-end team as well. And the process shall be a phased process in order to incorporate reviews from each phase and thereafter improvements can be made in subsequent implementation processes.

For my Literature Review I have used the following keywords:

1. Electronic Medical records
2. EMR implementation
3. EMR benefits
4. EMR in India

All the papers published before 2015 have been excluded.

Successful Physician Training Program for Large Scale EMR Implementation:

End user Training is the core of EMR implementation, because they are the one who make the project successful and at the same time the sufferers of lack of training investment. This study was conducted at Stanford Children's Health as a part of large scale EMR roll out. The training was done in phases and evaluation was done at the end of each phase to find out later that the ones who attended all the training session turn out to be ones with high compliance and satisfaction. (J.L. Pantaleoni et al, 2017)

Benefits and challenged of EMR implementation in low resource settings: A state of the art review:

According to the meta-analysis done by the authors, there is too little documentation of benefits and awareness about EMR in Sub Saharan Africa. Hence, to conclude that there is huge impact of considering the social, economic factors before rolling out their complex systems. As in areas like these the summative guides and implementation took kits were also not helpful. (Badeis Jawari, 2016)

Health information systems in developing countries: Benefits, problems and prospects:

The paper concludes that the health information system is not only important for patient care point of view but also important for planning and implementation of interventions of the management. EMR carries its importance both from the perspective of effectiveness and coverage. Various obstacles were understood and practical suggestions to overcome the battles were given. It was stated that the well-coordinated information collection systems at all the levels of healthcare system in developing countries with adequate staff is important to improve digitalisation of activities. (M.C. Azubike, 2019)

Open MRS, A global medical records system collaborative: Factor's influencing successful implementation:

Open MRS is an open source, electronic medical records platform, supported by great global network and utilised in more than 40 countries. In this paper it was explored that what was the reason behind successful implementation of EMR in low resource settings as well. The key reasons behind successful implementation are adequate infrastructure, sociotechnical system factors, adequate number of staffing, and also sound technology friendly staff to use the software. (Nareesa A et all, 2019)

Going digital: A checklist in preparing for hospital wise electronic medical record implementation and digital transformation:

The authors of the paper developed a checklist comprising of 19 questions, 13 related to EMR implementation and six to digital transformation. The evidence based and field-tested checklist provided guidance to hospitals planning EMR implementation and allows readiness for EMR from readiness to digital transformation. (Ian A. Scott, 2018)

Chapter 7: Structure of EMR in Narayana Health

From the very beginning Narayana began its journey with a vision to bring about a transformational journey to healthcare in India. Two broad aim NH has envisioned since the very beginning Is digitalising healthcare and bringing affordable healthcare to each citizen of the nation.

The current EMR system in NH is widely known as ATHMA (A Total Hospital Management Application). Which has many branches attached to it like: AADI, ATTUNE, MOKSHA.

ABOUT ATHMA

It is web-based hospital management and information system which is designed with the help of professionals who have rich healthcare experience and in-house specialists from diverse fields of medicine to provide a cost-effective solution for all type of hospitals – small, medium and large tertiary care hospitals.

This application supports wide range of hospital administration and management functions and provides quick access to vital information. ATHMA is configurable and scalable and offers seamless integration with various other applications like AADI, ATTUNE, MOKSHA.

In built flexibility allows easy customization and an intuitive user interface increases efficiency, productivity and satisfaction.

Current running version of ATHMA is ATHMA 3.3.17 and ATHMA 4.0 is in pipeline which shall be launched by the time I will be delivering this dissertation.

ATHMA is an integrated system for complete hospital operations (Clinical and Non-Clinical).

Features of ATHMA:

- Supports configurable workflows that can be customized to suit the needs of the organisation
- Uses the FHIR standards to enable east interoperability
- Provided comprehensive MIS reporting capability
- Streamlines various clinical, administrative and financial workflows and enables operational efficiency.

- Enables collaboration across various EHR platforms through mobile notifications
- Collaboration made easy with just a click
- Easy access to previous data allowing ease of audit logs across the system
- Inbuilt discrepancy capturing feature
- Integrates with widely used LIS i.e., ATTUNE and RIS i.e., MOKSHA
- Above all provides enhanced data integrity and security

Clinical Areas that ATHMA envisages:

1. OPD
2. IPD
3. Emergency
4. OT
5. ICU
6. Radiology
7. Laboratory
8. Imaging

Non-Clinical Areas that ATHMA envisages:

1. Supply Chain
2. Billing
3. Pharmacy operations
4. MRD

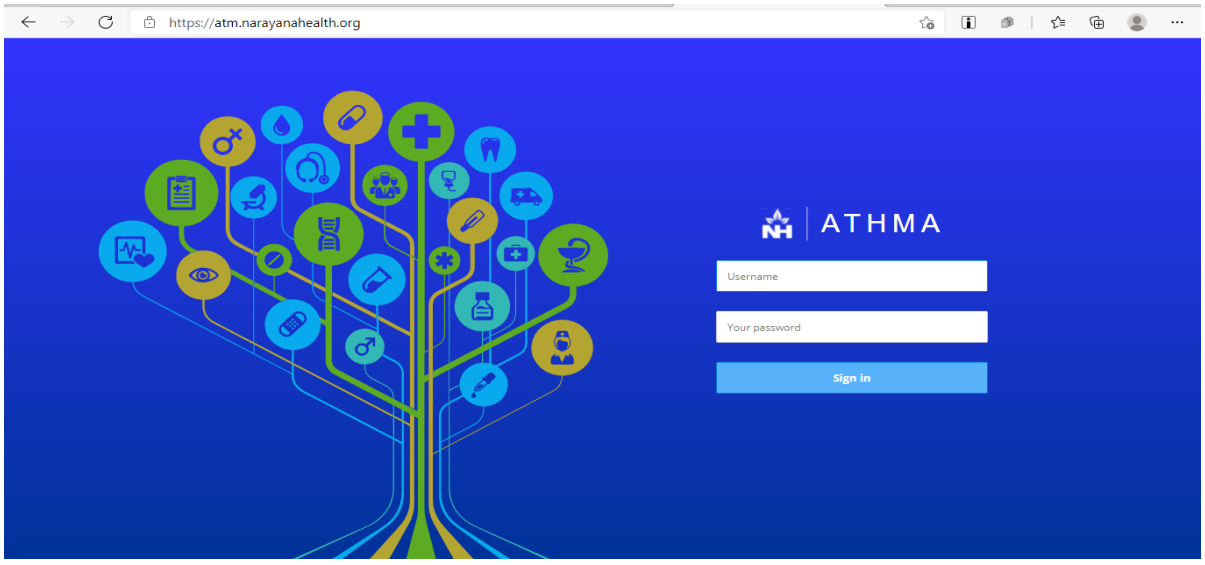

Figure 3 EMR Homepage

Above is the home screen of ATHMA which is the one stop solution for consultants. ATHMA is only accessible on Narayana's network i.e., not accessible outside the range of Narayana except when VPN access has been provided.

Various Modules in ATHMA are:

1. Administration
2. ADT
3. Ambulatory Care
4. Billing Management
5. Dashboard
6. EHR
7. HSM
8. Inventory
9. MRD
10. OT Management
11. Pharmacy Management

ADMINISTRATION MODULE:

This Module supports the management of master entities, configuration settings, user's roles, care plans, services and packages, service tariffs and other key data.

Basically, it can be said that this module allows a common interface to manage the workflow tasks.

Administration Module features Include:

- **Authorization:** Process of verifying a patient's coverage details with the insurer or TPA.

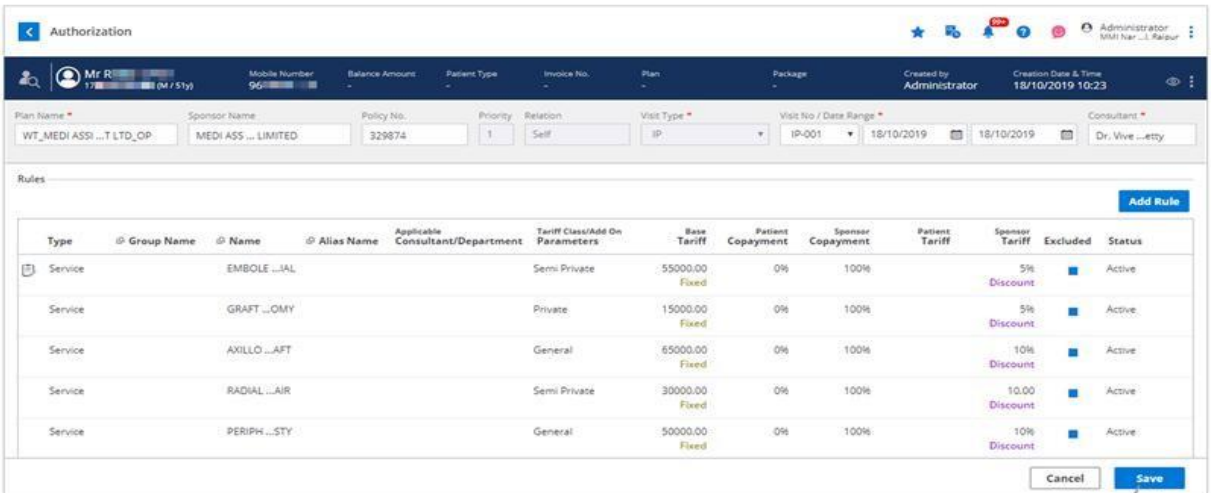

Figure 4 Administration Module

- **Auto Post Service Configuration:** This master lets you define duration-based tariff percentages for various services that are automatically posted for different bed types.
- **Barcode Configuration**: This master specifies the format for printing the item barcodes.

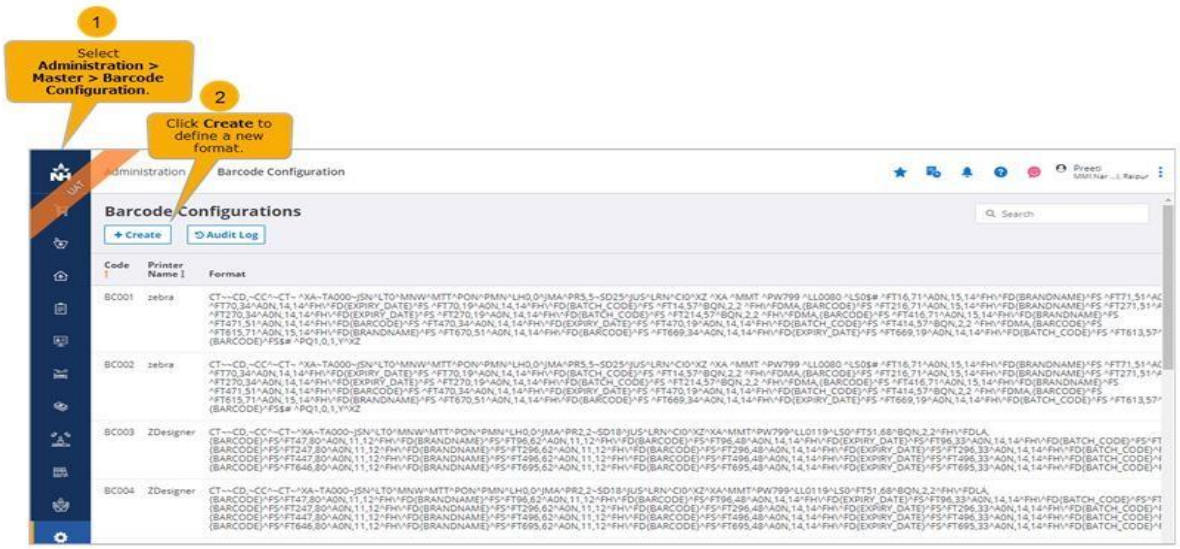

Figure 5 Bar Code Configuration

- **Configuration:** This allows you to customize the application to suitability of the organisation needs. ATHMA lets you set the configuration values at the below mentioned levels:
    - HSC Level
    - Unit Level
    - Global Level
    - System Level
- **Device Master:** This is used for saving information about various devices, medical equipment, POS Machines, and other devices that are used in various transactions and procedures.

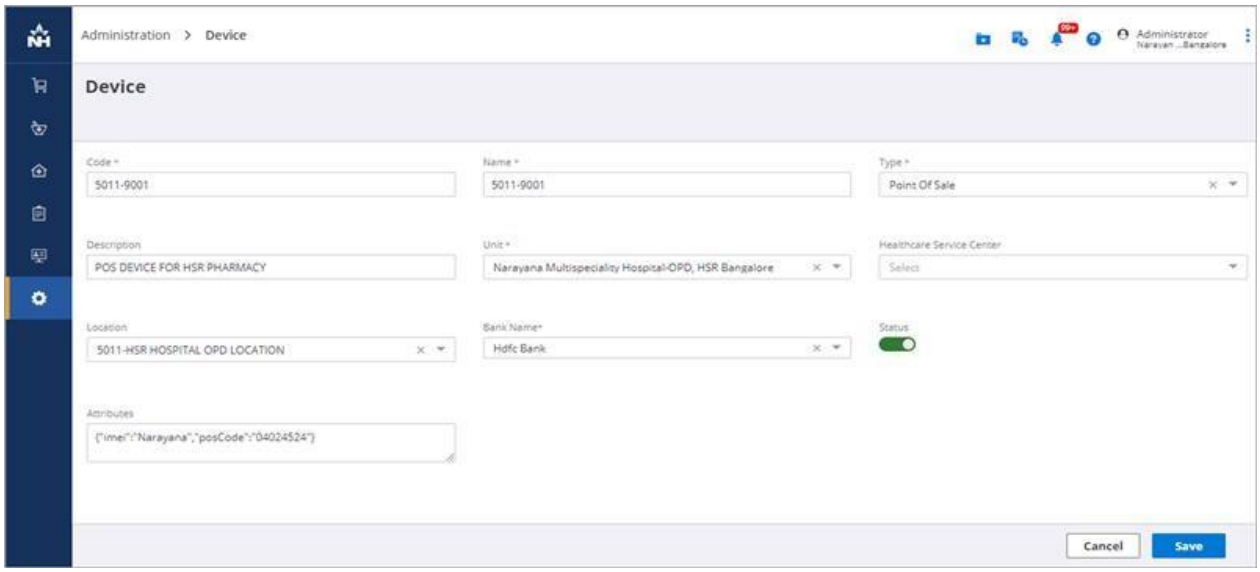

Figure 6 Device Master

- **Employee Mapping:** This lets users to Map and specify department, category and service rendering, used to pre-populate various lists on the transaction screens.

- **Groups:** Used to define different types of groups in ATHMA, groups include: Approval committee, service committee, billing groups, financial groups, employee categories.

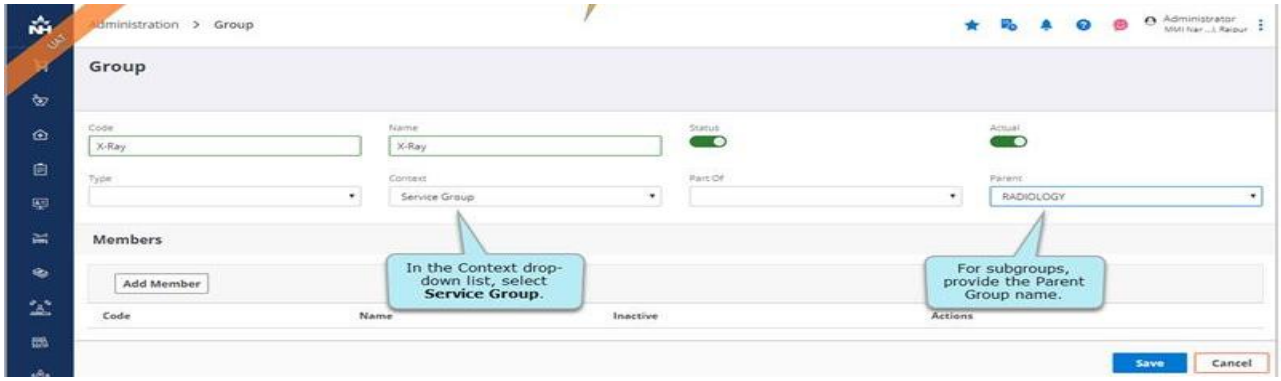

Figure 7 Administration Group

- **Patient Plan:** Here health plan subscription details of the patients are stored. Whenever the patient is registering for the health plan the details can be added right now or can be added later on also. This master enables old sponsor discounts if applicable to be added in new billing section.
- **Referral Master:** This lets you maintain the patient referral sources for your unit. Referral sources do include the external hospitals and consultants. Each referral is given a code.

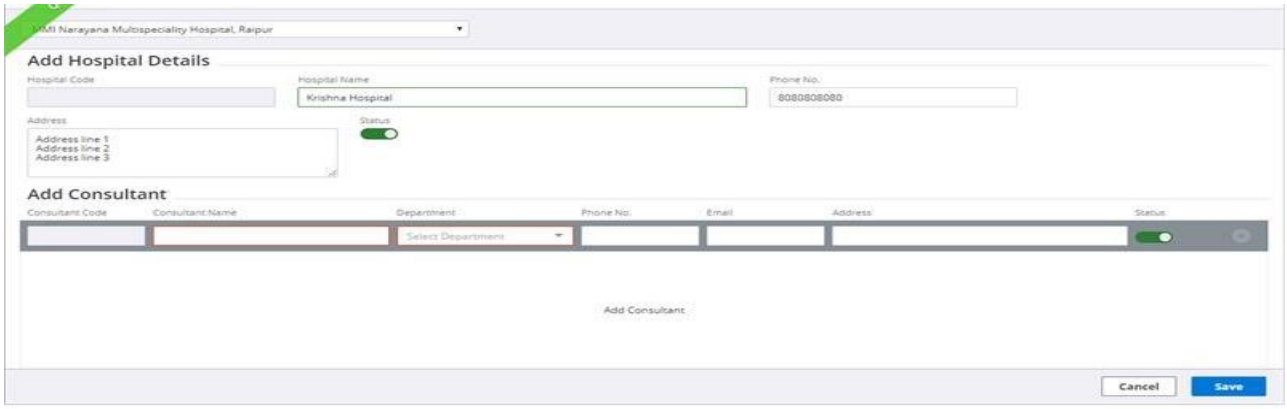

Figure 8 Referral Master

- **Tariff Definition:** This includes a base tariff and rates for different tariff classes. Additionally, there is a provision add specify department level and doctor level tariff.
- **Tariff Rules:** Used to define and upgrade rates for different classes of tariff. Rules can be created for unit level, service type level.

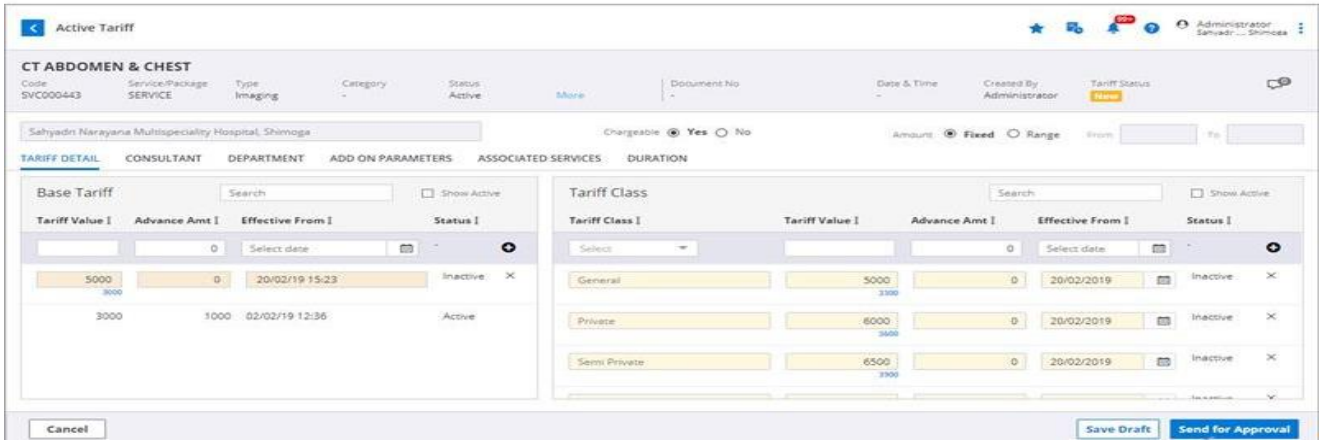

Figure 9 Tariff Rules

- **Units:** Unit configuration involves, mapping the depts and healthcare services to a unit. This one of tasks that needs to be completed before using any module in ATHMA.
- **User Details:** Users are registered in SAP when any individual joins the organisation. ATHMA directly picks up user details from SAP.

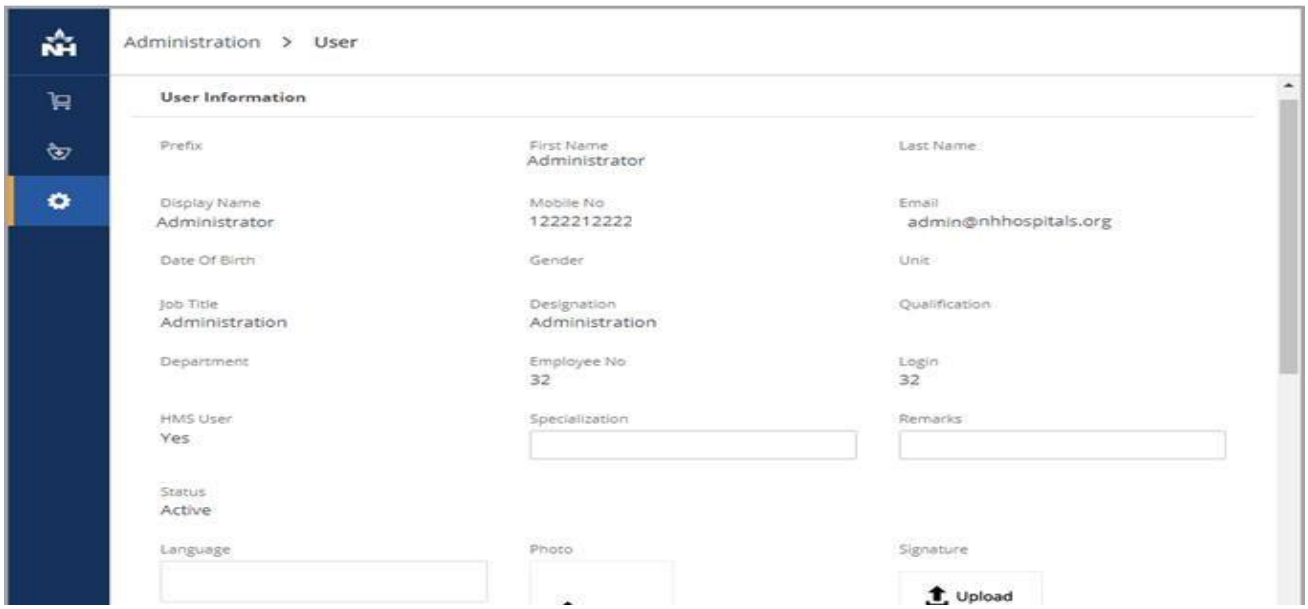

Figure 10: User Details

- **User Roles:** This defines the permissions to access or perform various functions in ATHMA. This functionality is able only to the ADMIN.
- **Value Sets:** Contains all possible input values for a field.

TASK MANAGEMENT:

- **Tasks:**
  - Approval Workflow Overview
  - Groups Overview
  - Tasks Overview

- Tasks Screen Overview
- Completing Tasks from the tasks screen
- Reverting a claimed task to the group
- Completing tasks from the task notification list
- Completing tasks from transaction list view.

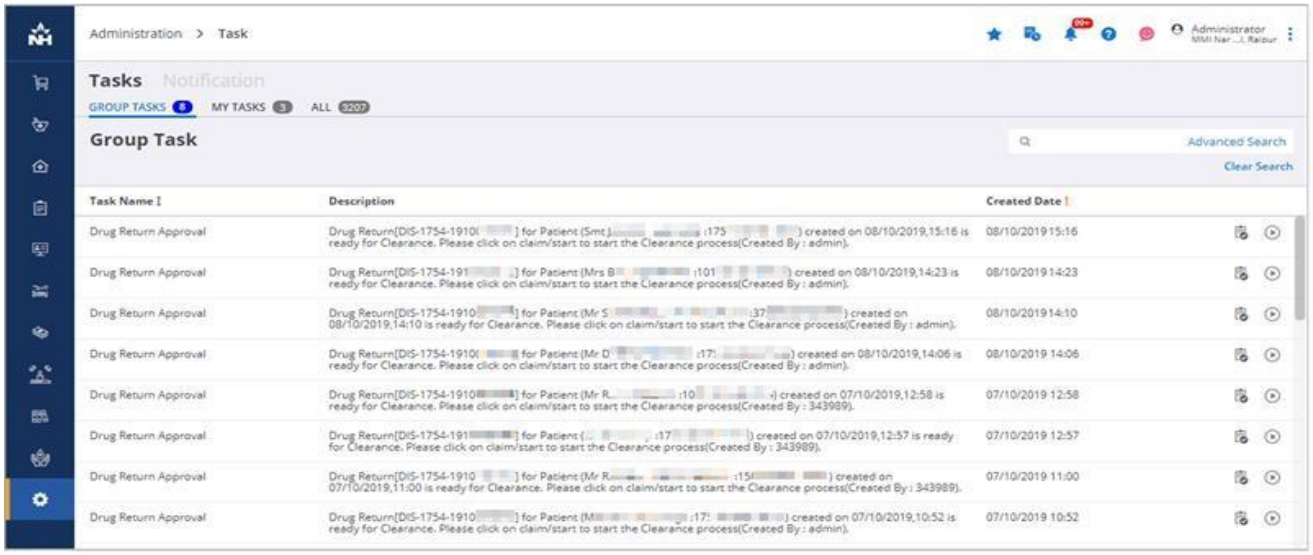

Figure 11 Task Management

ADT Module:

Provides an all-encompassing solution for managing the inpatient care, Day care, Emergency care, enabling various departments in the hospital to improve on their operational performance and hence result into a coordinated care.

ADT Workflow is as follows:

Admission Request is created (Optional)
Admission is completed
Financial clearance is granted for admission
Patient is received to the ward
Patient care tasks are performed
Patient is marked for discharged
Discharge clearances are given
Invoice is generated and settled
Patient is physically discharged

Figure 12 ADT Workflow

The ADT features include:

- **Admission:** This allows admission desk to manage admission requests and admit the patients in Inpatient care or day care. This supports direct and planned admissions both.

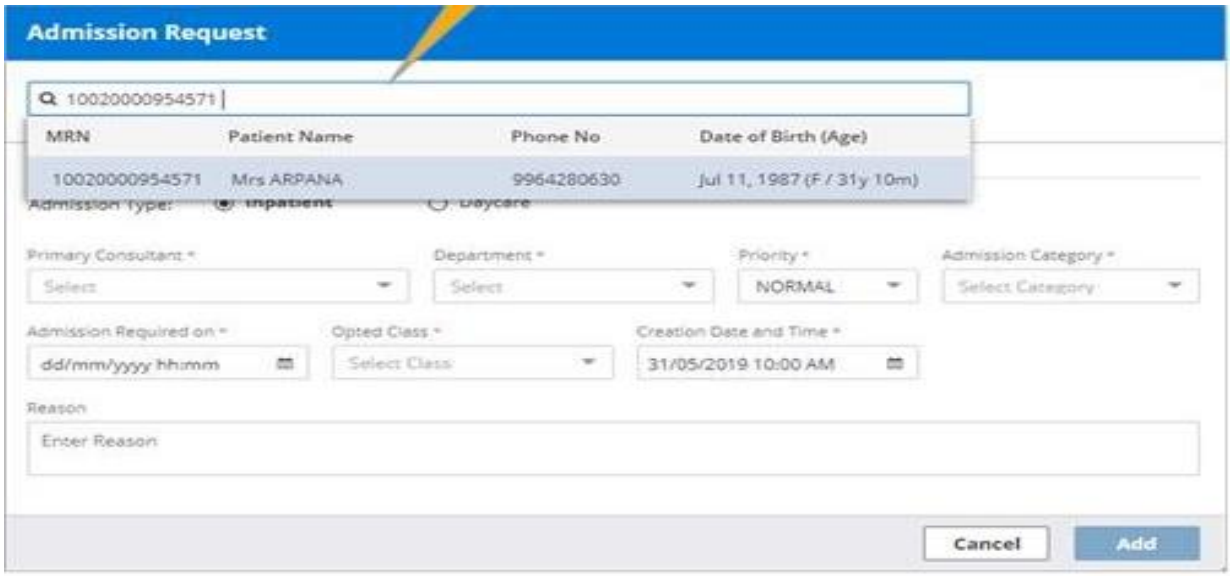

Figure 13 Admission request

- **Bed Management:** This is a real time tracking system for each bed in the hospital and allows the front desk to perform various bed management tasks like green channel creation, bed allocation.

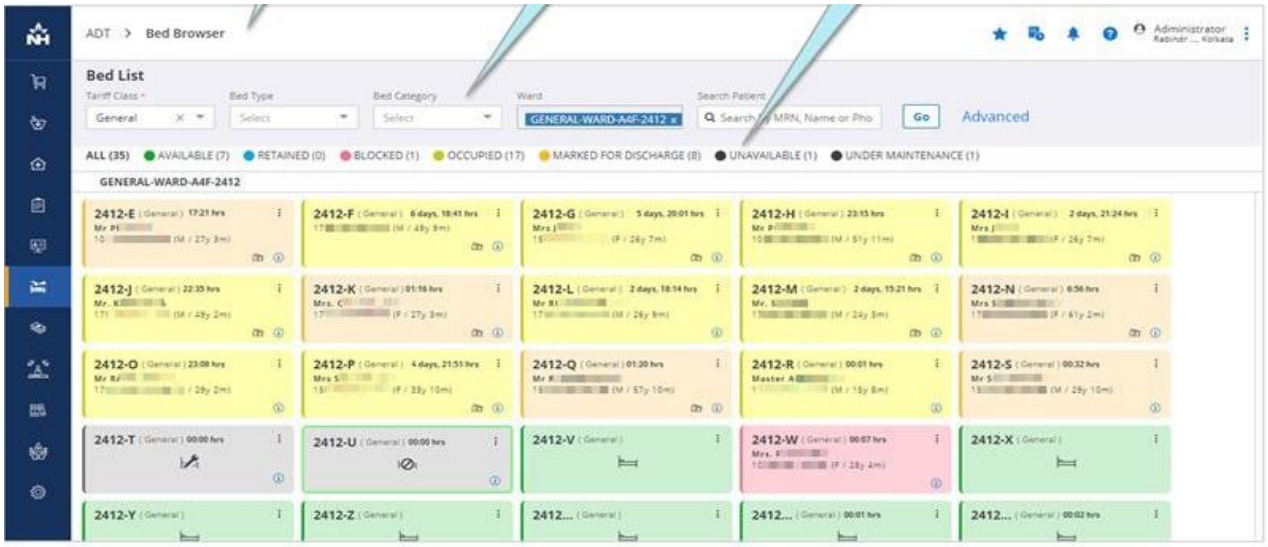

Figure 14 Bed Management

- **Nursing Station:** Allows the nurse to receive the patient in ward, and quickly indent medicines, start with diet chart as per dietician advice, updating patient status, recording patient vitals, completing patient transfers, initiating discharge procedure and so on.

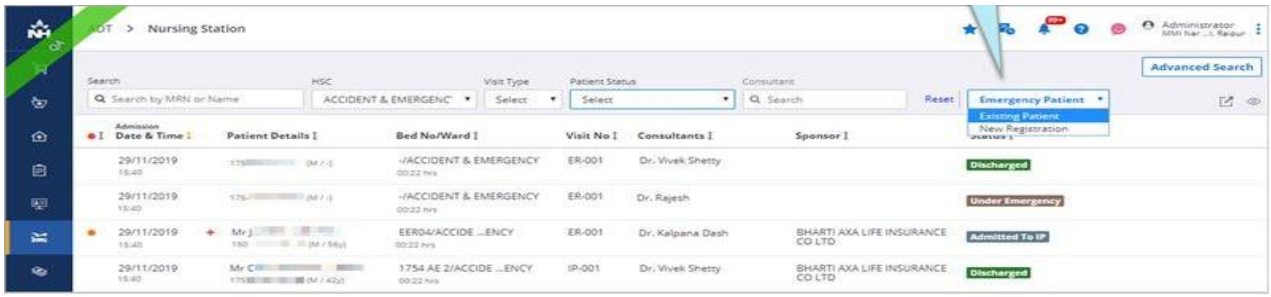

Figure 15 Nursing Station

- **CPOE:** The doctors and nurses can place e-prescriptions and investigation orders, which are automatically routed to the prescriptive pharmacies, laboratories, and imaging centres.
- **Patient Transfers:** Allows patient transfers inter and intra units

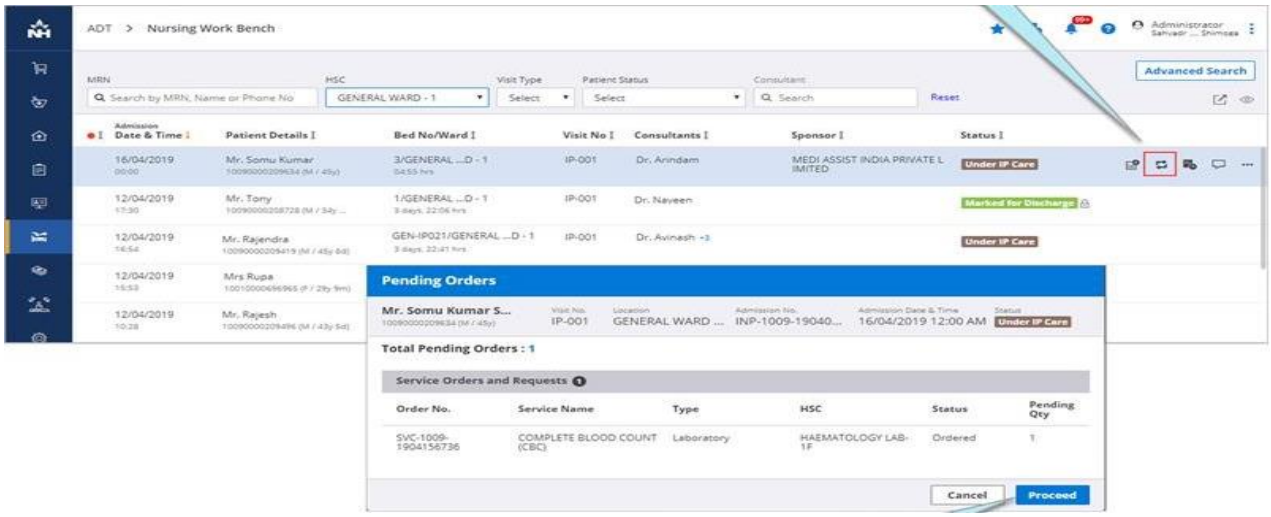

Figure 16 Patient Transfer

- **Discharge Workflow:** The authorized staff can complete various discharge tasks that are created on initiating the discharge process of the patient. Various discharge tasks include Pharmacy Clearance, service clearance, drug return clearance, discharge summary, Invoice, physical discharge.
- **Discharge Summary:** Allow the authorized staff to create, review, and sign off the discharge summary.
- **Discharge Dashboard:** Provides a common interface to track the status of discharge clearance for patients who are marked for discharge on that particular day.
- **Reports:** Provides relevant and useful information about various operations and functions.

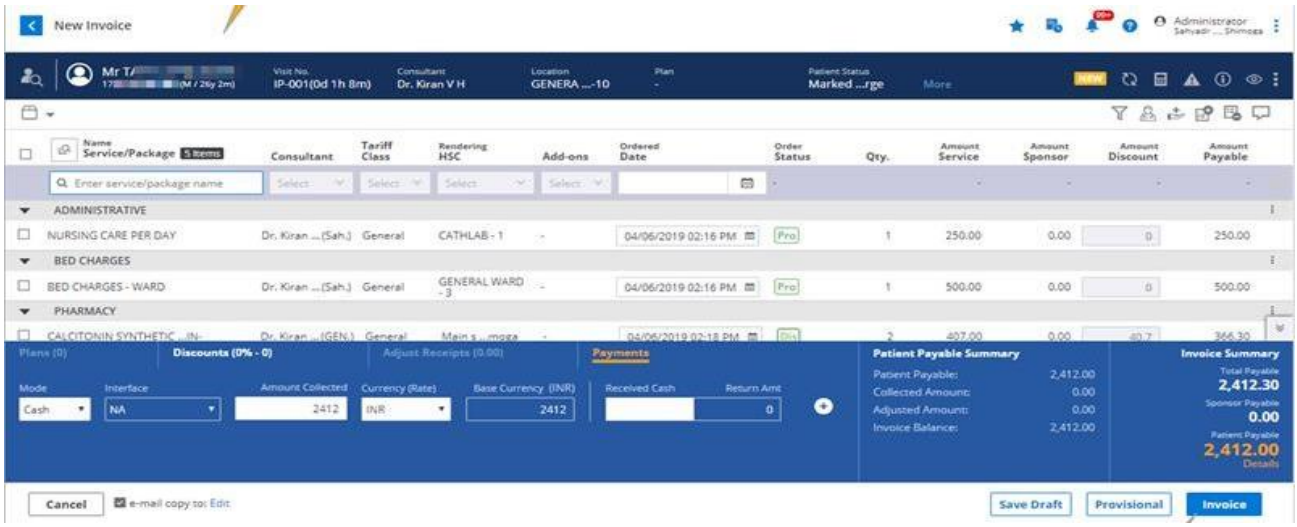

Figure 17 Invoice

AMBULATORY CARE:

Streamlines various outpatient workflows, enabling the staff to work more effectively and provide enhanced patient experience.

This module provides a flexible solution to manage wide range of clinical and administrative functions like Appointment scheduling, patient registration, visit management, medication ordering, service ordering, billing and other functions.

Ambulatory Care Features Include:

- **Appointment Scheduling**: Provides and easy to use interface to book appointments and manage the doctor's calendars, with the ability to send automated SMS Notifications when appointments are confirmed, cancelled or if rescheduled.

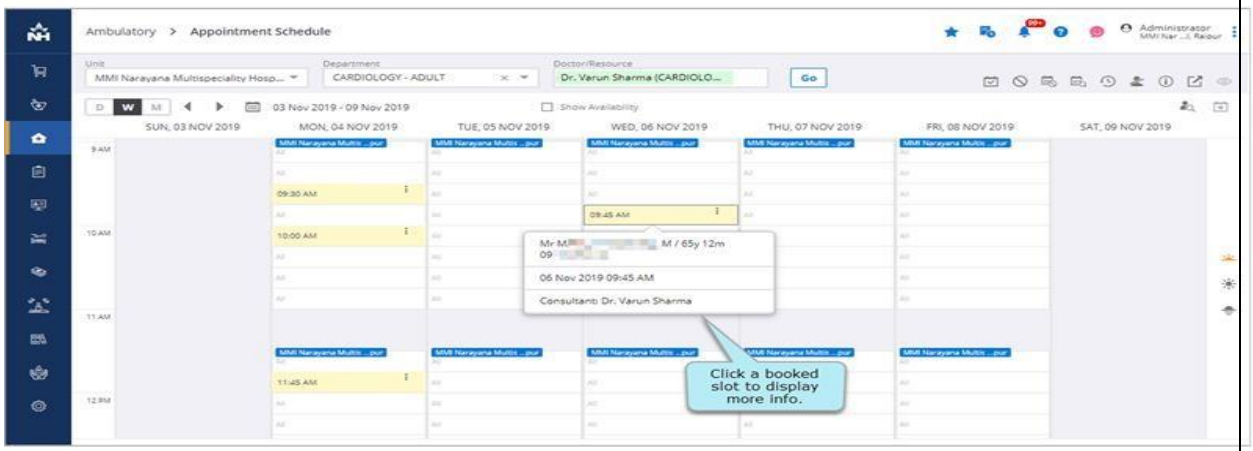

Figure 18 Appointment Scheduling

- **Patient Registration:** Here the front desk enters patient details accurate to their knowledge and thereafter an MRN Number is generated automatically.

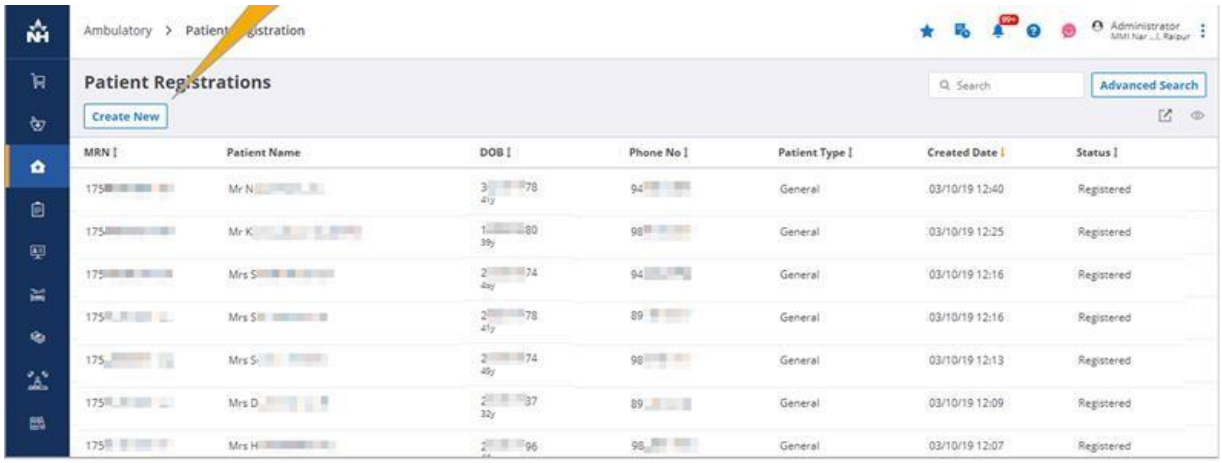

Figure 19 Patient Registration

- **Bay Management:** Helps the staff to manage the OPD appointments and queues for different doctors and allows admin or team doctors to perform management related tasks.

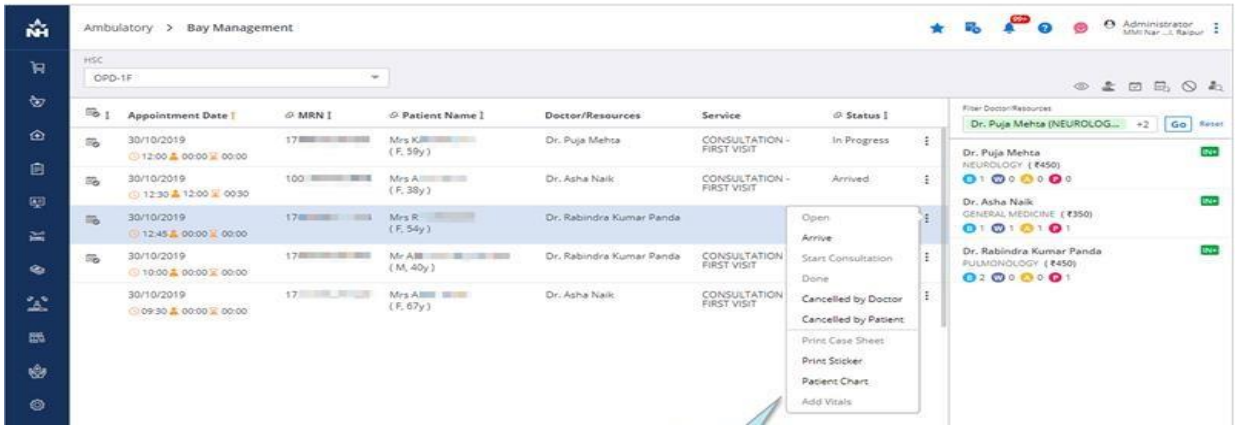

Figure 20 Bay Management

- **Consultation Lists**: Provides a list of current and past OP Consultations. There are various filters available in this section.
- **CPOE:** Allows doctors and nurses to provide medication, investigation orders which are automatically routed to the respective labs, imaging centres, and pharmacies.
- **Reports:** Provides details and summary reports that provide useful information about various operations and functions.

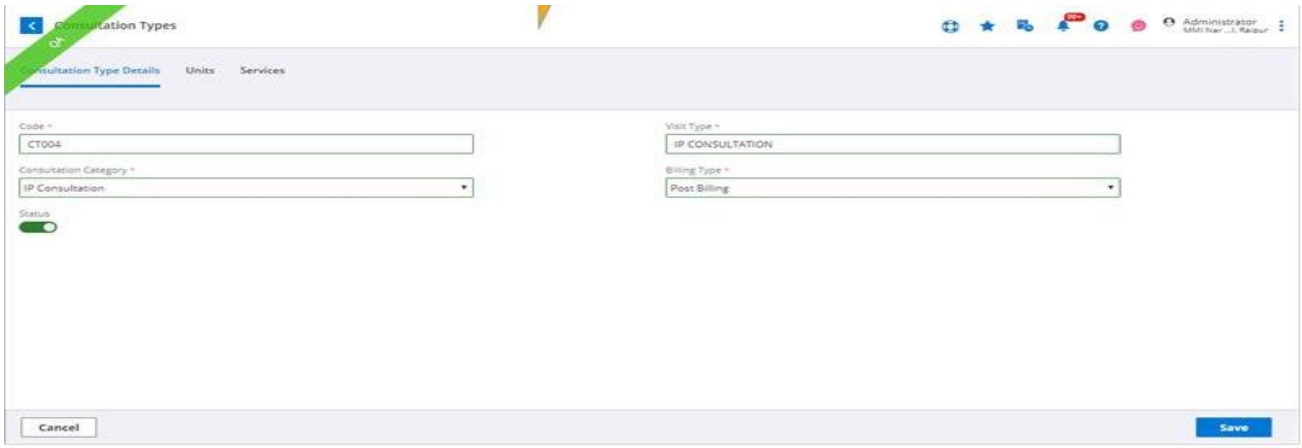

Figure 21 Consultation Type

BILLING MANAGEMENT:

This module automates the billing process for almost all kind of services – OPD, IPD, Day Care, and Emergency Care Services. There is flexibility to choose pre – or post billing settings and offers the benefits of built-in workflows for checks and approvals. Enormous number of features include processing of patient invoices, receipts, refunds, clearance for admission and therefore improving the overall efficiency.

Billing Management features include:

- **Invoice**: Helps manage billing for patients care services. This also supports pre and post billing settings and also allows cancellation and regeneration of invoices.

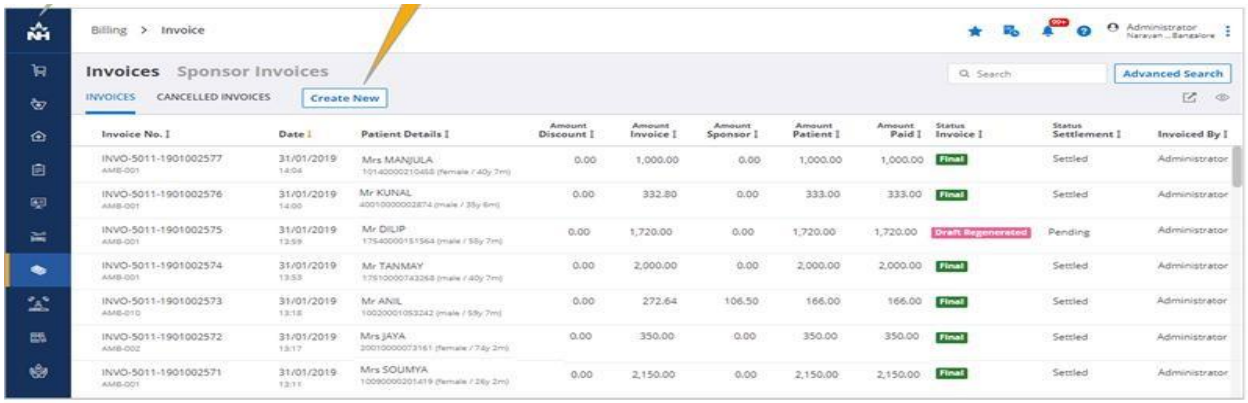

Figure 22 Invoice

- **Receipt:** For all the invoices created, this section also generation of receipt for both administrative and patient point of view.

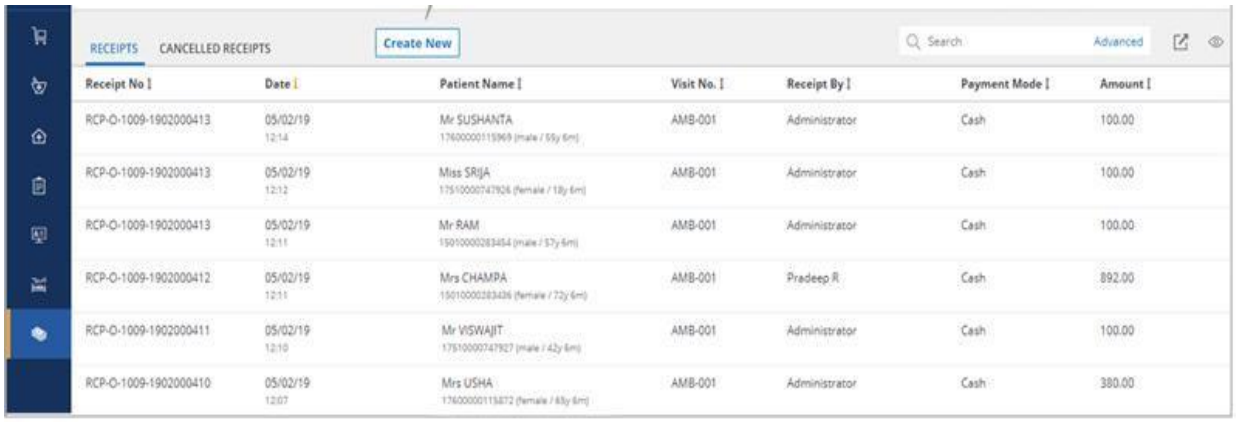

Figure 23 Cancelled Invoices

- **Refund**: For any refund request generated, this section allows processing and thereby issuance of refunds.
- **Financial Clearance:** allows the user to clear the patient for admission, service orders, patient transfers and surgery requests.

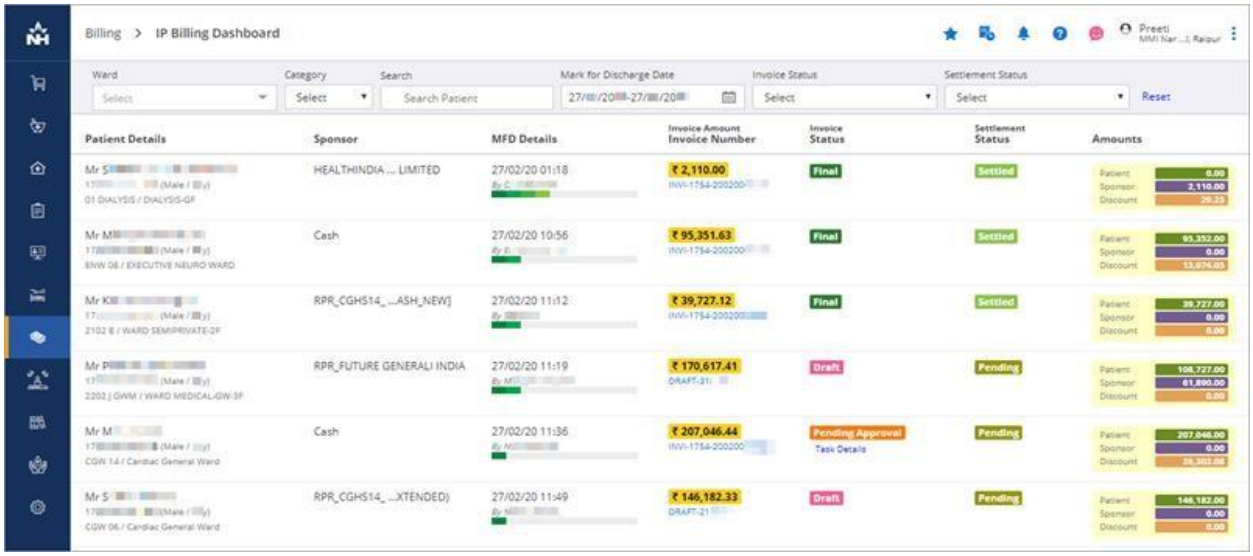

Figure 24 IP Billing Dashboard

- **Reports**: Includes relevant details and summaries for various operational and administrative functions

DASHBOARD MODULE:

- Allows user specific dashboard. Access to key metric, data points related to various functionalities are displayed in the form of charts and tables. The dashboard is the first screen which comes by default when we open ATHMA.

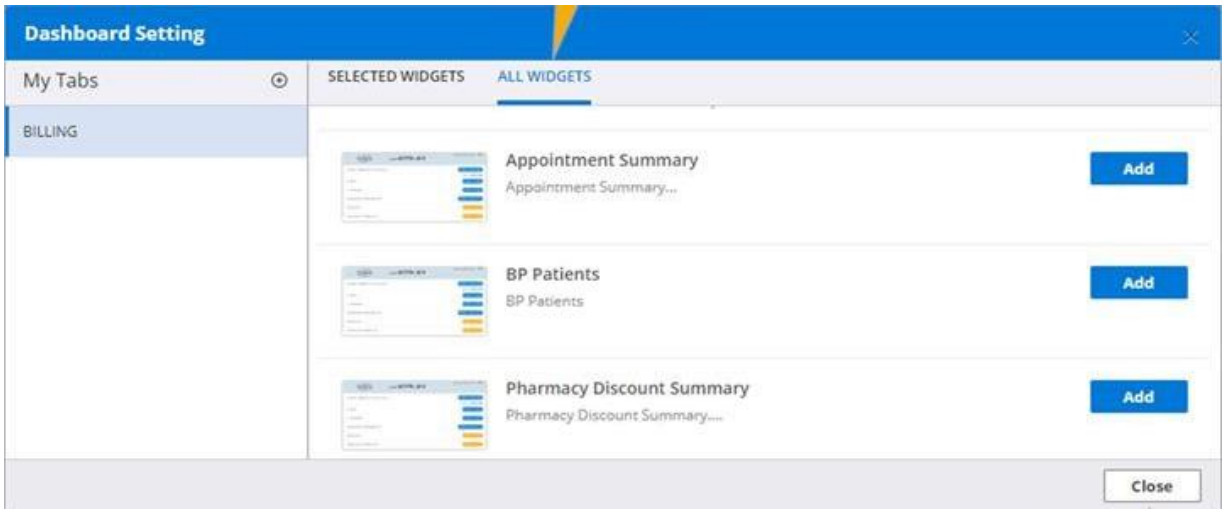

Figure 25 Dashboard Widgets

Available built – in widgets:

- **Ambulatory Care:**
  - **Appointment Summary**: This shows the total count and status of appointments for specified period. Appointment status includes booked, scheduled, arrived, in progress, done, and cancelled.
- **ADT:**
  - **Inpatient Summary:** Total number of inpatients and the count of each status for the specified period. Status include Booked, Arrived, Under Care, Discharge intimated, Mark for discharge, Discharges.
- **Billing Management:**
  - **Billing Collection**: Displays the total billing collection, billing refund, net billing.
  - **Billing Collection Trends:** Provides a graphical display of total billing collection.
  - **Billing discount summary:** Shows Overall billing discounts provided under different categories.
  - **Billing insights:** Shows the outstanding invoice amount, pending amount for refund, draft regenerated invoices, number of registrations, bed occupancy ratio.
  - **Billing Productivity**
  - **Billing Productivity trend**
- **EHR**
  - **BP Patients:** Shows the total number of hypertension and hypotension cases recorded
  - **Chief Complaints:** Shows the major 5 chief complaints
  - **Diabetic Patients:** Shows total number of diabetic cases
  - **Diagnosis:** Shows 5 major diagnosis made
  - **Top EHR Usage:** EHR application usage stats
- **Pharmacy Management:**
  - **Pharmacy Collection:** Shows the net revenue, total refund for a period of time
  - **Pharmacy Collection Trends:** Graphical representation of pharmacy collection
  - **Pharmacy Discount Summary:** Shows the overall discounts given for a specified period
  - **Pharmacy Productivity:** Total dispense and total return are displayed here

- **Pharmacy productivity trends:** Graphical representation of pharmacy productivity

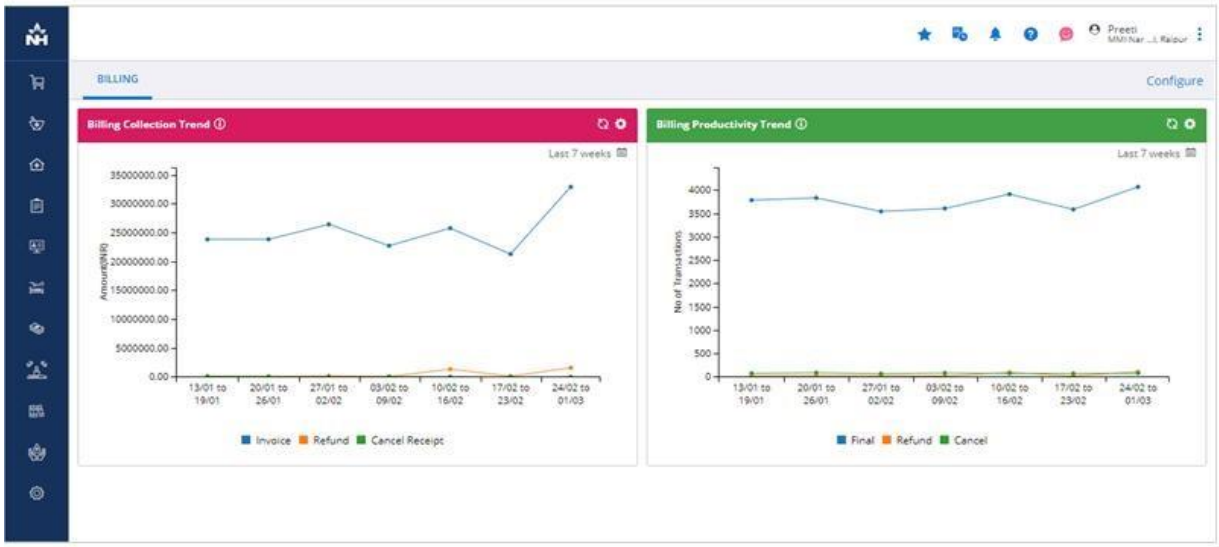

Figure 26 Billing Dashboard

EHR Overview:

Enables management of patient data, allowing you to maintain accurate, complete and up to date information about patients, quickly retrieve this information as needed to make decision about patient care. This module increases productivity, standardizes documentations, and enables enhanced patient care.

EHR Features include:

- **Doctor Dashboard:** Gives overview of OPD Appointments. Allows one to access the patients' records and update the records. One section of doctor dashboard shows the referrals, admissions, investigation reports.

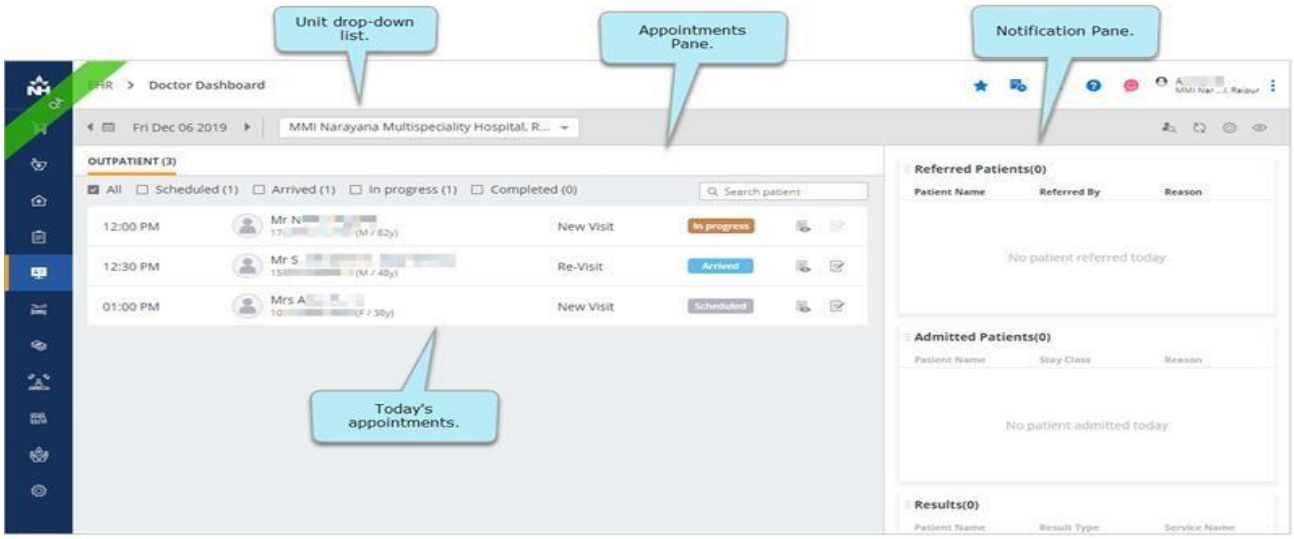

Figure 27 Doctor Dashboard

- **Consultation Reports:** User friendly interface to record consultation notes. Provides multiple ways to record notes, include “favourites” for frequently used entries.
- **Patient Chart:** Allows quick access to patient’s clinical records, medical history.

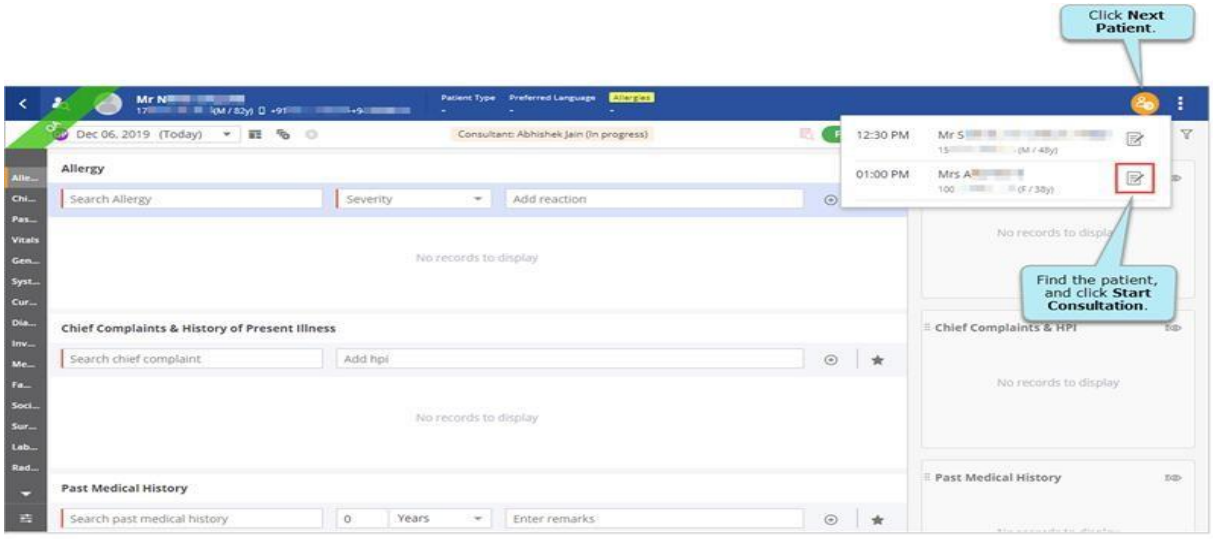

Figure 28 Patient Chart

- **Form Customisation:** Allows user to specify how they want to see the patient chart
- **Care Team Definition:** Allows the admin to define common care team for a doctor. It can be modified for individual patients as well.

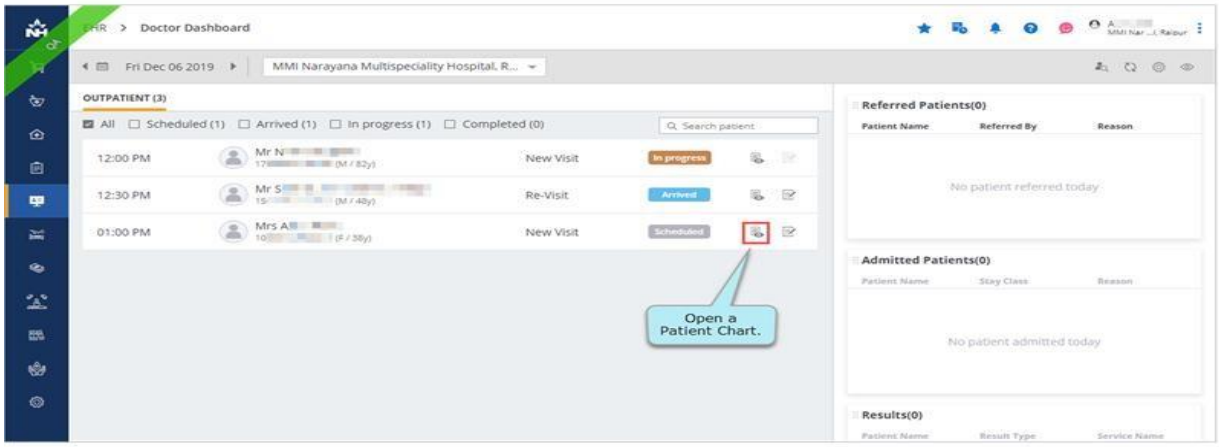

Figure 29 OPD Appointment Schedule

HSM Module:

Healthcare service manager (HSM) allows the HSC to keep a tab of service orders, enabling timely processing of services and delivery of reports to the patients. Application makes it convenient for the order update status and uploads the reports when services are processed and testing is completed for the service.

Authorized staff can print and download the report, including all those processed via LIS and RIS.

HSM features Include:

- **Worklist:** Allows the HSC to keep a track of service orders and process the orders

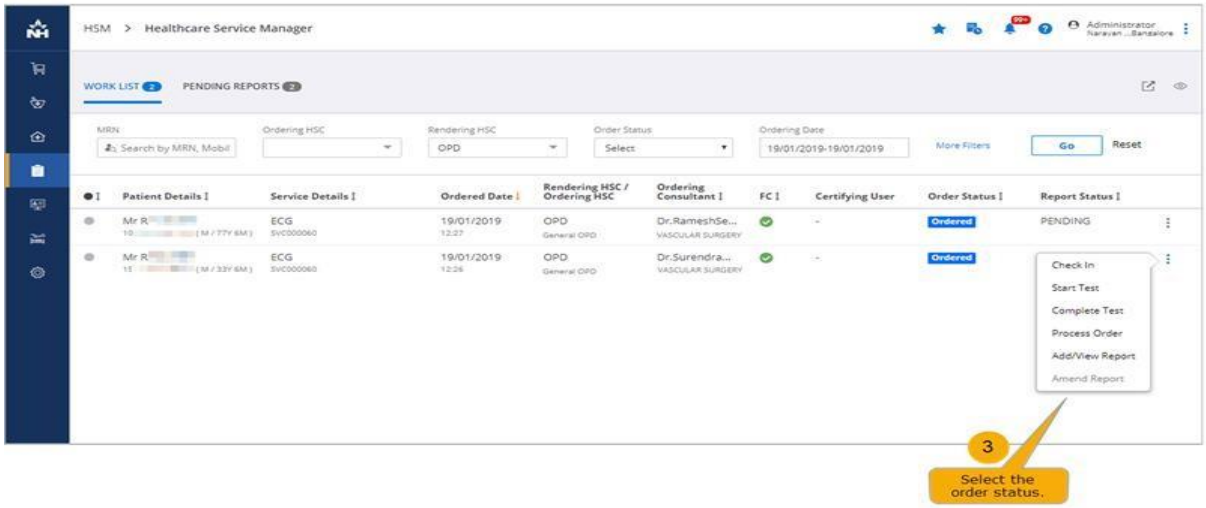

Figure 30 Worklist

- **Investigation results**: Allows authorized users to download the reports and thereby print and deliver them to the patients.

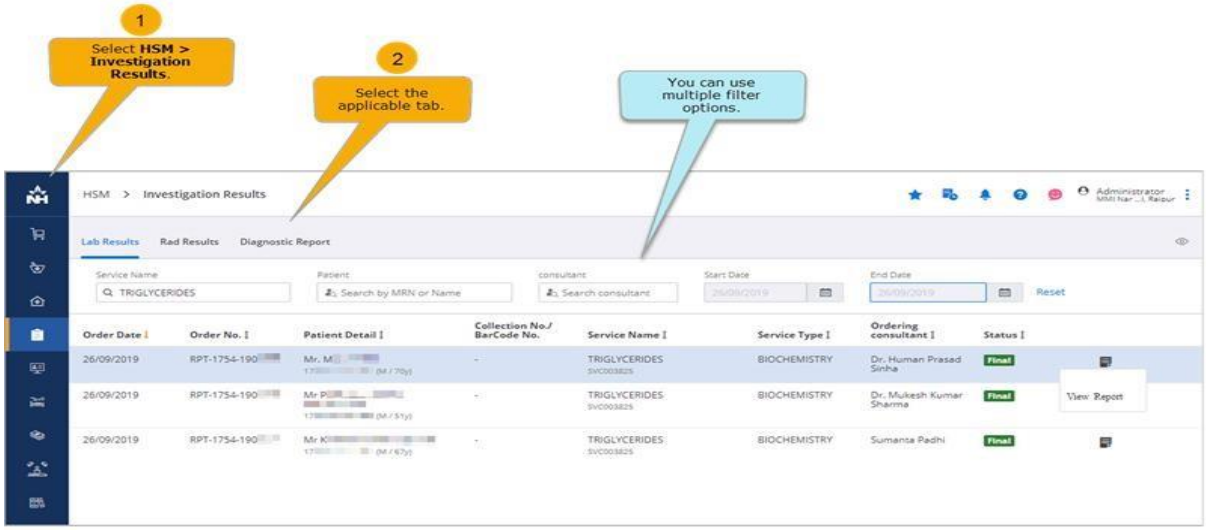

Figure 31 Investigation Results

Inventory Management:

Automates the inventory workflow for pharmacies and allows the store personnel to efficiently perform day to day stock transactions and periodic stock audits. This module supports all kinds of stock transactions, including indent, issue receipt, direct transfers, audit, adjustments and other transactions, enabling the store personnel to track the stock movement.

Inventory Management Features:

- Indent: Enables efficient management of inter and intra unit indents

Figure 32 Indent List

- Issue: Related to stock issue transaction
- Receipt: Facilitates stock receipt against indents and direct transfers. Automatically generates stock reversals if any item rejections are noted in the receipt documents
- Direct transfers: typically done to transfer rejected stock to a hypothetical store.

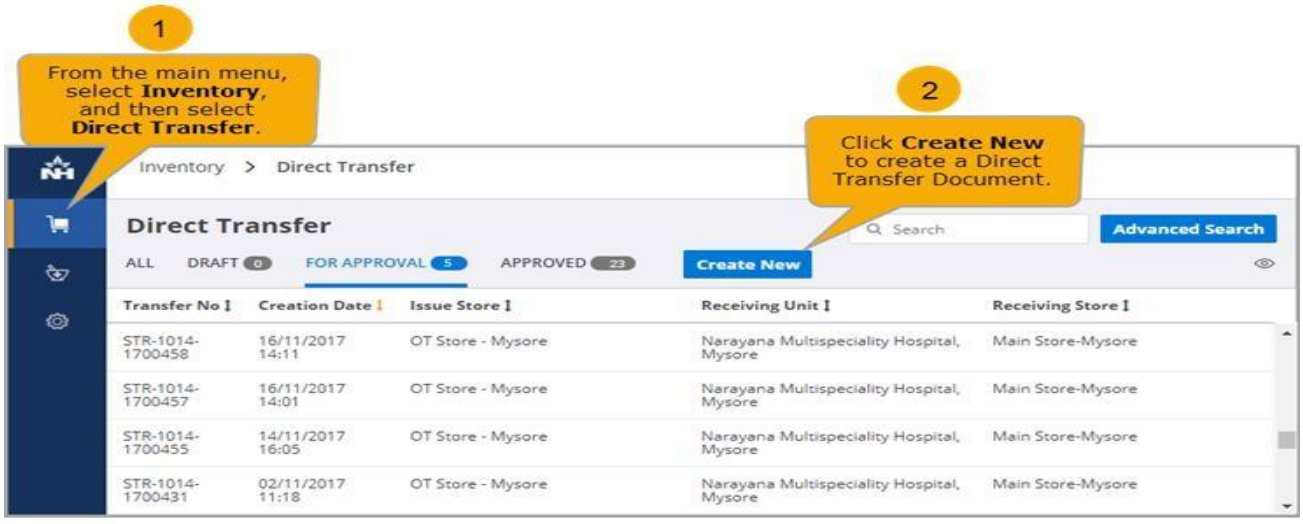

Figure 33 Direct Indent Transfers

- Reversal: Enables automatic recording of stock reversals when a store rejects any items that it receives against indents or direct transfers

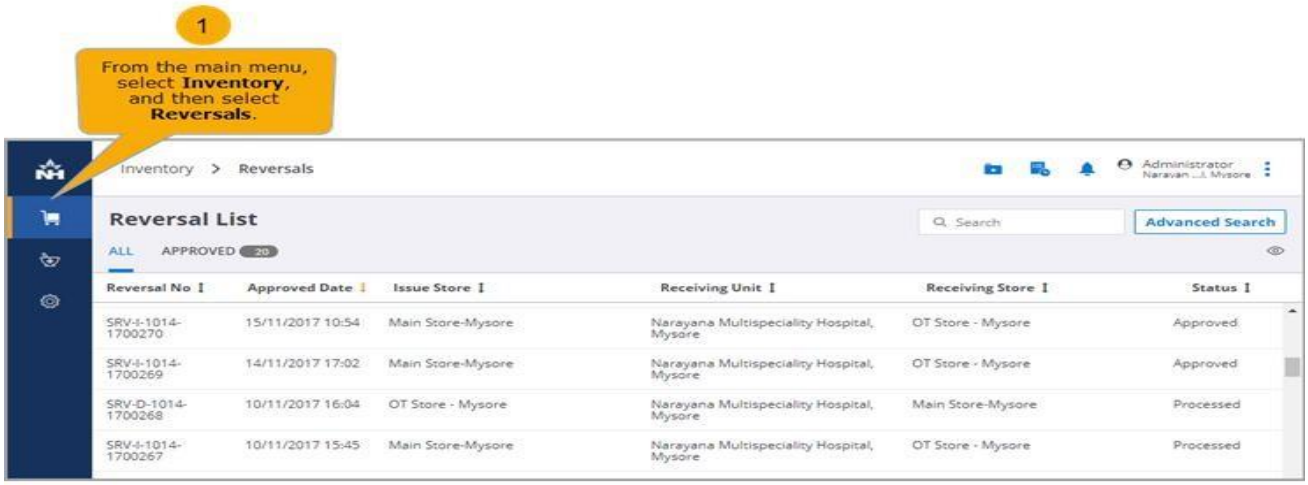

Figure 34 Reverse Indent

- Audit: Conducting period stock audits to identify any discrepancy between the book stock and physical stock of items.

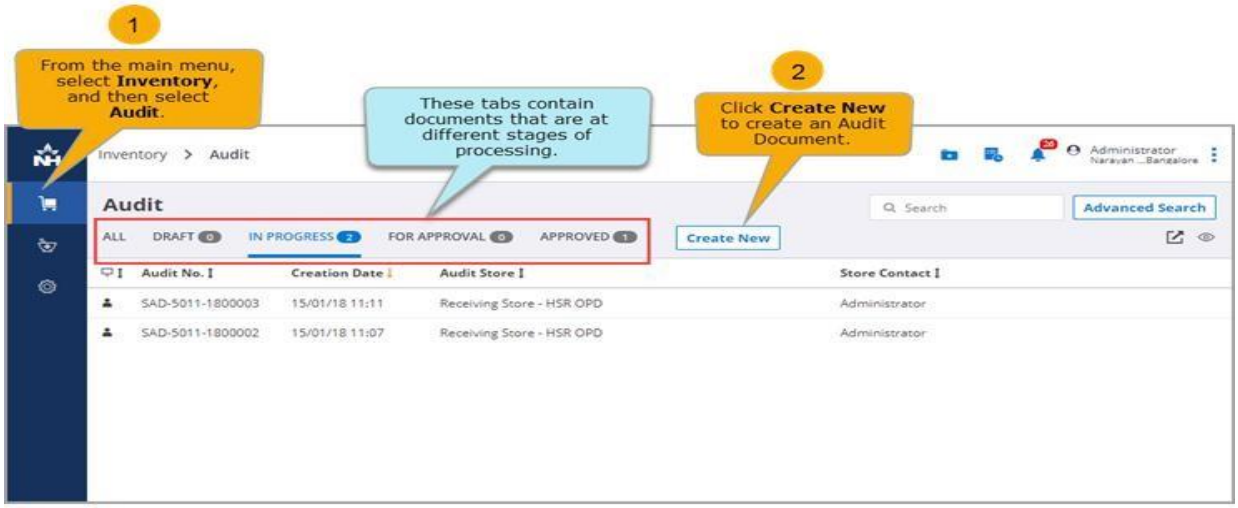

Figure 35 Audit

- Adjustments: Supports stock adjustments to match the book stock with the actual stock
- Consumption: Helps keeping a track of items that are issues without indenting
- Correction: Allows amendments to batch numbers, MRP, expiration date of the existing batches.
- Barcode Printing: Generates and prints item barcodes which are used during pharmacy dispensing, stock auditing, other transactions
- Reports: Relevant detail and summary reports that provide useful information about various operational functions.

MRD Module:

Maintains the patient database and patient related documents, including all administrative, clinical and personal information documents.

MRD Features:

- Patient Profile: Allows updating patient demographic data.

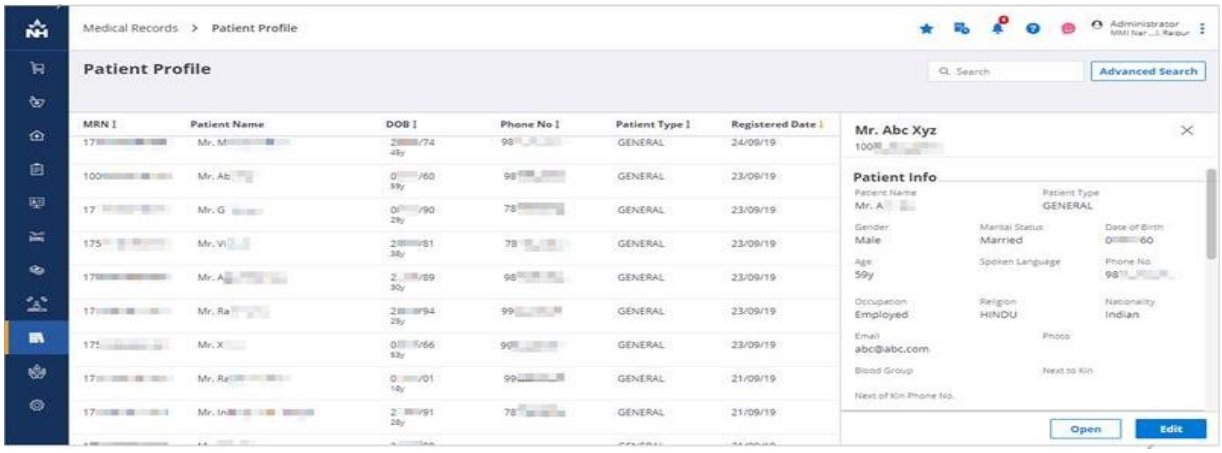

Figure 36 Patient profile

- Patient history: Provides historical information about the patient visit.
- Patient documents: Lets you maintain patient related documents that include administrative, clinical, identification documents.

Figure 37 Edit Patient Profile

OT MANAGEMENT REVIEW:

This module supports routine surgery administration tasks, including processing surgery requests, scheduling surgeries, maintaining surgery records, and billing information.

OT Management Features:

- Surgery Requests: Allows creation of surgery requests which serves as a waiting list for OT Booking

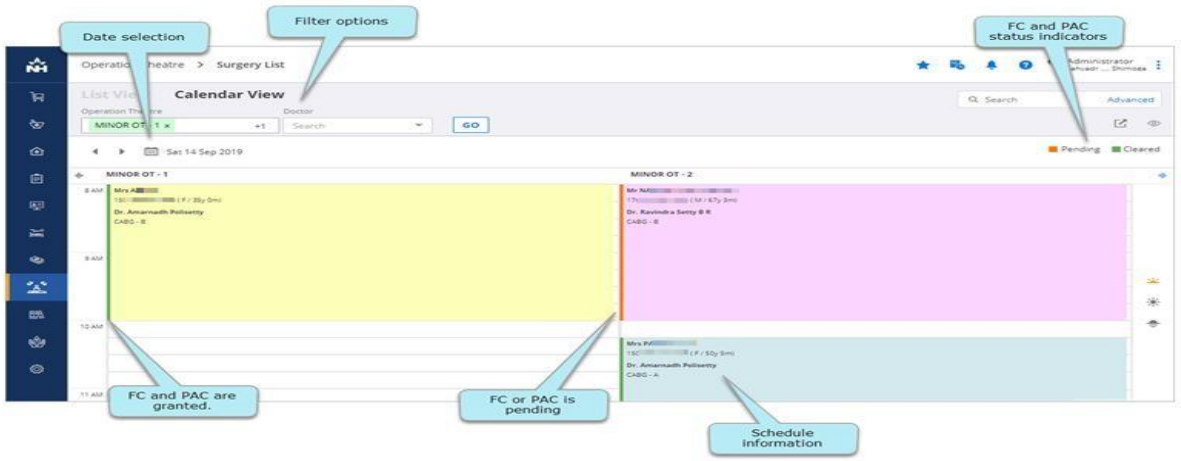

Figure 38 OT Scheduling

- Surgery Scheduling: Allows scheduling, which involves selecting a suitable date and time to book an OT according to OT Calendar.
- Pre-Anaesthesia Clearance: Allows completion for pre-anaesthesia checks
- Surgery Status Update: Allows updating status when surgery is completed, to record surgery notes, provide details of surgery and so on.
- Surgery Documentation: Maintain surgery notes, include details of surgery team
- Reports: Include relevant details and reports to provide useful information about various operations.

PHARMACY MANAGEMENT REVIEW:

This module allows the store to personnel to efficiently perform the daily retail pharmacy operations like: Prescription processing, dispensing of medicines, processing of return. Application helps in reducing the medication errors and improving the speed of order processing. The built-in workflows for checks and approvals ensure that authorized transactions are processed in the application.

Pharmacy management Features:

- OP Dispense: Helps the pharmacist to paper prescriptions and electronic orders, give out medications to registered patients as well as outside patients.

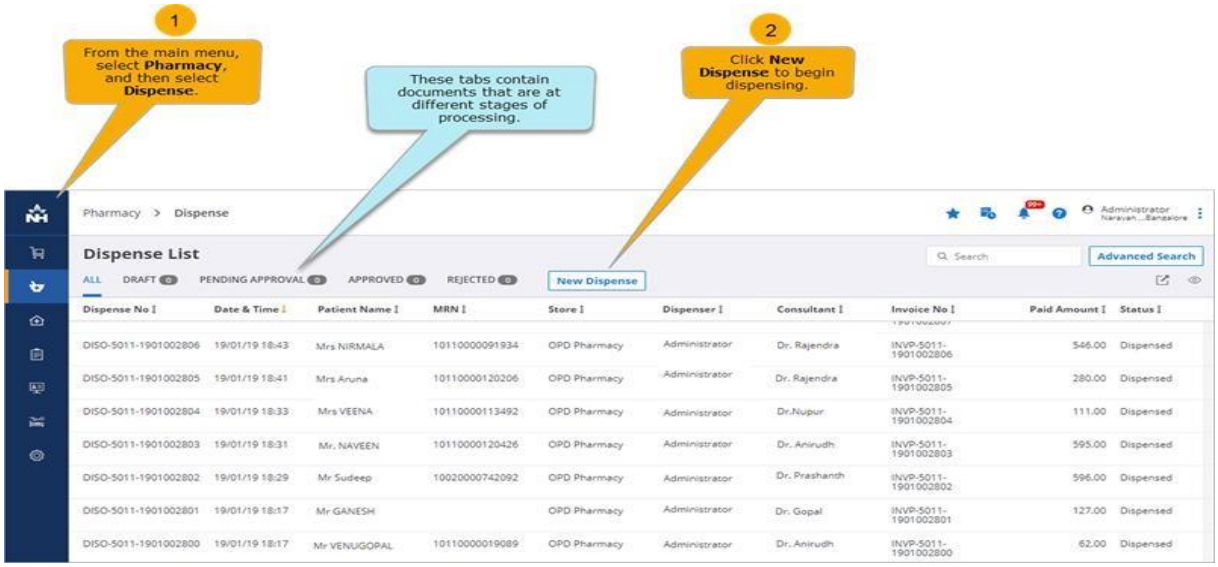

Figure 39 Pharmacy Dispense

- OP Returns: Helps to manage return of medicines from the store as well as other stores.
- IP Dispense: Helps manage e-prescriptions for IPD, Day acre, ER patients and dispense plus deliver medicines.

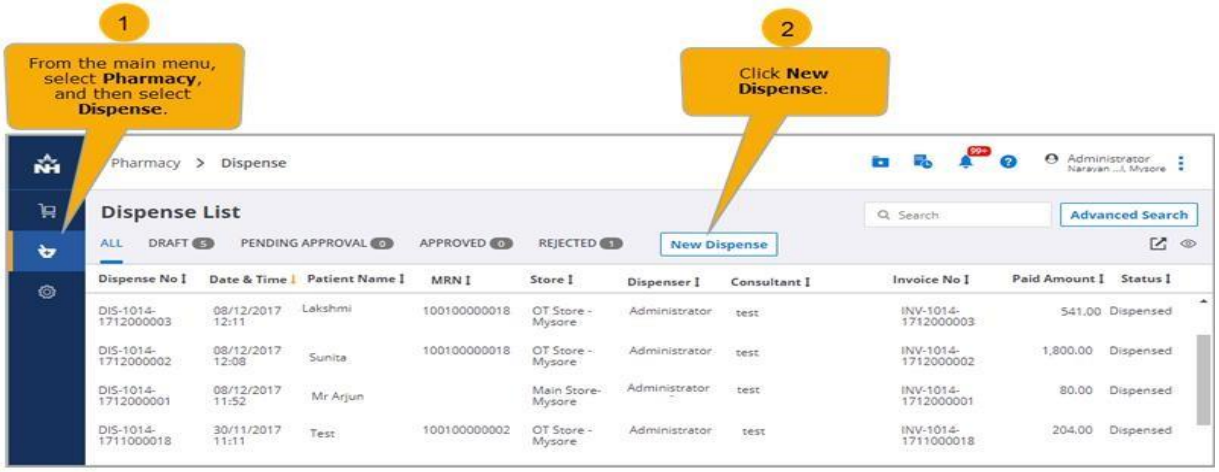

Figure 40 IP Dispense

- Direct Issue: Allows direct issuing of medicines and other supplies without pharmacy orders
- IP Return: Helps manage the return requests

Figure 41 IP Return List

- Direct Return: Supports return of medications and supplies from IPD, Day Care, ER without return requests
- Reports: Include relevant reports that give detailed and summarised information about various functions.

ABOUT AADI:

A mobile application which enables the consultant to:

- Access reports, vitals, progress notes, family contact details of the patients admitted under him/her.
    - The doctor can place IVR calls to the patient's attendants
    - The doctor can enter progress notes of the patients
    - Doctor can place investigation orders and medication orders
    - Cross consultation referrals can also be provided via AADI itself
    - Initial assessment made by the emergency doctors is also accessible via AADI.
    - Doctors can view, edit and sign off the discharge summary
    - Doctors can view, add and delete consultants from a doctor's care team.
- View his/her appointment list which included both physical appointments and video consultation appointments.
    - Consultants can do Video consultations via AADI itself from the comfort of their home

Figure 42 AADI application

Figure 43 AADI IPD View

Chapter 8: PROCESS OF EMR IMPLEMENTATION

The rolling out of EMR implementation was done 4 phases based on the outcomes of the previous phase.

Phase 1: Understanding the Structure

At the beginning of the study, the author of the report was unaware of the structure of EMR as she was new to the organisation, hence, a hand – on training was given at Dharamshila Narayana Hospital. The training included understanding various modules of ATHMA, AADI, MOKSHA, ATTUNE, IT HELPDESK. This was mandatory as without this process it was not possible to break the ice of staggered 45% compliance of EMR in Narayana, Gurugram. After one week training and overall idea of the various platforms which will allow transforming manual process to digital platforms. Post training, overall feedback from various consultants and patients was taken regarding their experience in complying to EMR.

And it was decided to start with phase 2 on March 1'2021.

Phase 2: Communication with stakeholders

As the structure was understood, various stakeholders necessary for digital adoption were identified.

Stakeholders Include:

1. Unit IT team – Backend infrastructure development
2. Corporate IT team – Backend software and infrastructure development
3. Consultants – As users
4. Patients – As users
5. Unit Management

Facilitation Activities Performed:

- Opinions, Feedback interviews, ease of usability were introspected.
- Need assessment for training facilitation was done
- Trainings were given to consultants (Individual/ Group) as per the need assessment

- Written training modules developed for consultants' ease

Phase 3: Understanding the infrastructure needs

As a remarkable improvement was seen in compliance related to digital adoption therefore, the focus for the third phase which began from 1st April was to learn about infrastructure requirements of the consultants.

Phase 4: The lockdown

As the second wave of COVID- 19 pandemic forced many consultants and patients to stay back home. The requirements of all the stakeholders changed and hence we adopted for more interactive and problem-solving mechanism. Rather than concentrating on increasing the compliance, the focus now was to maintain the compliance achieved in the Phase 3 with facilitation of resource availability at dispersal.

Chapter 9: OUTCOMES OF FACILITATING IMPLEMENTATION

9.1 Outcome of Phase 1:

Phase 1 was about gaining the knowledge of the structure of EMR in NH. The learnings of phase 1 are as what explained in the section: Structure of EMR.

9.2 Outcome of Phase 2:

Below is the comparison of improvements from Feb'21 to March'21:

Feb % Usage	March % Usage	% CHANGE
50%	72%	22%
FEB OVERALL OP VOLUMES	MARCH OVERALL OP VOLUMES	% CHANGE
2648	3438	23%
Feb % Adoption	March % Adoption	% CHANGE
61%	82%	21%
Feb % Training	March % Training	% CHANGE
71%	83%	12%

In a discussion with management a target for March was set, status of which is as follows:

	March Target	Achieved
Usage	90%	72%
Adoption	80%	82%
Training	80%	83%

FEB TOP 5 SPECIALITIES		
TOP 5 SPECIALTIES	OPD NEW & REVISIT VOLUMES	% USAGE
NEPHROLOGY	158	82%
NEUROLOGY	143	97%
HEAD & NECK SURGERY - ONCOLOGY	44	86%
GENERAL MEDICINE	559	76%
MINIMAL ACCESS GI AND BARIATRIC SURGERY	89	71%

MARCH TOP 5 SPECIALITIES		
TOP 5 SPECIALTIES	OPD NEW & REVISIT VOLUMES	% USAGE
GENERAL MEDICINE	803	88%
NEPHROLOGY	228	94%
GASTROENTEROLOGY	205	87%
NEUROLOGY	175	97%
MINIMAL ACCESS GI AND BARIATRIC SURGERY	114	83%

MAJOR IMPROVEMENT AREAS	FEB USAGE %	MARCH USAGE %
ORTHOPAEDICS	8%	78%
RADIATION ONCOLGY	5%	34%
PHYSIOTHERAPY	0%	43%
PLASTIC SURGERY	0%	60%
GYNAEONCOLOGY	0%	34%
E.N.T	52%	74%

MAJOR ISSUES RAISED:
1. PATIENTS NOT REFLECTING IN ATHMA AFTER BILLING
2. SLOWNESS OF AADI AND ATHMA
3. DROP DOWN MENUS TAKE TOO MUCH TIME TO UPLAOD
4. OLD PATIENTS STILL REFLECTING IN AADI EVEN AFTER DISCHARGE
5. NO OPTION TO ENTER NOTES FOR DRESSING PATIENTS
6. NO OPTION TO ENTER NOTES FOR FOLLOWUP PATIENTS IN RADIOTHERAPY WHO HAS COMPLETED PACKAGE BILLING ONE TIME ONLY

9.3: Outcomes of Phase 3:

All these major issues were taken care of in the phase 3:

TRAINED	ADOPTION	OVERALL OP VOLUMES	% USAGE OVERALL
84%	84%	1917	70%

TOP 5 SPECI	OPD NEW & REVISIT VOLUMES	% USAGE
CARDIOLOGY - ADULT	304	80%
NEPHROLOGY	176	90%
NEUROLOGY	126	96%
GASTROENTEROLOGY	90	82%
MINIMAL ACCESS GI AND BARIATRIC SURGERY	58	84%

Area of major focus in 3rd phase was:

BOTTOM 5 SPECIALTIES	OPD NEW & REVISIT VOLUMES	% USAGE
INTERVENTIONAL NEUROLOGY	8	0%
GYNAECOLOGY - ONCOLOGY	9	0%

LIVER TRANSPLANT	17	18%
CARDIAC SURGERY - ADULT	26	23%
MEDICAL ONCOLOGY	115	23%

9.4: Outcome of Phase 4:

Now the target for May Month was to bring the number so Bottom user departments up and hence strategy of driving their implementation with the efforts of management were made.

However, the COVID –19 second wave struck but our efforts were undeterred. And hence the results were better than what was expected out of a really tough time.

TRAINED	ADOPTION	OVERALL OP VOLUMES	% USAGE OVERALL
88%	83%	1546	77%

TOP 5 DOCTORS	OPD NEW & REVISIT VOLUMES	% USAGE
CARDIOLOGY - ADULT	274	89%
GENERAL MEDICINE	158	80%
PULMONOLOGY	158	91%
NEPHROLOGY	134	84%
ORTHOPAEDICS	129	63%

BOTTOM 5 SPECIALTIES	OPD NEW & REVISIT VOLUMES	% USAGE
UROLOGY	43	33%
CARDIAC SURGERY - ADULT	13	3%
PHYSIOTHERAPY & PHYSICAL REHABILITATION	7	14%
LIVER TRANSPLANT	12	8%
OBSTETRICS & GYNAECOLOGY	22	5%

9.5 Advantages of Digital Adoption:

A) To patients:

- Patients can access their health records at their comfort
- Digital health records are saved for time indeed till the patient is alive
- Legibility of the prescription reduces medication errors
- Enhancing security of patient's personal information
- Allows ease of sharing the prescriptions/ investigation reports
- Ease in booking appointments with consultant's
- Access to a lot of health related informational/educational content
- Patients can book video consultations with doctor which was especially helpful during the first and the second wave of COVID Pandemic
- The attendants of patient's admitted in COVID ward were able to connect with their family/friends/relatives through patient specific zoom link and get connected with the patient
- Ease of downloading investigation reports

B) To consultants:

- Providing accurate, up to date and complete information about patients at the point of care.
- Enabling quick access to patient records for more coordinated, efficient care
- Securely sharing electronic information with their patients and other clinicians for opinions
- Helping, aiding clinicians in diagnosing patients, reduce medical errors, provide safer care
- Improving patient and provider interaction as well as providing health care convenience
- Talk to patients over video calls
- Consultants can edit, amend or sign off discharge summaries through the AADI app which allows discharging of their patients as and when required
- Consultants can access reports of their patients from home thus allowing them to monitor their patients' health even when they are not in the hospital
- Enables patients to check for their next day appointments on the app

C) To hospital management:

- Makes a lot of data available for analysis and planning
- Allows streamlined coding and billing
- Helps providers analysis work life balance of their employees and enhance productivity
- Various parameters like:
    - Waiting time
    - Discharge time
    - Consultation Time
    - Medication ordered by the consultants
    - Most commonly prescribed medicines
    - Number of each medicine in Inventory
    - Drug interaction alert
    - Drug Food interaction alert
    - Investigation ordered and if the patient got that investigation done at the hospital
    - Ease of creating work patterns for patient which will also be available online for patients to book appointments
- With a lot, of data at disposal, the hospital management can utilise it in decision making

9.6 Bottlenecks and Challenges:

- Major bottlenecks lie with adoption of a new system of clinical practice
- With EMR, network and IT infrastructure has to be flawless in order to make end users use it with enthusiasm
- It is human nature that when we don't want to adopt some new habit, we will find all types of excuses to not go for it, to get over this resistance in adopting to digital platforms we need to have organised complaint redressal mechanism which provides quick resolution to problems
- Incorporation of new suggested features quickly into the software which can improve the user experience.

9.7 Future Plans:

Right now, in Narayana Super speciality Gurugram, Consultants are using EMR in OPD only. The way ahead is to implement ATHMA in IPD, ICU and OT as well. Although doctors are using AAADI application for IPD and ICU patients however, for progress notes, vitals, medication orders, and investigation orders still manual processes are in place which in coming few months will be transformed into Digital mechanisms.

9.8 Consonance of NH Digital Platforms with NDHM:

Scoring is on a scale of 0-1-2

- 0: No compliance
- 1: Partial Compliance
- 2: Full Compliance

S.no	Feature	0	1	2
1	Availability of digital prescriptions/ reports instead of handwritten			✓
2	Collection of Health ID		✓	
3	AADHAR / phone number linked Health ID creation			✓
4	Issue of health ID to those who don't have one already		✓	
5	Print out of Health ID on generation		✓	
6	Notification of new health record published			✓
7	Any documents / health records shared shall meet privacy requirements			✓
8	Health records are preserved indefinitely			✓
9	Share aggregated data for public health	✓		
10	Migrate data on change of status	✓		

Chapter 10: Conclusion and Recommendations:

10.1 CONCLUSION:

1. Departments like Orthopaedics, Physiotherapy, Gynae and Obstetrics, Medical oncology and few others have shown remarkable results in terms of EMR Compliance as compared to the pre phase 1 where there was no EMR facilitator for the unit.
2. When management is keenly involved in driving of activities the compliance turns up.

3. Infrastructure requirements of Consultants and Patients when taken care of with single point of contact the gears of resistance slow down.
4. Challenges of stakeholders should be well understood to enhance their compliance
5. The end users' recommendations should be well taken care of by escalating it to the Software development team.

10.2 RECOMMENDATIONS:

1. Infrastructure related:
   a. When any digital platform is being rolled out it is recommended that infrastructure requirements are first in place them followed by rolling out of facilities.
   b. Printers, letter heads, doctor stamps are few facilities should be procured as soon as any digital platform is rolled out.
2. Software related:

a. In corporates, like Narayana super speciality Hospital. Any software developed is to be implemented across all the 24 units. However, it should be understood that there are some regional requirements and restrictions which needs to be taken care of while new platforms are launched.

b. Any change requests or new feature requests put forward by the stakeholders should be addressed on time as to they should also be aware to when will their requirement be fulfilled and if it is not going to be incorporated the why not?

3. Others:

a. Consultants feel that EMR or viewing reports on desktops is an administrative task so handholding of the doctors is required so as to make them understand that this makes their job easy

b. Consultants be provided with flyers or mauls with SOPs and Advantages of using EMR

c. When it comes from the consultant side to promote digital platforms like NH care app which is for online appointment system of patients, the usage will increase.

4. Branding Activities:

a. When we are going to make our hospital Smart hospital then patients should also be apprised on the benefits of online appointments, online payments, e-prescriptions, via flyers, in hospital brandings.

Chapter 11: Limitations of the Study:

1. The Implementation process was altered due to second wave of COVID
2. All the parameters of comparison between NDHM guidelines and NH Digital Adoption could be completed because the NDHM is not yet rolled out in the State of Haryana.
3. As planned, feedbacks and testimonies of stakeholders could not be recording due to minimal contact as per COID-19 Guidelines

Chapter 12: References

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