DISSERTATION

ON

EMRs IN DIALYSIS : A PERSPECTIVE STUDY

SUBMITTED BY

COL SANJIV KUMAR SHARMA

PG/15/071

POST GRADUATE DIPLOMA IN HOSPITAL AND HEALTH MANAGEMENT

2015-2017

UNDER THE GUIDANCE OF

Dr. ANANDHI RAMACHANDRAN

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT & RESEARCH

INTERNSHIP TRAINING

AT

JAY PEE HOSPITAL, NOIDA, NEW DELHI

ON

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INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT & RESEARCH NEW DELHI

CERTIFICATE

The certificate is awarded to

COL SANJIV KUMAR SHARMA

in recognition of having successfully completed his
Internship in the department of

NEPHROLOGY

and has successfully completed his Project on

EMRs IN DIALYSIS : A PERSPECTIVE STUDY

at

JAYPEE HOSPITAL ,NOIDA

He comes across as a committed, sincere & diligent person who has
a strong drive & zeal for application oriented learning

We wish him all the best for future endeavors

Dr Anil P Bhatt
HoD Nephrology,
Jay Pee Hospital,Noida

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Col Sanjiv Kumar Sharma , student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at Jay Pee Hospital ,Noida from 06-02-2017 to 30-04-2017.

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical. The Internship is in fulfillment of the course requirements.

We wish him all success in all his future endeavours.

Dr. A.K. Aggarwal
Dean, Academics and Student Affairs
IIHMR New Delhi

Dr. Anandhi Ramachandran
Mentor,
IIHMR, New Delhi

CERTIFICATE OF APPROVAL

The following dissertation titled **" EMRs in Dialysis : A Perspective Study"** 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. Dissertation Examination Committee for evaluation of dissertation.

Name

Signature

Manav Chaudhary

CERTIFICATE FROM DISSERTATION ADVISORY COMMITTEE

This is to certify that **Col Sanjiv Kumar Sharma,** a graduate student of the **Post- Graduate Diploma in Health and Hospital Management** has worked under our guidance and supervision. He is submitting this dissertation titled **EMRs in Dialysis : A Perspective Study** in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management.**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

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Dr. Anandhi Ramachandran,
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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **EMRs in Dialysis : A Perspective Study** and submitted by Col Sanjiv Kumar sharma , Enrollment No. PG/2015-17/071 under the supervision of Dr. Anandhi Ramachandran for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 06-02-2017 to 30-04-2017 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

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COL SANJIV KUMAR SHARMA

13 May 17

ORIGINAL LITERARY WORK DECLARATION

Name of Candidate : Col Sanjiv Kumar Sharma

Enroll No. : PG/2015-17/071

Name of Degree : PGDHM

Title : **" EMRs in Dialysis : A Perspective Study"**

Field of Study: EMRs mapping for Dialysis

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Date : 18 May 17

Name : Col Sanjiv Kumar Sharma

FEEDBACK FORM

Name of the Student	: Col Sanjiv Kumar Sharma
Dissertation Organisation	: Jay Pee Hospital Noida
Area of Dissertation	: EMRs in Dialysis
Attendance	: Complete
Objectives achieved	: Understanding and Mapping of EMR and development of Dashboards
Deliverables Dashboard of biomarkers	: Risk profile assessment based on Biomarkers
Strengths	: Domain Knowledge, Gap Analysis, Innovative Approach

Suggestions for Improvement : App /Software development for Dialysis info

Suggestions for Institute : Predictive Analytics on the Subject

Dr Anil P Bhatt
HoD Nephrology,
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SYNOPSIS

Introduction

Dialysis is the procedure in which the detoxification of blood is done at the medical facility or dialysis centre with the help of a dialysis machine , dialyser and dialysate. The cost of dialysis in corporate hospitals varies from Rs 3000 to Rs 4500 per dialysis. As of now there is no nationwide statistics available for the Chronic Kidney Disease / End Stage Renal Disease, but globally the rate of requirement of dialysis treatment for ESRD patient is increasing at 7%, where as in India it is estimated at 10%. Keeping in view the growth of disease, there are 2.2 lakh people added every year for dialysis requirement. To the meet this ever widening gap in resources required for the dialysis the National Dialysis Program was launched in April 2016. A patient require minimum two dialysis per week, with each dialysis session lasting for 3 to 4 hours, which generates a large data, which is neither captured nor archived. Since there is lack of information pertaining to the CKD/ESRD patients it becomes mandatory that acquisition of data pertaining to this disease is carried out earnestly. Since Health Information Technology and EMR implementation, are making deeper ingress into the Public Health system ,study of EMR from the dialysis perspective ,becomes pressing and pertinent, which makes it the genesis of this study.

Objectives

The objectives are , to study and understand EMR from the dialysis perspective, identify the gaps, suggest methods for convergence, recommend potential benefits of implementation, gather data and develop dashboards for a quick analysis for the clinician

Methodology

To start with, a visit to the dialysis facility was carried out to get an overview. After a keen observation of the procedure, the important areas of concern, related to the workflow were identified. The information up take was classified into two major domains i.e registration process of the patient through EMR and the conduct of dialysis of the patient. In depth interviews were carried out with the help of interview guide, so as to get free, frank opinions /advices besides the requisite info.

Desk review of the EMR was carried out to scrutinize and understand its different features. Walkthrough of the dialysis procedure was carried out along with the nursing and technical staff of the dialysis centre to under the sequence of action for information and workflow. Having understood the aspects of functioning, they were translated and mapped into the EMR registration and dialysis centre workflows. For the purpose of automation and capturing of data, use cases for registration through EMR and the dialysis procedure were also developed. For assessment and flow of sequence of information , data flow diagrams were made for the registration as well as the dialysis procedure.

To appreciate the inadequacy in both the systems of registration and dialysis, gap analysis was carried out with the help of a fishbone diagram. For carrying out data analysis, one

year secondary data of the monthly protocol of biomarkers of the dialysis patients was collected, the important clinical parameters required for assessing the health performance of dialysis patient were identified in consultation with the clinician. Based on two functional requirements, these parameters were then classified into two sets , one reflecting the of dialysis { URR, Serum Bicarbonate, Blood Urea (Post-Dialysis)}and the other reflecting the condition based on nutrition uptake { Albumin, Serum Phosphorus, Hb, Serum Calcium, Blood Urea(Pre- Dialysis)} of the patient. As per the advice of the Clinician, based on the values of biomarkers, of the regular patients with best health outcomes, benchmark values of all other parameters were defined. These benchmark values of the best performers were used as a standard for profiling the performance of other dialysis patient. Mean of the last twelve months value of the biomarkers for regular patient was matched with mean of the last six month values of an irregular patient ,the trend of these value was also plotted for the type of patients and projected to the clinician as a snapshot of performance on dashboard.

Outcomes

The study has been successful in pointing the reasons for lack of optimum utilisation of the EMRs. During the interviews it has come to highlight that that design of the EMR is not comprehensive, user-friendly, and does not match with the workflow and is incapable to capture the requirements of dialysis procedure. The staff is technological savvy and has a positive attitude. Clinicians find it difficult to interact with the patient and encode the data in the EMR as it adversely affects the Doctor-Patient interaction.

Provision of a supporting staff to the clinician , will facilitate the implementation and its adaption with the workflow. EMR has features which are not utilised by the staff, some of them are not provided access by the vendor. Analytics feature is available in the HIS, however it is blocked by the vendor.

Finally, it is realised that the required data for dialysis procedure can be mapped, by designing suitable forms and encoding data through portable devices like Tabs and Kiosks. For analytics, the required data for health performance of dialysis patients can be provided to the clinician, as per his requirement, based on the continuous and accurate capture of data during the dialysis procedure. Provision of the dashboard will facilitate improved and informed decision making leading to multifold rise in the productivity, profitability and quality of care.

ACKNOWLEDGEMENT

Sincerity of Purpose , Sustained Guidance and Soulful Perseverance are the prerequisites for achieving any goal in life. Support from Superiors and blessings of the Almighty helps us to progress on the destined path.. I wish to thank the divine power that provided me with the Energy , Enthusiasm and Competence to undertake the Endeavours needed to complete this summer training.

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LIST OF ABBREVIATIONS

EMR	Electronic Medical Records
DIS	Dialysis Info Sheet
DTR	Dialysis Treatment Record
OPC	Out Patient Case Sheet
AKI	Acute kidney Injury
ESRD	End Stage Renal Disease
CKD	Chronic Kidney Disease
HIS	Health Information Systems
LIMS	Laboratory Information Management Systems
RIS	Radiology Information System

APPENDICES

1. Organization Overview

The Jay Pee Hospital was conceptualized by revered Founder Chairman, Shri Jai Prakash Gaur with the vision of promoting world-class healthcare amongst the masses by providing quality and affordable medical care with commitment.

Fig 1.1

Jay Pee Hospital at Noida is the flagship hospital of the Jay Pee Group, which heralds the group's noble intention to enter the healthcare space. This hospital has been planned and designed as a 1200 bedded tertiary care multi-specialty facility and has commissioned 525 beds in the first phase.

The Jay Pee Hospital is constructed across a sprawling twenty-five acre campus in Sector 128, Noida which is easily accessible from Delhi, Noida and the Yamuna Expressway.

The Jay Pee Hospital is established on the following fundamental principles:

- Patient centric high quality care
- Evidence based medicine
- Ethical treatment
- Value for money

Infrastructure Highlights

- 525 beds in first phase
- 150 Critical Care beds
- 24 bedded Advanced Neonatal ICU
- 20 bedded Dialysis Unit
- 325 ward beds with Suite, Deluxe, Twin Sharing and Economy options
- 18 Modular OTs
- 4 Cardiac Catheterization Lab with Hybrid Operating Room
- 2 Linear Accelerator (IMRT, IGRT and VMAT), 1 Brachytherapy Suite, Wide Bore CT Simulator
- 2 MRI (3.0 Tesla) with High Intensity Focused Ultrasound
- 256 Slice CT Scan, CT Simulation
- 64 Slice PET CT, Dual Head 6 Slice SPECT CT, Gamma Camera
- Da Vinci Robotic Surgery for comprehensive robotic surgical solutions

Vision

Promoting healthcare to the common masses with the growing needs of society by providing quality and affordable healthcare with commitment.

Mission

The Jay Pee Group is committed to serve the cause of millions who seek dedicated quality and affordable healthcare through its multi-super specialty facility, the Jay Pee Hospital. With advanced healthcare facilities, the latest diagnostic services and state-of-the-art technology focused on medical specialties, the Jay Pee Hospital strives to be the ultimate choice for medical care.

Core Values

- **Quality:** We shall maintain the highest standards and achieve them by continually measuring and improving outcomes
- **Innovation:** We welcome and encourage change and continuously seek better and more efficient ways to target success
- **Teamwork:** We shall collaborate and share knowledge, for the advancement of our mission
- **Service:** We strive to exceed our patients and fellow colleagues expectations for comfort and convenience
- **Integrity:** We adhere to the highest moral and professional standards of honesty, confidentiality, trust, respect and transparency
- **Compassion:** We adhere to provide a caring and supportive environment for all our patients, their families and fellow colleagues

2. Introduction

Today, technology has become an integral part of any system. Healthcare is one of the sectors which has seen immense development with the use of technology. Keeping the population explosion and limited resources at hand , technology has replaced the paper based communication with EMR system. With the help of information technology it has been possible to improve the quality of care, improve efficiency and effectiveness of the staff and also reduce some organizational costs.

Health Information Technology (HIT) and the use of Electronic Medical Records (EMRs) has increased through efforts to achieve the following: reduce medical errors, provide more effective methods of communicating and sharing information among clinicians, lower organizational health care costs, better manage patient medical records, and improve coordination of care and health care quality. While adoption and implementation has increased significantly within the recent years, not all hospitals and healthcare organizations have chosen to adopt an EMR system.

The primary aim of this research is to gain an understanding of the of Electronic Medical Records (EMR) systems from the perspectives of Dialysis, identify the gaps and map them into the EMR for effective and efficient functioning of the HIS in the organization.

It is observed the EMRs are generic in nature and as a part of Hospital Information System are not able to function in a comprehensive manner, the data required for the specific requirement related to the different department of the hospital or not captured, which results in inadequate

capturing or encoding of the data and incomplete inadequate and inconclusive functioning of the HIS.

Aim of the study is to develop an understanding of the dialysis procedure from the clinical perspective, identify the parameters involved for assessment and evaluation of health outcome, map-in those parameters for their presence in the EMR, carrying out gap analysis and suggest actions for meeting or bridging this gap between virtual requirement and real capturing of data. At the end, as a part of study an endeavour is carried out to understand the requirement of information from the clinician perspective and how can it be presented to the clinician for prompt and informed decision making.

2.1 Dialysis Procedure

Dialysis may be defined as a process for removal of excess water and waste from the blood, which are the functions normally done by organ called kidney, it is used as a procedure for patient suffering with acute disturbance in the Kidney function which is

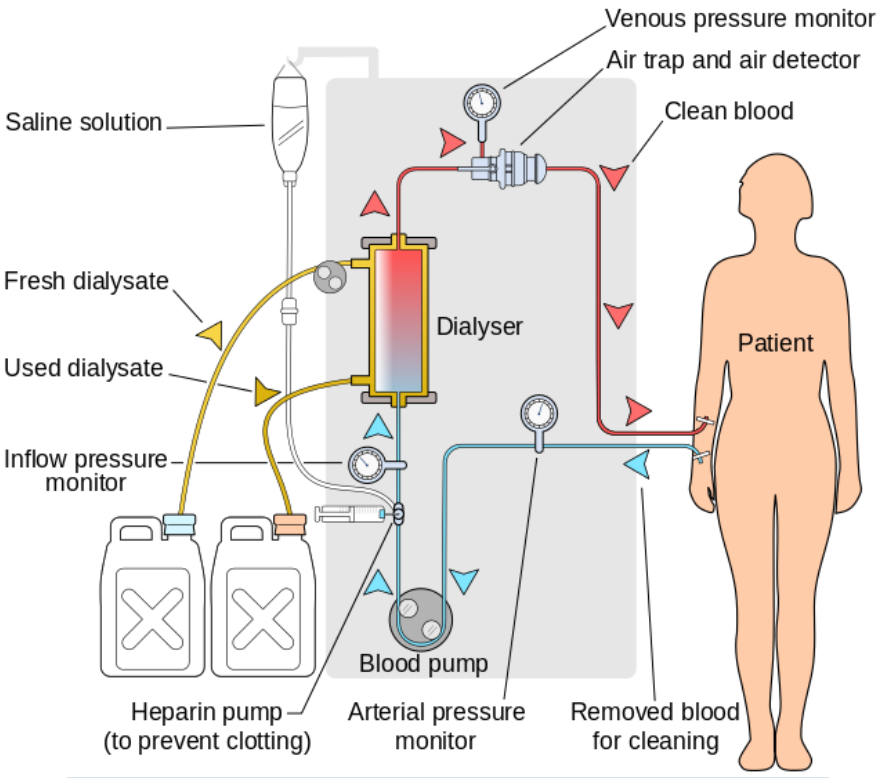


Fig 2.1

called Chronic Kidney Disease (CKD) or End Stage Renal Disease(ESRD) or Acute kidney Injury (AKI) or renal failure .The disease is progressive in nature and it is only in the fifth stage of the disease when the kidney stops filtration of the toxic waste absolutely, when the requirement of dialysis is felt. Dialysis is considered as a substitute for a normal functioning kidney and is been adhered till the time, a transplant of kidney is not carried out. The functioning of Dialysis as procedure is as shown in Fig 1.1

3. Review of Literature

Carrying out the literature survey, Google scholar for a search of "EMR in kidney care" gives 9830 results, next specifying a bit further, "EMRs in dialysis" gives a result of 5410 results, clarifying this search to "EMRs in capturing of data in Dialysis" the results comes down to 2980 and finally fine tuning to check the details of state of "EMRs in dialysis in India" it gives 903 details.

The papers mentioned cover the clinical aspects and research associated with the different morbidity and mortality rates associated with kidney care.

National Dialysis Program gives the requirements and provisions of starting a Dialysis Centre and the associated record keeping to be maintained (1).These are further supplemented by the SOP and the guidelines of Indian Society of Nephrology (2)

The burden of chronic kidney disease is increasing at an alarming rate all over the world, in India due to lack of financial resources, trained manpower, and privately oriented health policies the burden is likely to be more heavy to be dealt with. Maintenance dialysis is a recognized modality for treating the patients and improving the quality of life. With an alarming rate of increase, the prevalence of CKD ranges between 0.7 % to 1.4% ,making it an important aspect which is bound to adversely affect the public health of the nation, drastically

Searching for the satisfaction and adoption of EMR in facilities providing dialysis (1) it clearly stands out, there is a requirement of capturing of realistic data which should be incorporated in the EMR. Thus the EMRS are found wanting making the HIS an incomprehensive information system

Adoption of EMR and its implementation can have many reasons but economic factors and in incentives have been identified as one of the main reasons in case of USA, considering the economics be not the only factor but the communication and sociocultural factors may also have impacts on adoption and implementation of EMRs which include the environmental ,organisational the individual levels of functioning in the organisation (2)

Electronic health records have got integrated with medical practices, appropriate use of EMR potentially improves patient care while an appropriate use make cause an undefined harm. The potential applications of an EMR could be ranging from developing predictive models to clinical decision support system which will improve the quality of care and outcome of the patients with Kidney Disease(3)

It is been established that the EMR has the potential to transform the in medical care practice and leads to enhancement of Healthcare delivery it also associates in decision making processes the benefits of EMR includes updation of medical list, improved prescription notes and readily available charts for progress or regression of the morbidity. Despite the challenges in the developing countries it is felt and found feasible to design and implement any EMR that support the environment (4)

Electronic medical record are the means to create legible, organised data and make it accessible to derive clinical information. Despite the positive effects EMRs adoption rate has not been Encouraging and meet resistance generally from the physicians. The common reasons projected for the failures are lack of time for familiarity with the new technology absence of computer skills,

workflow disruptions, disruption in doctor- patient interface, interoperability leading to rework and lack of dissemination of information, inadequate data exchange between systems, dual system of functioning that is paper as well as electronic, duplication of manual entry, unsynchronized switching between different systems and need of accessibility of data irrespective of provider and point of care(5)

When it comes to mapping of the different parameters of dialysis , it is observed that the EMR does not capture the parameters as per the workflow hence either the workflow has to be adapted as per EMR or the EMR has to be redefined based on the workflow. It is possible to develop the EMR components based on the open source software for EMR and Workflow management Building Dialysis Workflows into EMRs system(6)

For kidney care to be effective, instead of depending upon performance of single biomarker it has been established that for adequacy of treatment ,a multidimentional approach of performance and relation of all the biomarkers with each other could be used for proving the effective and progressive health outcomes of kidney care patients(7)

Most important parameters for the healthy outcome of Kidney Disease patients is a target dose and volume removal of the fluid. These two data, are collected manually which makes them error and bias prone. This lack of integration of the dialysis device data from clinical information system that is the EMR is a big barrier in effective care of these patients. A need is felt for automated data capture, in real time from the dialysis devices that include the delivered dose, ultra filtration rate and pressure measurements, these inputs can be leveraged for data mining, quality improvement and therapy adjustments(8)

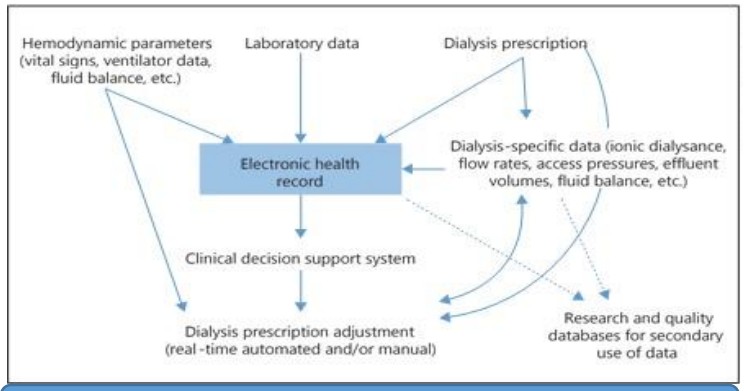


Fig 3.1

A well-designed EHR can reduce information overload by configuring the user interface to display preferentially subsets of task-specific data, at the point of care. It also provides system surveillance of healthcare delivery and provides real-time feedback on performance. The AKI-related EHR tools need to be seamlessly integrated into the environment and workflow in a manner that use the understanding of distributed cognitive function and 'choice architecture' to optimize patient-centered outcomes (9)

4. Objective

The objective of the dissertation is to study and understand existing EMR from the dialysis perspective, identify the gaps and suggest actions and input for capture of the dialysis information, to facilitate informed decision making.

The specific objectives being:

(a) To understand the workflow of the dialysis procedure

(b) To explore the existing gaps in maintaining patient information using EMR

(c) To illustrate potential benefits of use of EMR for dialysis patients

(d) To provide potential recommendations for effective use of EMR

(e) To provide dashboards for the doctors for presumptive and prompt clinical analysis

5. Methodology

5.1.1 Descriptive Study

To gather irrelevant inputs pertaining to the complete process of dialysis an observational method of study was adopted .An interaction with the team of technicians and nursing staff was subsequently carried out. For collection of more information pertaining to each activity and stage of dialysis starting from the registration at reception and culminating at an appointment for dialysis. To receive free and frank inputs structured in-depth interviews based on interview guide were carried out with the nursing staff, technical staff and clinician. The finer details missed out during the verbal interaction were further supplemented by second iteration and critical observation of process of dialysis, in progress. List of Questions for interview is attached as Appx A

5.1.2 Desk Review of EMR

To gather the relevant inputs pertaining to the EMR and about the functioning of the Health Information System of the hospital, a detailed desk review of the EMR was carried out. The review was, to understand, the user friendliness, the accessibility, the ease and visual appeal of the graphic user interface, the rights and access given to the different users, the responsibilities of entering the different data into the EMR, it was also to analyse what are the different widgets which are being provided in the Health Information System and EMR in specific. How is the layout of different widget affects the input of the data, what are the features which are fully exploited,

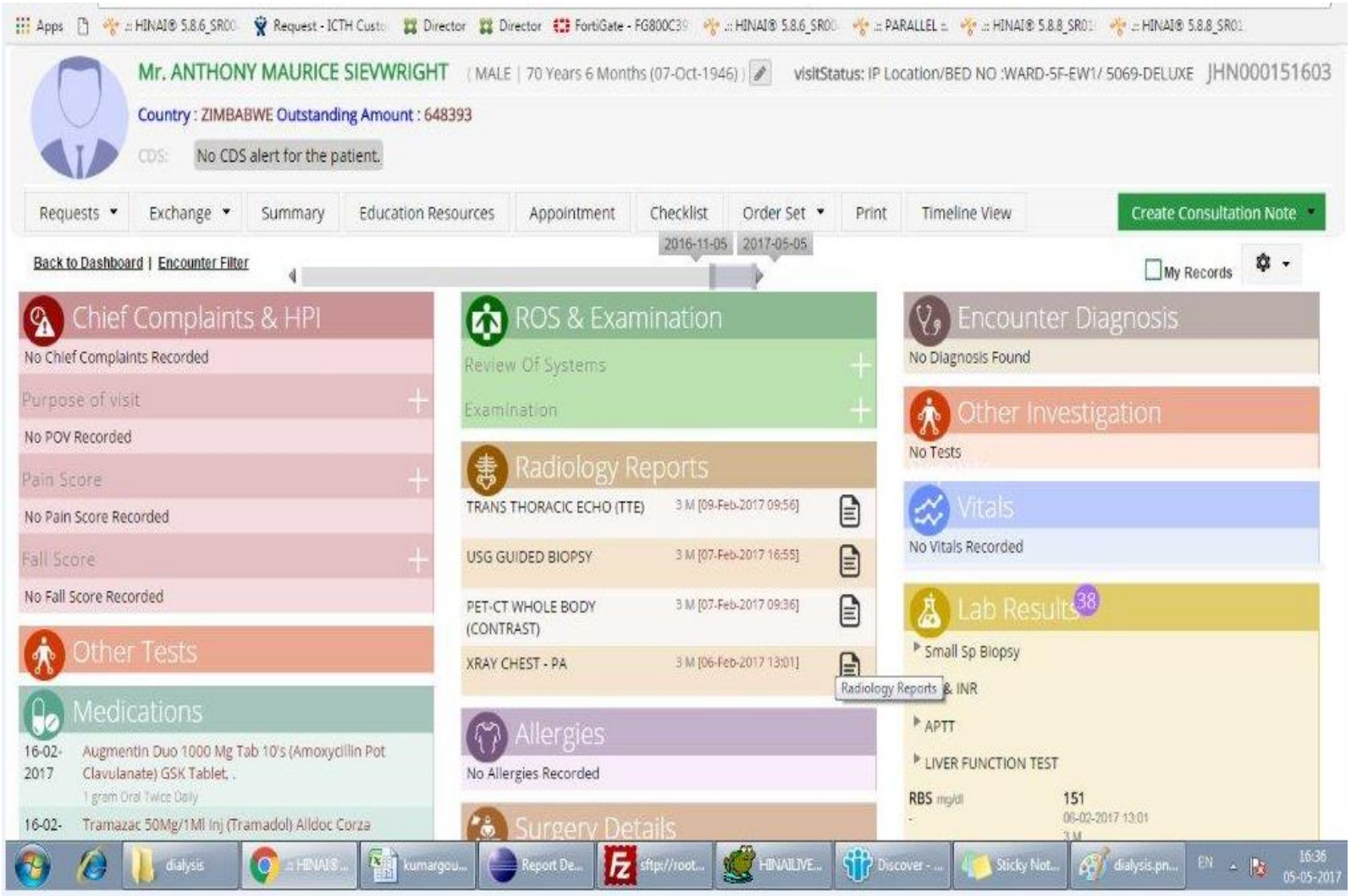

Mr. ANTHONY MAURICE SIEVWRIGHT | MALE | 70 Years 6 Months (07-Oct-1946) | visitStatus: IP Location/BED NO :WARD-5F-EW1/ 5069-DELUXE JHN000151603
Country : ZIMBABWE Outstanding Amount : 648393
CDS: No CDS alert for the patient.
Requests
Exchange
Summary
Education Resources
Appointment
Checklist
Order Set
Print
Timeline View
Create Consultation Note
2016-11-05
2017-05-05
Back to Dashboard | Encounter Filter
My Records
Chief Complaints & HPI
No Chief Complaints Recorded
Purpose of visit
No POV Recorded
Pain Score
No Pain Score Recorded
Fall Score
No Fall Score Recorded
Other Tests
Medications
16-02-2017 Augmentin Duo 1000 Mg Tab 10's (Amoxycillin Pot Clavulanate) GSK Tablet, .
1 gram Oral Twice Daily
16-02- Tramazac 50Mg/1Ml Inj (Tramadol) Alldoc Corza
ROS & Examination
Review Of Systems
Examination
Radiology Reports
TRANS THORACIC ECHO (TTE) 3 M [09-Feb-2017 09:56]
USG GUIDED BIOPSY 3 M [07-Feb-2017 16:55]
PET-CT WHOLE BODY (CONTRAST) 3 M [07-Feb-2017 09:36]
XRAY CHEST - PA 3 M [06-Feb-2017 13:01]
Radiology Reports
Allergies
No Allergies Recorded
Surgery Details
Encounter Diagnosis
No Diagnosis Found
Other Investigation
No Tests
Vitals
No Vitals Recorded
Lab Results 38
Small Sp Biopsy
& INR
APTT
LIVER FUNCTION TEST
RBS mg/dl 151
06-02-2017 13:01
dialysis
kumargou...
Report De...
sftp://root...
HINAILIVE...
Discover - ...
Sticky Not...
dialysis.pn...
EN
16:36
05-05-2017

Fig 5.1

and the balance which were not utilised at all or not open to access. How are the others widgets like Radiological Information System, Lab Information System, Pharmacy, Billing, Appointment scheduling is integrated with the data input in the EMR.

5.1.3 Form Reviews

To collect information on the different parameters and biomarkers which are used for assessment of health performance of the patient, the forms which are used for evaluation and recording of patient data were reviewed .The forms are:-

OPD Nursing Assessment It has got the basic demographic details, the details of complaints, psychological status, occupation, lifestyle, nutritional status, weight gain, pain assessment and fall risk screening

Out Patient Case Sheet The case sheet has got the details of the UHID , demographic data, the history, clinical assessment, provisional diagnosis, investigation details, treatment advised and the follow up date for the next appointment

Consent Form It has got the informed consent for HIV testing and pre-test counselling. It accompanies OPC sheet in case of viral marketing is to be carried out.

OPD Nursing Assessment- Adult

Name: _____ UHID: _____ Age: _____(in years)

Sex: Male ☐ Female ☐ Weight: _____(k.g) Height:_____(cm) BMI: _____(kg/cm²)

Chief Complaints: _____

Bp: _____ Pulse: _____ Temp: _____ RR: _____ SPO2: _____

Interpreter needed: Yes ☐ No ☐

Psychological Status: Calm ☐ Anxious ☐ Agitated ☐ Depressed ☐

Occupation: _____

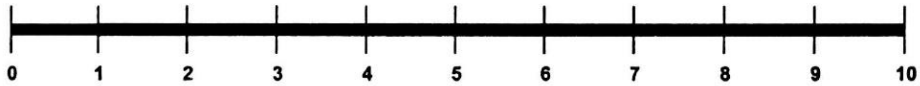
Life Style: Active ☐ Moderate ☐ Sedentary ☐

Nutritional Status: Appetite- Normal / Altered

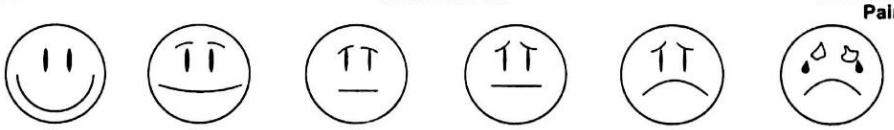
If Weight Loss/ Gain Is >3 Kg or < 3 Kg : ☐ Yes / ☐ No (Initiate Referral)

Functional Status: Independent ☐ Dependent ☐ (If dependent, provide assistance: Yes/ No)

PAIN ASSESSMENT



No Pain — Moderate Pain — Worst Possible Pain



0 No Hurt | 2 Hurts Little Bit | 4 Hurts Little More | 6 Hurts Even More | 8 Hurts whole Lot | 10 Hurts Worst

If pain scale score is >=4 inform Doctor ☐

FALL RISK SCREENING: (IF ANY OF THIS IS ☑ PATIENT IS AT HIGH RISK FOR FALL)

History of Fall ☐ Unsteady Gait ☐ Ambulatory Aid ☐ Abnormal Mental Status ☐ Elderly (>65 Years) ☐

Drugs : Anticoagulant Drugs ☐ Psychotropic Drugs ☐ Antihistamine Drugs ☐

Fall prevention interventions followed

- ☐ Always have an attendant to accompany you.
- ☐ Hospital Staff is available for you.
- ☐ Always have safety belt put on while using wheelchair.
- ☐ Please carry all the helping apparatus like eyeglasses, hearing aids, etc.
- ☐ Please be careful when lying down and getting up from investigation tables.

Disposition :

Assessment Done by..... ID No.....

Signature..... Date &Time.....

JHN/OPD/F/017/Ver. 2.0

Fig 5.2

JAYPEE HOSPITAL
LIFE FIRST

Patient Label/रोगी लेबल

CONSENT FORM FOR HIV TESTING AND PRETEST COUNSELING/
एचआईवी परीक्षण और पूर्व परीक्षण परामर्श के लिए सहमति पत्र

Patient's Informed Consent:

This is to state that I have been counseled about the HIV test and have been explained about the implications of the test results. All the details pertaining to HIV, its transmission, prevention, testing procedures, its limitations and interpretation of the result have been explained to me in manner that I can understand.

I, hereby give my consent for the test (s) to be conducted in order to ascertain my HIV sero-status.

Signature /Left Thumb Impression of Patient /Guardian

Patient Name (In block letter _____

Date & Time _____

मरीज की पूर्व सहमति पत्रः

मैं यह घोषणा करता/करती हूँ कि मुझे एचआईवी टेस्ट के बारे में सलाह दे दी गई है एवं टेस्ट के परिणामों के निष्कर्ष की विस्तृत जानकारी दी दे गई है। मुझे एचआईवी से जुड़ी विस्तृत जानकारी, इसका ट्रांसमिशन, रोकथाम, परीक्षण प्रक्रिया, सीमितता एंव परिणाम के निष्कर्ष की पूरी जानकारी इस तरीके से दी गई है, जिसे मैं समझ सकता/सकती हूँ

मैं इसके द्वारा मेरे एचआईवी सेरो-स्टेटस स्थिति जानने के लिए टेस्ट करने की सहमति प्रदान करता/करती हूँ।

मरीज/अभिभावक के हस्ताक्षर / अंगूठे का निशान

मरीज का नाम _____

दिनांक एवं समय _____

Counselor / Doctor's Commitment:

I hereby state that the patient/client have been counseled about the HIV test and have been explained about the implications of the test result. All details pertaining to HIV, its transmission, prevention testing procedures, its limitation and interpretation of result have been explained and the patient/client has given his/her free and informed consent to conduct an HIV test on him/her. I, the counselor, will do everything possible to assure that the consent of the counseling session and the test result will be kept confidential. I ensure that post test counseling will be given to the patient while having over the report.

Signature of Counselor / Doctor

Name (In Block Letter)_____

Date & Time _____

परामर्शदाता / चिकित्सक की प्रतिबद्धता

मैं यह घोषणा करता/करती हूँ कि मरीज को एचआईवी टेस्ट के बारे में परामर्श दे दिया गया है। एवं टेस्ट के परिणामों के निष्कर्ष के बारे में विस्तृत जानकारी दे दी गई है। एचआईवी से जुड़ी विस्तृत जानकारी, इसका ट्रांसमिशन, रोकथाम, परीक्षण प्रक्रिया, सीमितता एवं परिणामों के निष्कर्ष की पूरी जानकारी दे दी गई है और रोगी ने स्वंय का एचआईवी टेस्ट करने की स्वतत्रता एवं पूर्व सहमति प्रदान की है। मैं, परामर्शदाता, को यह आश्वस्त करने की हर संभव कोशिश करुंगा की परामर्श सत्र की सहमति एवं टेस्ट के परिणाम गोपनीय रखे जाएंगे। मैं सुनिश्चित करता हूं कि रोगी को रिर्पोट सौंपते समय टेस्ट के उपरांत परामर्श प्रदान किया जाएगा।

परामर्शदाता /चिकित्सक के हस्ताक्षर

नाम _____

दिनाकं एंव समय _____

Fig 5.3

JAYPEE HOSPITAL
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Patient Label/रोगी लेबल

HEMODIALYSIS / SLEDD TREATMENT RECORD

Date	Consent Taken ☐ Not Taken ☐	Dialyzer New ☐ Reuse ☐	Machine ID
Patient location	HbsAg HCV HIV	Dialyzer	Dry Weight
On Time Off Time	Treatment Duration		Weight Gain_____ Target Uf_____

Pre HD	Weight	Temp	Pulse	Pain Assessment (Wong Baker Scale) 0 No Hurt, 1 Hurts Little More, 2 Hurts Whole Lot, 3 Hurts Little Bit, 4 Hurts Even More, 5 Hurts Worst
	BP (Supine)		BP (Standing)	
Post HD	Weight	Temp	Pulse	
	BP (Supine)		BP (Standing)	

Access : ☐Avg. ☐Avf ☐Pc ☐Vc

Anti Coagulation
Heparin Bolus _____
Infusion_____
Total_____

At Fall Risk ☐ Yes ☐ No
Reason:
History of Fall ☐
Ambulatory Aid ☐
IV Access and Medications ☐
Secondary Diagnosis ☐
Unsteady Gait ☐
Abnormal Mental Status ☐
If Yes, Fall Prevention Intervention Followed ☐Yes ☐No

	Pain Score (0 –5)	Location & Charact-eristics	Duration	Increasing Decreasing Factors
Pre HD				
Post HD				

Teaching Done
☐Fluid Restriction
☐Diet
☐Access Care
☐Basic principles of Dialysis
☐Patient Verbalized Understanding ☐ Yes ☐ No

Plan of Care :

SAMPLE

Remarks

Nurse's Signature | Technician's Signature | Doctor's Signature

JHN/OPD/F/075/Ver 3.0

Fig 5.4

TIME	BLOOD PRESSURE	PULSE	BLOOD SUGAR	BLOOD FLOW	VENOUS PRESSURE	HEPARIN	NOTES	INITIALS

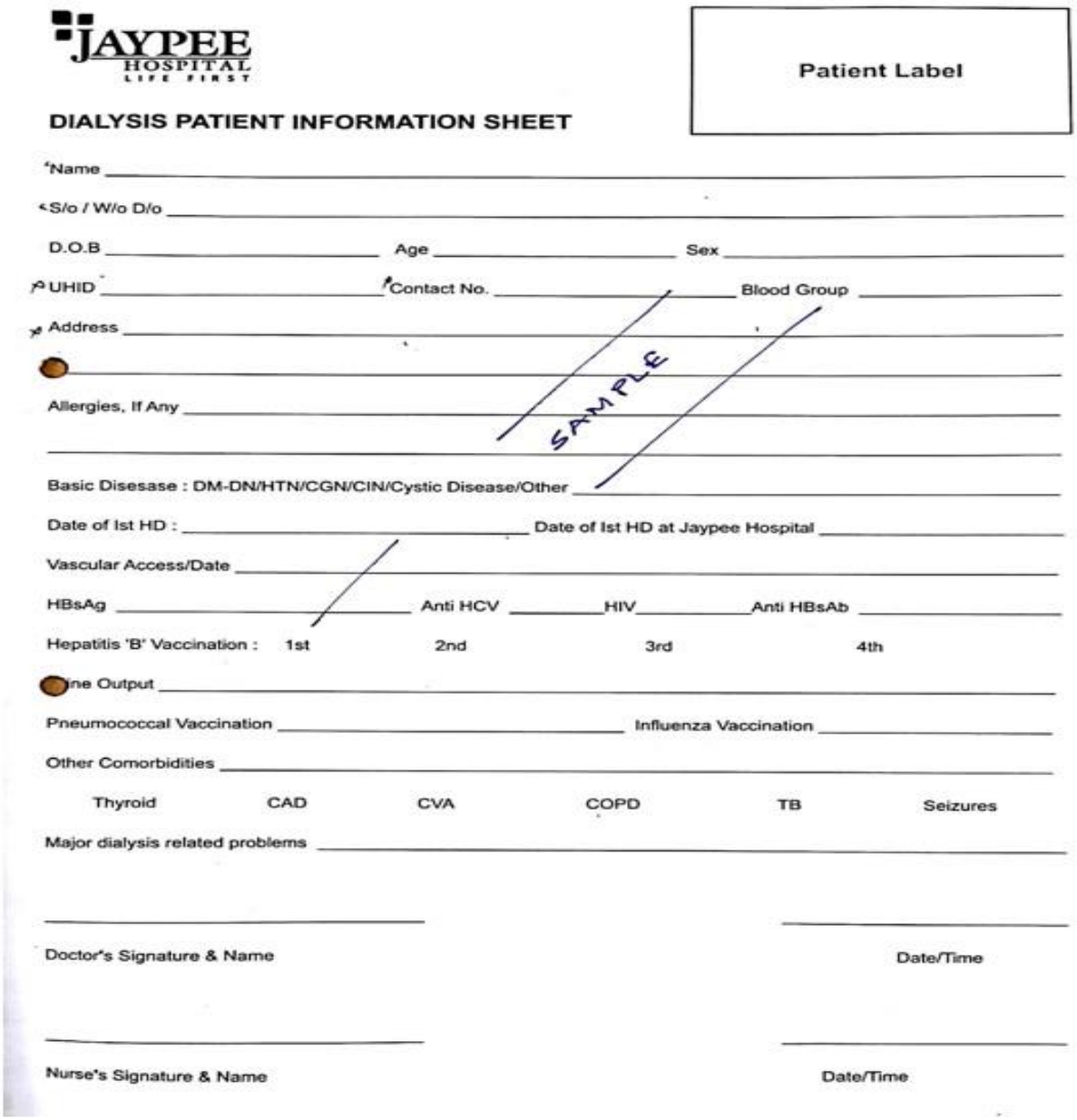
SAMPLE

MEDICATION RECORD

SL No.	DATE	MEDICATION ORDER	DOSE	ROUTE	DOCTOR'S SIGNATURE	REACTION NOTED	TIME	INITIA

PATIENT COMPLICATION	PRE RUN	RUN	TECHNICAL COMPLICATION	PRE RUN	RUN	TOTAL UF REMOVED	
						INITIALS	
						DATE & TIME	

Fig 5.5



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Patient Label

DIALYSIS PATIENT INFORMATION SHEET

*Name _____

*S/o / W/o D/o _____

D.O.B _____ Age _____ Sex _____

*UHID _____ *Contact No. _____ Blood Group _____

*Address _____

_____

Allergies, If Any _____

SAMPLE

_____

Basic Disesase : DM-DN/HTN/CGN/CIN/Cystic Disease/Other _____

Date of Ist HD : _____ Date of Ist HD at Jaypee Hospital _____

Vascular Access/Date _____

HBsAg _____ Anti HCV _____ HIV _____ Anti HBsAb _____

Hepatitis 'B' Vaccination : 1st 2nd 3rd 4th

Urine Output _____

Pneumococcal Vaccination _____ Influenza Vaccination _____

Other Comorbidities _____

Thyroid CAD CVA COPD TB Seizures

Major dialysis related problems _____

_____ _____

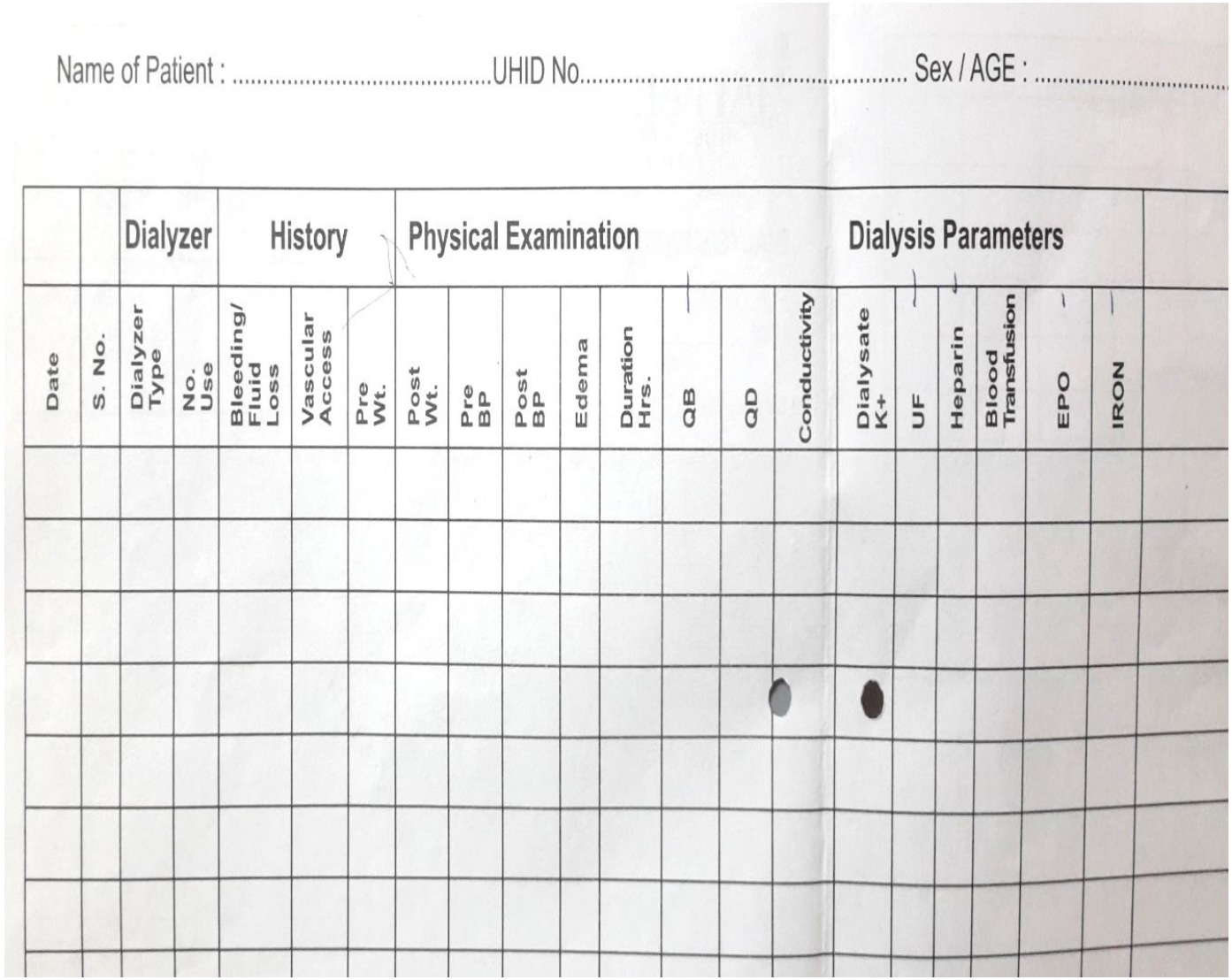
Doctor's Signature & Name Date/Time

_____ _____

Nurse's Signature & Name Date/Time

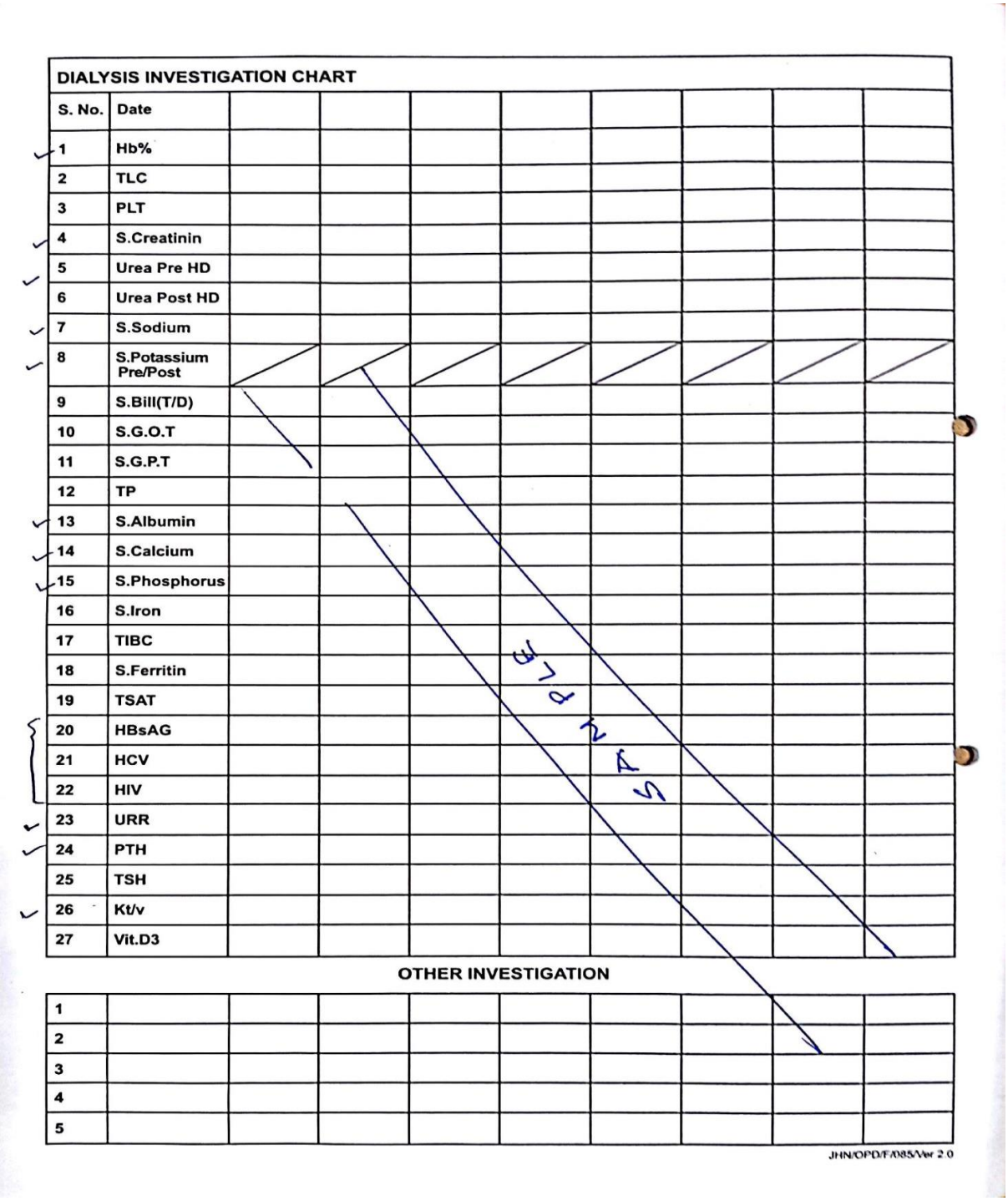
Fig 5.6

Name of Patient : .....UHID No..... Sex / AGE : .....



		Dialyzer		History			Physical Examination								Dialysis Parameters						
Date	S. No.	Dialyzer Type	No. Use	Bleeding/ Fluid Loss	Vascular Access	Pre Wt.	Post Wt.	Pre BP	Post BP	Edema	Duration Hrs.	QB	QD	Conductivity	Dialysate K+	UF	Heparin	Blood Transfusion	EPO	IRON	

Fig 5.7



DIALYSIS INVESTIGATION CHART

S. No.	Date								
1	Hb%								
2	TLC								
3	PLT								
4	S.Creatinin								
5	Urea Pre HD								
6	Urea Post HD								
7	S.Sodium								
8	S.Potassium Pre/Post								
9	S.Bill(T/D)								
10	S.G.O.T								
11	S.G.P.T								
12	TP								
13	S.Albumin								
14	S.Calcium								
15	S.Phosphorus								
16	S.Iron								
17	TIBC								
18	S.Ferritin								
19	TSAT								
20	HBsAG								
21	HCV								
22	HIV								
23	URR								
24	PTH								
25	TSH								
26	Kt/v								
27	Vit.D3								

OTHER INVESTIGATION

1									
2									
3									
4									
5									

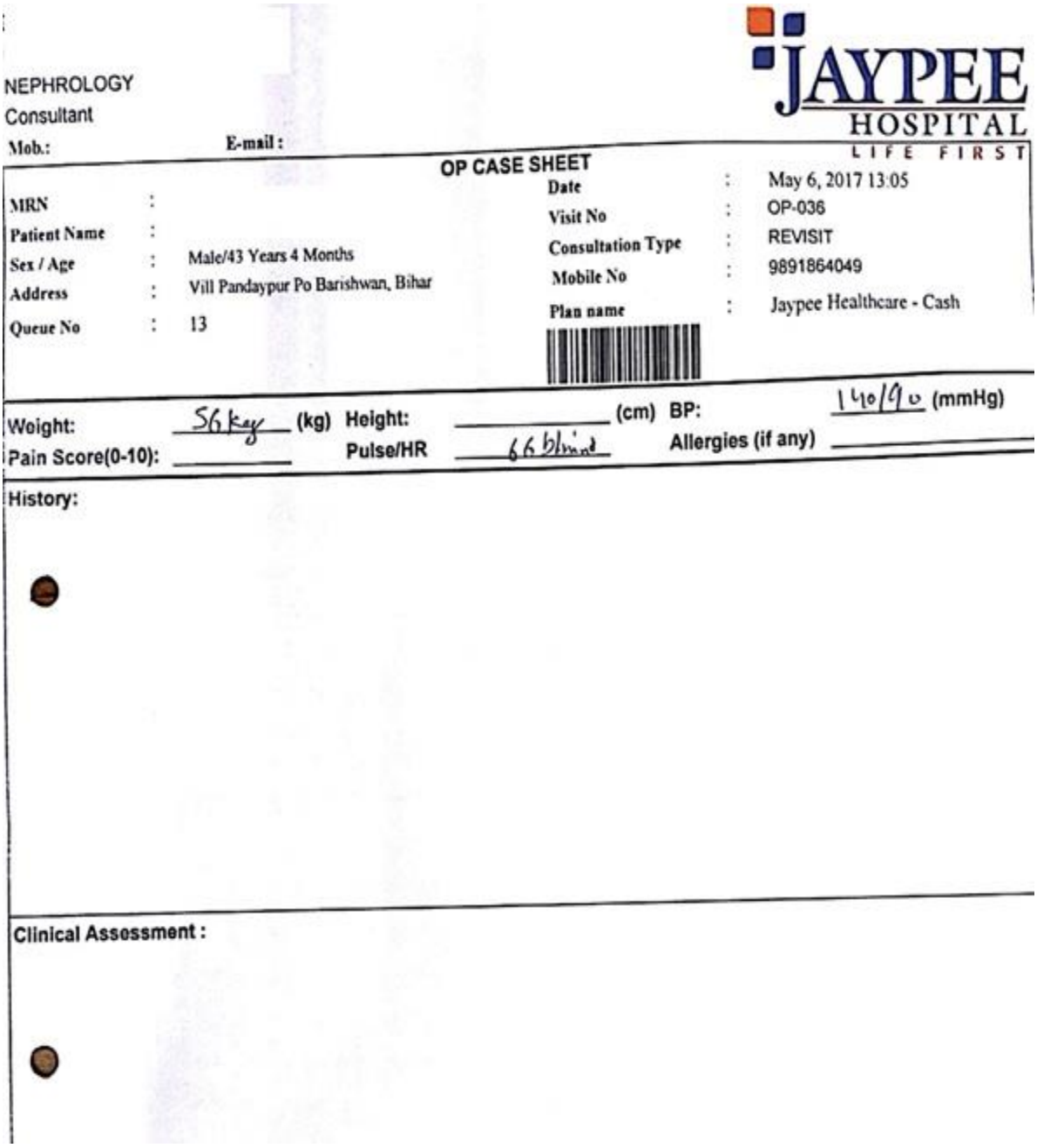
JHN/OPD/F/085/Ver 2.0

Fig 5.8

Dialysis Patient Information sheet. It has got the patient barcode ID, demographic details, viral marking details, comorbidity details and any other dialysis related complications. The next page of the form has got the details of dialyzer, the history of patient of any blood loss, physical examination of dialysis parameters and measurement of dialysis parameters pre and post dialysis. At the end of this sheet the details of the 27 biomarkers which are used for assessing the health performance of the patient for the last 8 data of monthly blood test protocols are maintained

Haemodialysis Treatment Record The record has got details of consent, the dialyser used ,the viral marking, the pre dialysis and post dialysis data, the pain score during dialysis, the fall risk assessment, patient counselling details, weight gain and target ultrafiltration followed by the plan of care suggested by the clinician. The next part of the treatment record has got the continuous monitoring data which is taken every half an hour about the blood pressure, sugar, pulse, blood flow, venous pressure, heparin dose and clinical notes. Besides this, is the medication record, dose and route with clinicians signature. It also has the details of complications encountered during the dialysis

Follow up book The book has got the demographic details, the details of the weight before and after the dialysis, along with the date for the next appointment for dialysis



NEPHROLOGY
Consultant
Mob.: E-mail :

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OP CASE SHEET

MRN	:		Date	:	May 6, 2017 13:05
Patient Name	:		Visit No	:	OP-036
Sex / Age	:	Male/43 Years 4 Months	Consultation Type	:	REVISIT
Address	:	Vill Pandaypur Po Barishwan, Bihar	Mobile No	:	9891864049
Queue No	:	13	Plan name	:	Jaypee Healthcare - Cash

Weight: 56 kg (kg) Height: _____ (cm) BP: 140/90 (mmHg)
Pain Score(0-10): _____ Pulse/HR 66 b/min Allergies (if any) _____

History:

Clinical Assessment :

Fig 5.9

Provisional Diagnosis :

Investigations Advised:

Treatment Advised:

Follow Up:

Consultant Sign **Date & Time:**

Fig 5.10

JAFFER
HOSPITAL

HAEMODIALYSIS FOLLOW-UP BOOK

NAME _____

UHID _____

AGE 57 Gender FEMALE

BLOOD GROUP _____

ADDRESS _____

_____

PHONE NO. _____

CONSULTANT IN-CHARGE _____

Fig 5.11

Name of patient _____

UHID _____ Age 57 Gender F

Permanent Address _____

_____

Present Address _____

Contact Number _____

Patient Diagnosis _____

Blood Group _____ Date of first HD _____

History of any previous transplant _____

Steroids, if any _____

HEPATITIS - B VACCINATION	VIRAL MARKERS
Date (0) _____	HbsAg NR on 31/12/16
(1) _____	HCV
(2) _____	HIV
(6) _____	HCV RNA _____
Booster _____	
PNEUMOCOCCAL VACCINATION	ANY OTHER VACCINATION

DOCTOR

Name _____

_____ Signature

Date / Time _____

NURSE'S

Name _____

_____ Signature

Date / Time _____

Fig 5.12

5.1.4. Analysis of Secondary Data

5.1.4 Analysis of Secondary Data

Going through the various forms and the parameters which are required for monitoring the health of the patient in the various stages i.e pre-dialysis, during dialysis and post dialysis stage, the biomarkers were selected for study. The monthly protocol of blood test which is used to assess the condition of the patient was used as a benchmark to create a standard. For assessment of health performance during dialysis. For this, one year data of dialysis patients was collected and their Health performance in the monthly protocol, which has 20 biomarkers in the test was selected. Out of the 64997 test ordered for the dialysis patients from the department, the 128 entries pertaining to regular patients undergoing dialysis were identified. After identifying the regular patients at the dialysis centre their pre- dialysis and post-dialysis readings were taken to filter them out from the casual patients. Based on the biomarkers and their value in the monthly protocol, the important parameters used by the clinician for a quick analysis and assessment of patients health were identified. Having identified the biomarkers, based on the advice and experience of the clinician in case of a good dialysis patient, the values of these biomarkers were defined and used as a standard for analysis. The biomarkers were classified in two set of variables, one reflecting about the adequacy of the dialysis procedure and the other projecting the health of the patient based on the nutritional intake. Based on the discussion and the experience of the clinician it was highlighted that investigation data of last 3 months and health performance of the patient during dialysis in the last 3 months is adequate for informed decision making and review before the patient is called for the next appointment or on the day of dialysis. Based on this, the three parameters i.e URR(urea reduction ratio), Blood Urea (post dialysis) and Serum Bicarbonate were considered to effect the adequacy of dialysis and Serum Albumin, Serum Phosphorus, Serum

, Serum Calcium and Hb count, Blood Urea (Pre dialysis) were considered to be affected by the nutrition. Based on the interaction with the staff of dialysis centre a list of the best performing patients was prepared and it was tallied with the data collected. A sample crude data sheet is attached as Appx B. The crude sample data, was refined and compiled for the information required about the biomarkers for analysis. To study the two domains of Dialysis Adequacy and Nutrition Uptake, the results of the biomarkers were compiled and the data was converted into charts and dashboards.

5.2 Tools

5.2.1 In-Depth interview Structured in depth interviews, based on the interview guide (Ref Appx A) was used to gather the reasons for non-optimum utilisation of the EMR, the questions were designed to assess their awareness, technological skills, knowledge about their role and responsibilities, the availability of infrastructure, inter department functioning, capability of decision making and barriers in effective implementation of EMR.

5.2.2 Gap Analysis For carrying out gap analysis for identification of underlying factors and causes for non-implementation of EMR, fishbone diagram was used.

5.2.3 Work Flow For efficient and effective utilisation of EMR, it was realised that there is a necessity of mapping the workflow of the two components i.e the capturing of data in the EMR as well as the actual workflow of the dialysis procedure, was must. For mapping the workflow of the EMR and dialysis procedure, flowchart and use cases were used.

5.2.4 Data Analytics Basic analysis for segregation of various patient details and test from the data was carried out with the help of MS Excel. Further analysis for profiling of patients has also been carried out with the help of MS Excel.

5.2.5 Dash Board For developing dashboards for presenting the desired information about the parameters and biomarkers, MS Excel has been used.

6. RESULTS

6.1 Interviews

Based on the in-depth interviews carried out with the 10 nursing staff, 4 technicians and three clinicians, the following points were highlighted :-

a) EMR was not fully exploited by the staff because of miss match between the requirement of parameters used in the dialysis and as mentioned in the EMR.

b) The staff is technology savvy and keen to learn new skills.

c) EMR is not exhaustive.

d) EMR is less user friendly.

e) EMR reduces the accessibility of information at point of care.

f) Availability of interfacing devices at point of care will enhance exploitation.

g) Incentives, forceful and motivating directions by the organisation will help in exploitation.

h) Requirement of creating awareness about the complete EMR and its features.

i) Clinicians find coding or typing a difficult thing for capturing data, others being:-

   a. Lack of interoperability in EMR , hamper their task

   b. Provision of supporting staff capable of typing will ease their task and facilitate implementation.

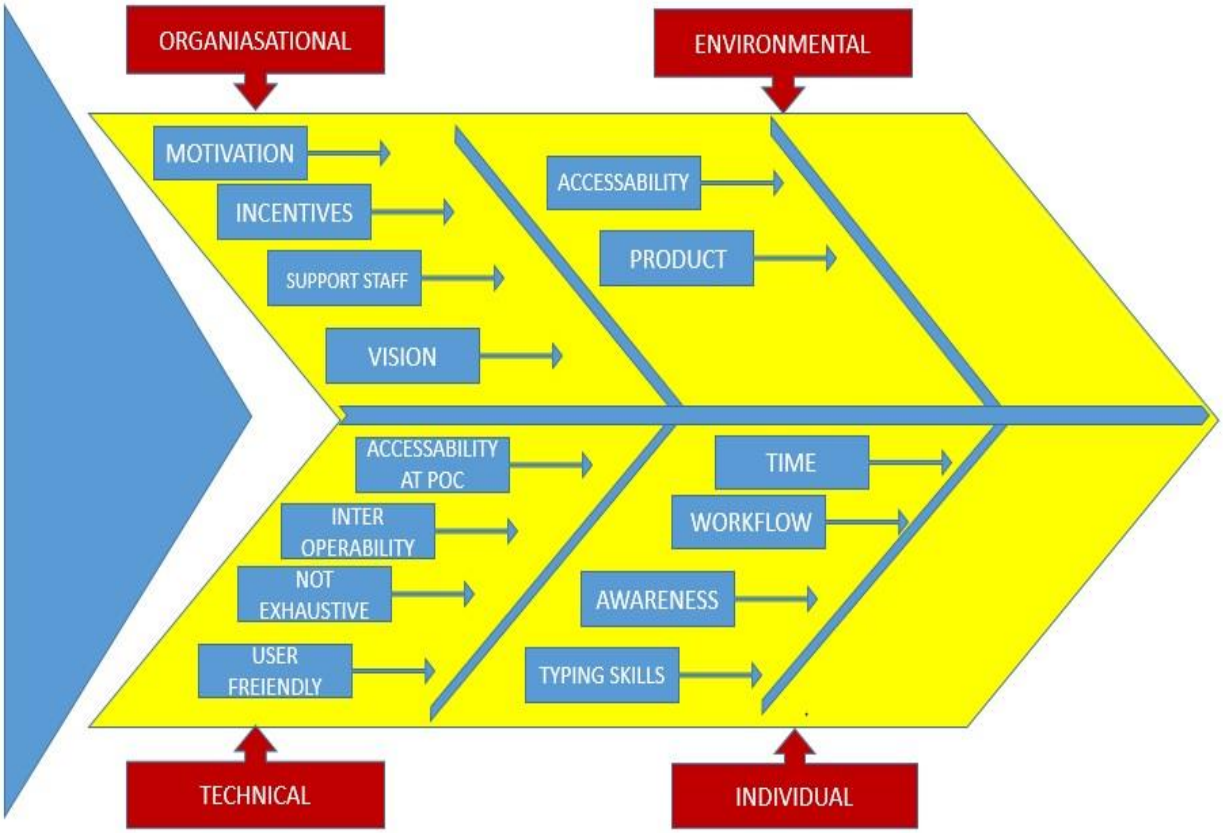


Fig 6.1

6.2 Gap Analysis

Gap analysis has been carried out and the causes has been divided into different echelons of responsibility or area of influence:-

6.2.1 Environmental

It is observed that for implementation of EMR the environment plays an important role, as it gives the interdependence of one department over other. As in case of the clinicians they need to share lot of information between two specialists, hence an environment of faster exchange of

information seamlessly must be provided. It comes to highlight that a generic product cannot serve and exhaustively capture the data of all the departments or sections, for efficient functioning customised product must be procured

6.2.2 Organisational

An organisation must provide motivational environment for the staff to work, motivation could be in the form of recognition or financial incentives. The implementation of EMR could also be linked to the appraisals of the individuals, linking it up with their performance will give them a sense of achievement. It is observed in case of clinicians, provision of a supporting staff which functions directly under the authority of the clinician, will facilitate fast implementation of the EMR which will save their time for typing as well patient –doctor interaction. Keeping in view the ever growing futuristic requirements of record keeping and maintenance for the accreditation purposes, as an organisation automation should be included in the vision or goal. Short term profitability through manual processes will fall short, in terms of the gains accrued through automation, since the patient load and requirement of quality services will increase.

6.2.3 Individual

From the individual point of view, user friendliness is an important aspect. The EMR should be able to capture the required details as per the role of the staff. It should also be capable of capturing data at the point of care. Capture of data, should not disturb the workflow of the individual leading to loss of productivity. The staff must be provided refreshing course to make them aware about the features of EMR, so that they can realign themselves for doing the task. Special time must be allocated for this refresher training

6.2.4 Technical

From the user point of view, interoperability of the data is important, and system should facilitate flow of info being disseminated between two different departments in a faster and smooth manner. For free flow of information, the information must be captured by the provider at the point of care accordingly, suitable interfaces in form of portable devices must be provided. As a generic product, the EMR is not exhaustive and does not capture the data as per the workflow and data acquisition. Few user friendly tips like features of saving of bill if it is delayed due to non-payment, can be provided to the billing department.

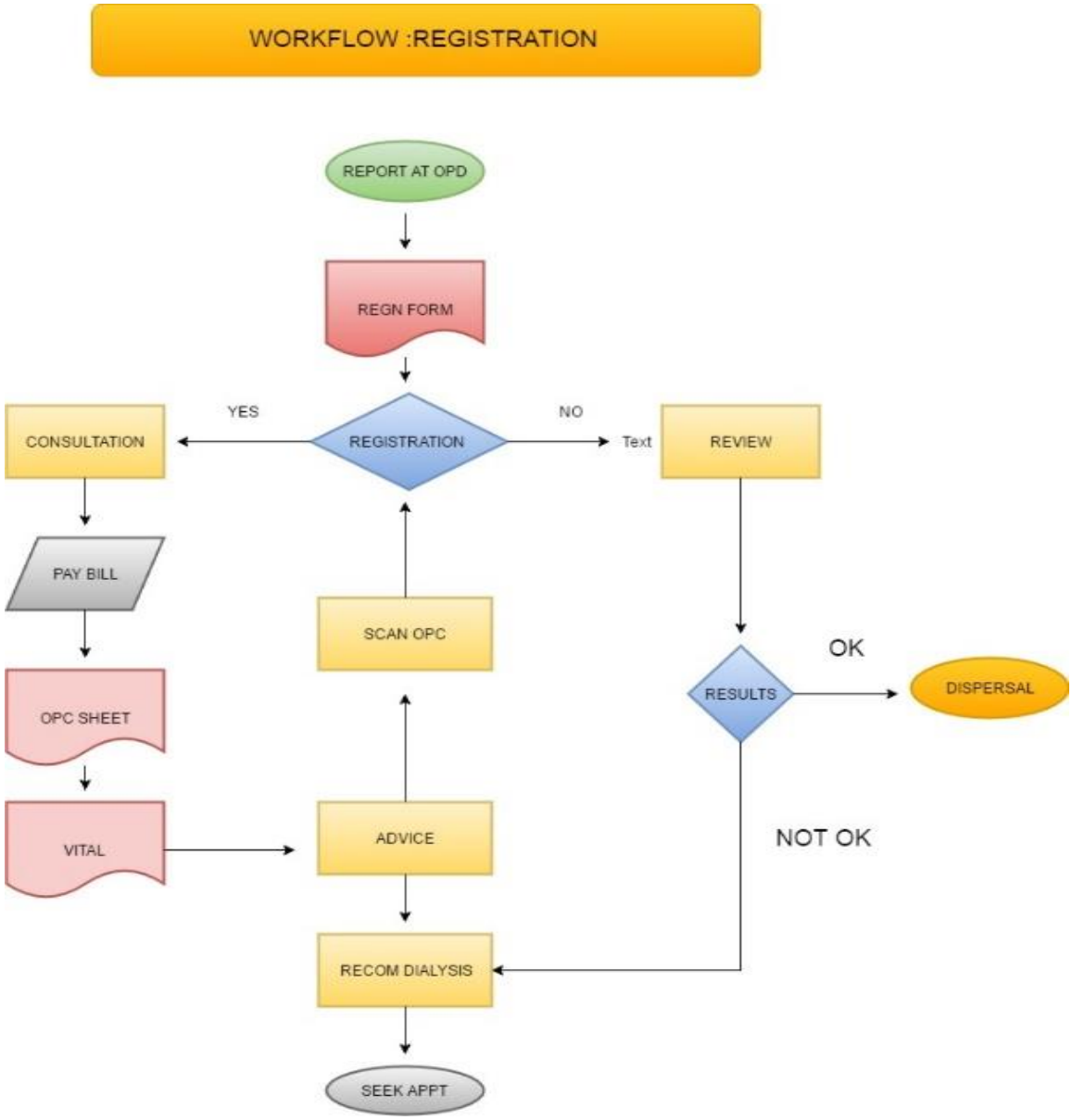

WORKFLOW :REGISTRATION
REPORT AT OPD
REGN FORM
REGISTRATION
YES
NO
CONSULTATION
Text
REVIEW
PAY BILL
SCAN OPC
OK
RESULTS
DISPERSAL
OPC SHEET
VITAL
ADVICE
NOT OK
RECOM DIALYSIS
SEEK APPT

Fig 6.2

6.3 Work Flow

Dialysis process takes around 3 to 4 hours for the ultrafiltration process, based on the directions and prescriptions given for each patient by the clinician. The workflow from the time of registration of appointment or for review and subsequent dates for the treatment entails the following actions and steps :

6.3.1 Work Flow of Registration in EMR

Step1

Registration The patients report either for registration or come for review of consultation. Once they report at the reception, Out Patient Case (OPC) sheet is generated online and a copy is handed over to the patient after payment of the consultation charges.

Step 2

Vitals Along with the outpatient case sheet the patient reports to the nursing assistant for checking of vitals. In the OPD nursing assessment the demographic data is recorded along with the psychological status, occupation, lifestyle, pain assessment, fall risk screening.

Step 3

Consultation The vital data sheet along with the copy of the OP case sheet a file is prepared for the patient which the patient takes along for the consultation with the doctor.

Step 4

OP Case Sheet The doctor endorses the clinical details and the medical history of the patient on the outpatient sheet. The doctor gives details of clinical assessment, provisional diagnosis, investigations advised, treatment advised, follow up and signs off.

Step 5

Scan Post consultation the patient comes out and hands over the file to the receptionist. The receptionist scans the outpatient case sheet, and handover the file to the patient back for the subsequent follow ups.

6.3.2 Work flow Dialysis Centre

Step 6

OPC On the day of dialysis the patient reports to the dialysis centre based on the appointment allocated to him and his OPC prescription sheet is checked for medication and recommendation for dialysis.

Step 7

Order After the patient is reported and order is generated for the billing section.

Step 8

Invoice The patient make the payment, and along with the invoice reports to the dialysis centre.

Step 9

Bed Allocation Before initiating the dialysis the bed is allocated and vitals are taken.

Step 10

Dialysis Starts Based on the prescription details, investigations are checked and medications to be administered are reviewed. After which dialysis treatment and monitoring starts.

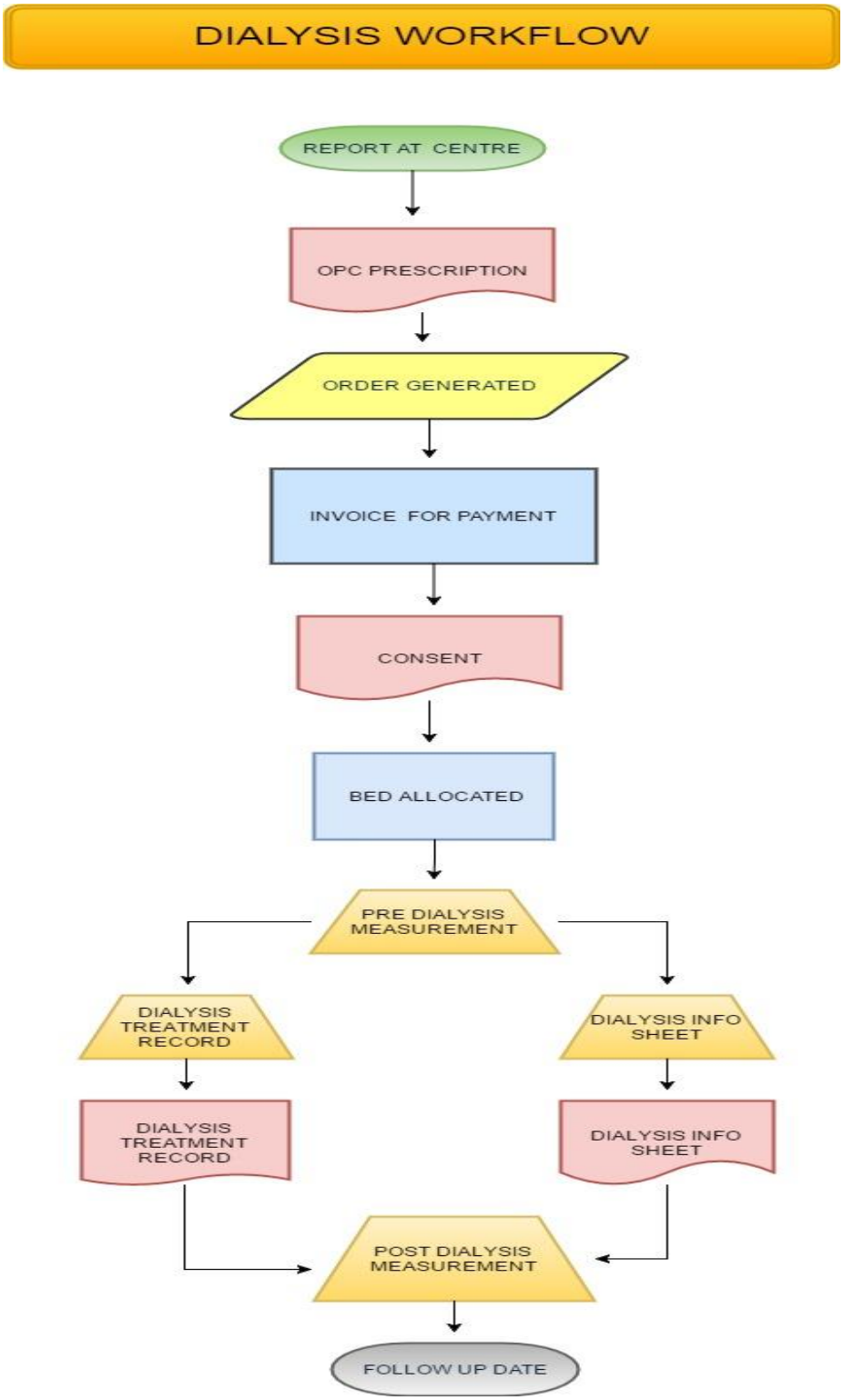

DIALYSIS WORKFLOW
REPORT AT CENTRE
OPC PRESCRIPTION
ORDER GENERATED
INVOICE FOR PAYMENT
CONSENT
BED ALLOCATED
PRE DIALYSIS MEASUREMENT
DIALYSIS TREATMENT RECORD
DIALYSIS INFO SHEET
DIALYSIS TREATMENT RECORD
DIALYSIS INFO SHEET
POST DIALYSIS MEASUREMENT
FOLLOW UP DATE

Fig 6.3

6.4 Use Case Diagrams

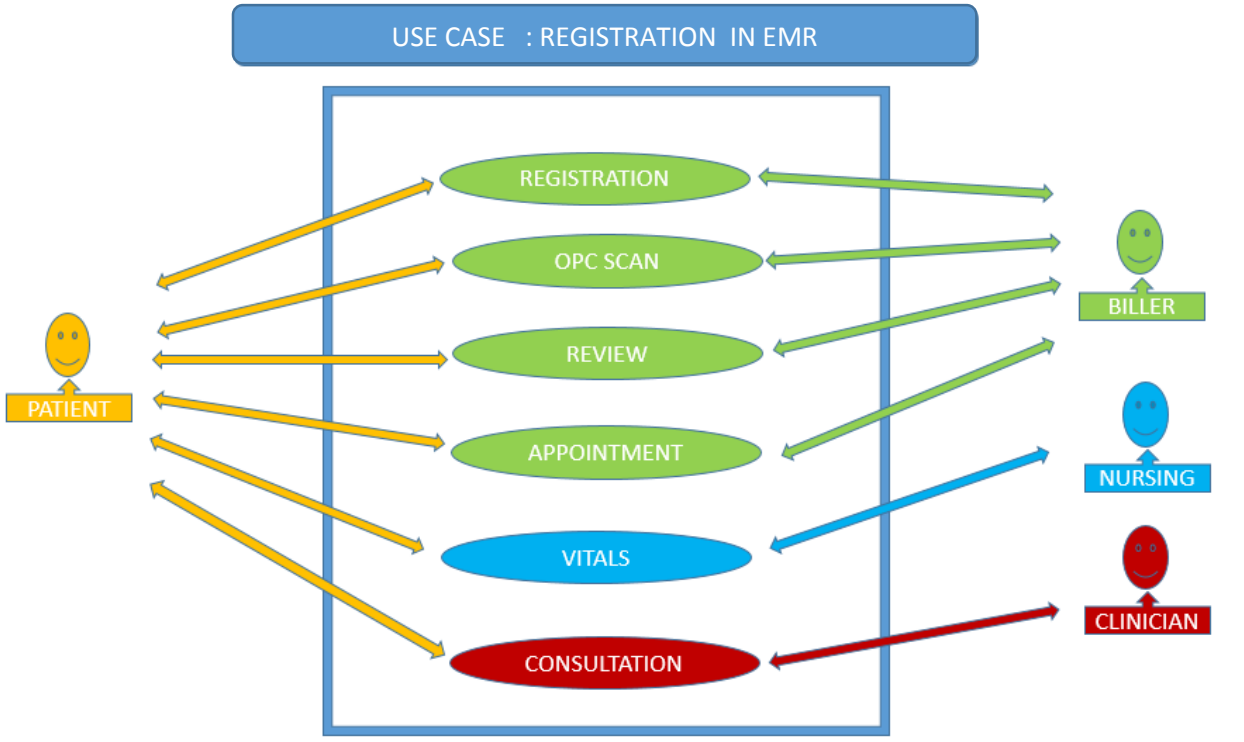


Fig 6.4

6.4.1 Registration in EMR

The patient interacts with the biller after filling the registration form. After making the payment, the OPC sheet is generated and the appointment is fixed. The nursing assistant fills in the outpatient nursing assessment form and along with OPC give it to the patient for consultation. the patient consult with doctor and comes out with the OPC sheet, which is scanned again for recording the transaction.

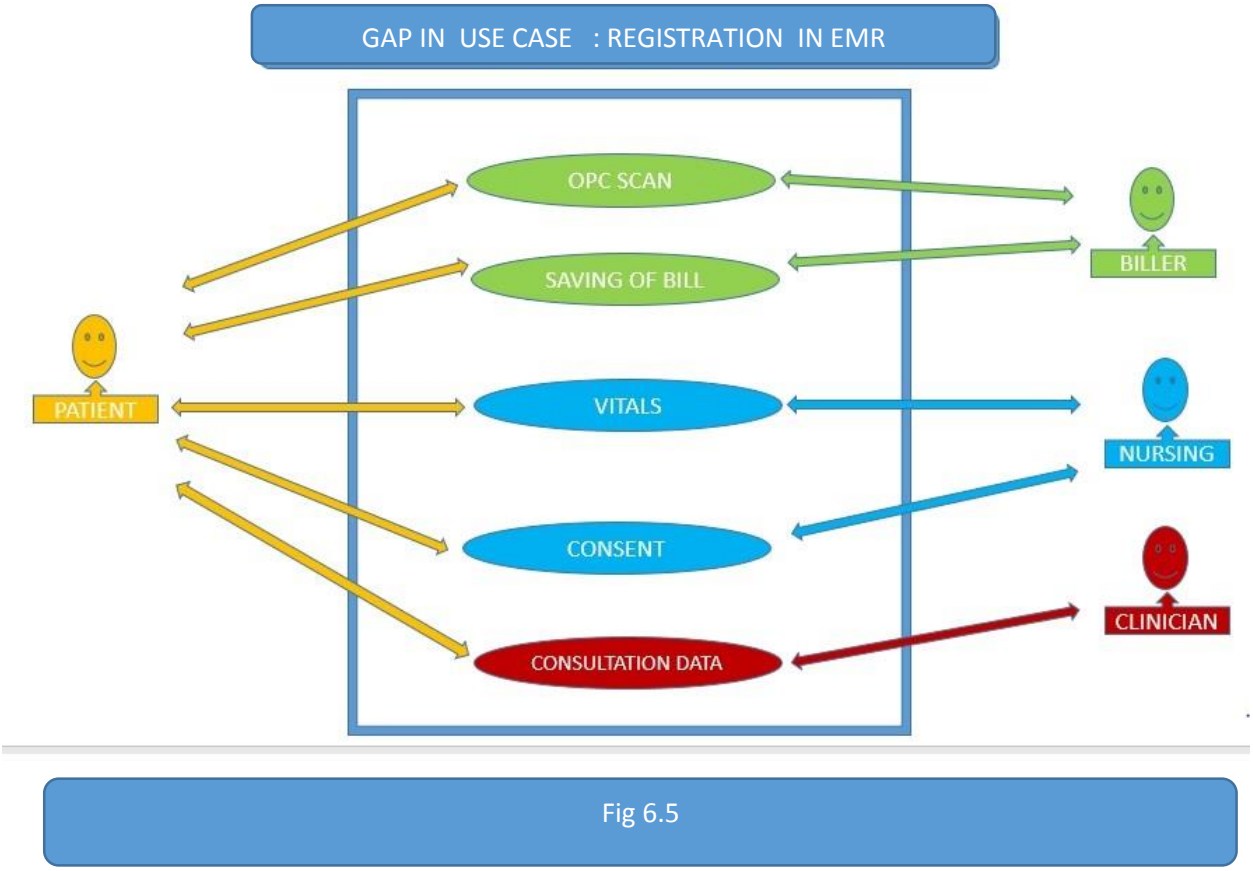


Fig 6.5

6.4.1.1 Gap in Registration

The observed gap in the registration through EMR is, that OPC sheet is scanned again, for recording of transaction has the details are not filled online. The details of nursing assessment are also not filled online. Even the consent form, is also being filled by the patient and signed by the doctor manually. All clinical details pertaining to the patient are filled by the doctor in hand.

6.4.2 Dialysis Centre

In case of dialysis centre once the patient reports, his prescription sheet is been reviewed by the technician, an order is placed in the CPOE online. The patient goes and makes the payment, and produces the invoice at the centre. Based on the invoice, he is allocated a bed , his vitals are taken, and the dialysis procedure starts. A review for the doctor is carried out during dialysis, and all data required for dialysis are captured manually.

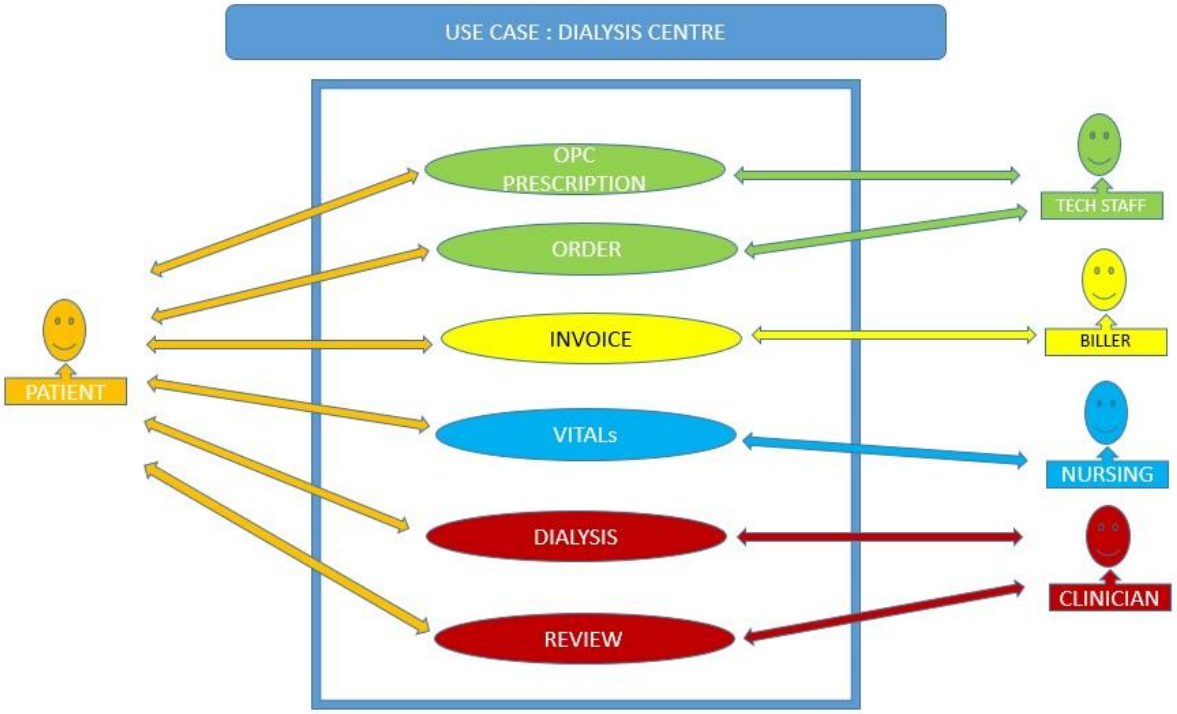


Fig 6.6

6.4.2.1 Gap in Dialysis Centre

The gaps in capturing the information during the conduct of different activities reveals, that most of the information at dialysis centre is recorded manually. The actions like, ordering of medication, investigations, capture of dialysis monitoring data, dates for next appointment can also be captured online. These gaps can easily be removed by intervention of suitable portable devices and designing suitable changes in the workflow.

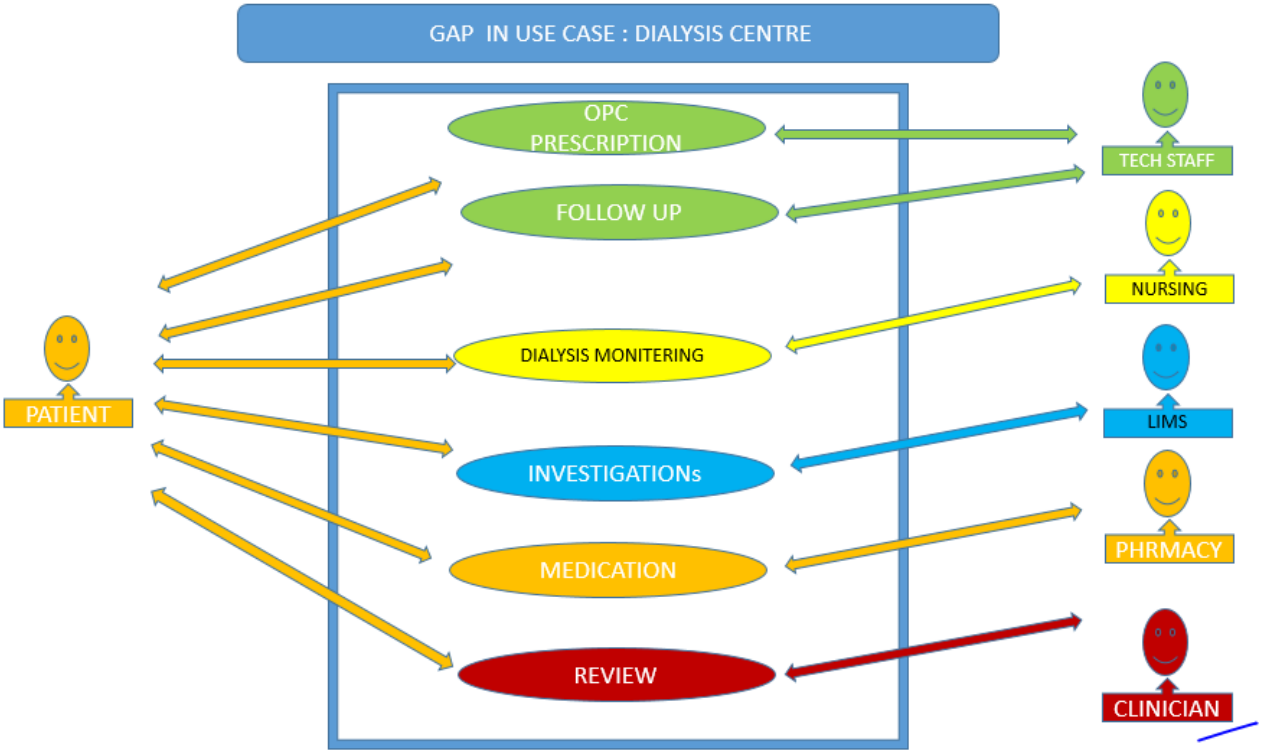


Fig 6.7

6.5 Data Flow Diagrams

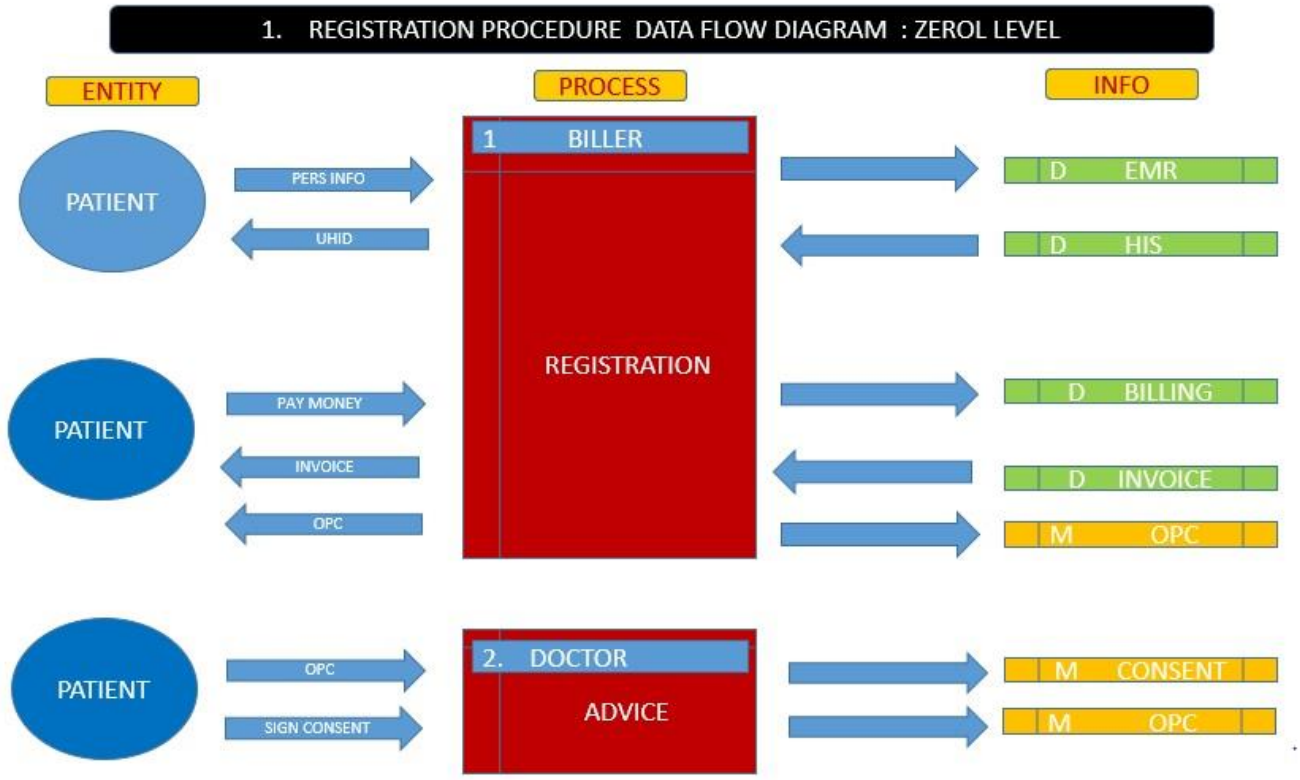


Fig 6.8

The patient gives personal information mentioned in the registration form to the biller, who enters that information into the EMR which is maintained online. The biller from the system generate the UHID and gives it to the patient. An invoice is generated after making the payment and a copy of OPC sheet is printed out by the biller. The OPC sheet is given to the doctor, where he endorses the clinical details related to the disease.

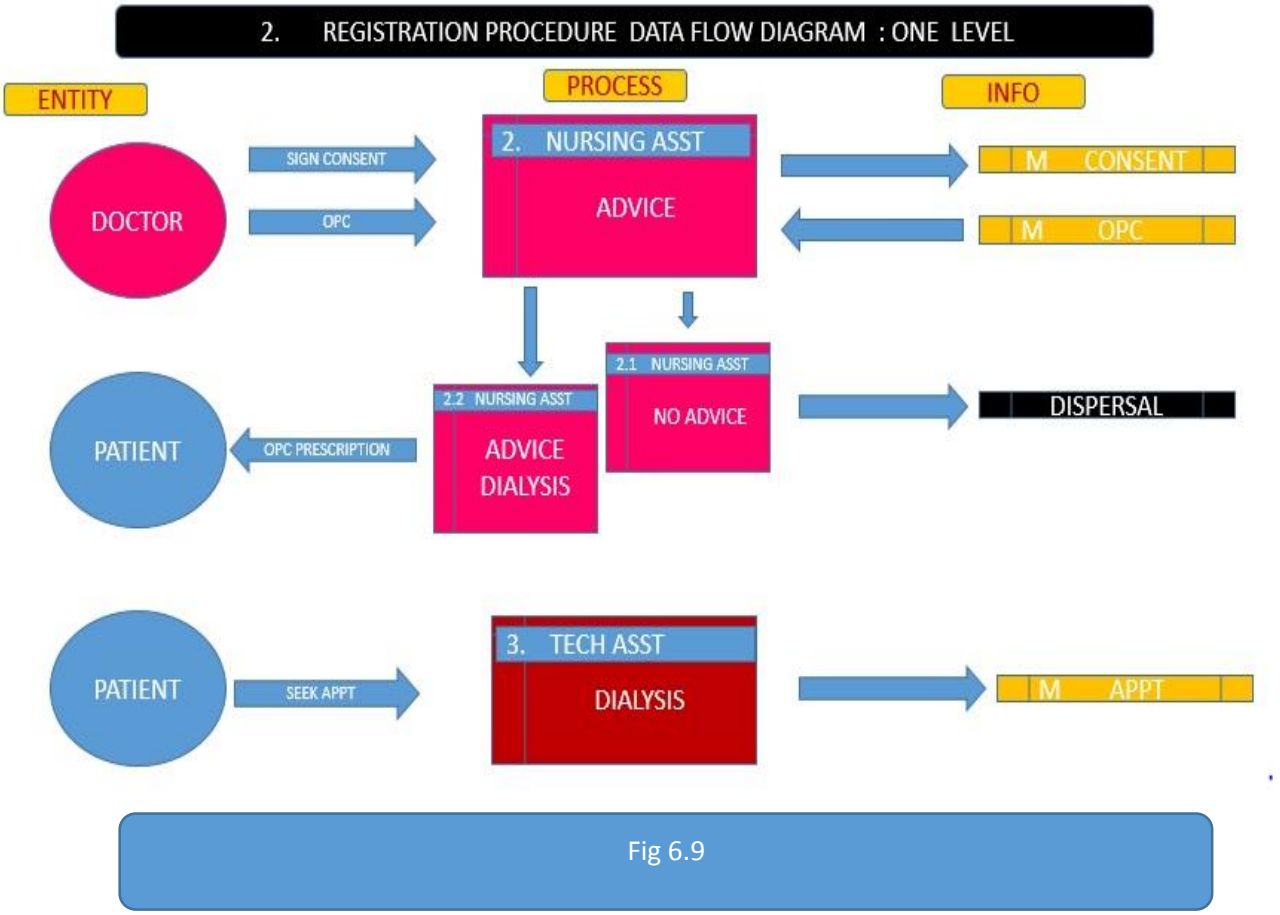


Fig 6.9

6.5.1 Data Flow Diagram of Registration

After consultation clinician returns the OPC sheet to the patient, the patient hands over OPC sheet to the biller who scans for keeping the record of transaction. In case viral marking is to be done then the patient also hands over the consent form to the doctor for signature The doctor has two course of actions, where based on the consultation he may advise the patient a dialysis option or he may not. Based on the advice for dialysis, the patient reports to the technical assistant of dialysis centre for seeking an appointment. The patient not advised dialysis, disperses from the hospital.

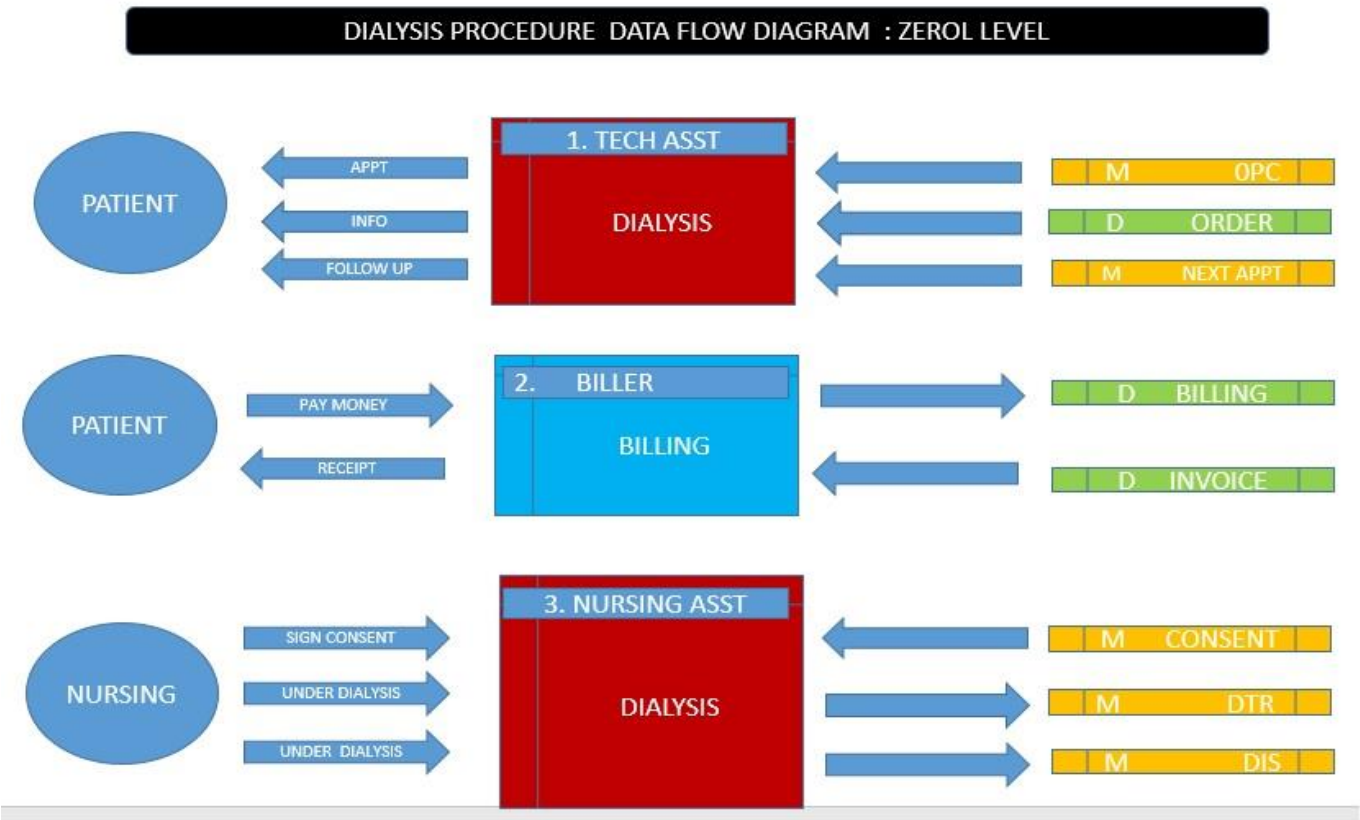


Fig 6.10

6.5.2 Data Flow Diagram of Dialysis Centre

Having sought an appointment, the patient reports at the dialysis centre with OPC prescription sheet, and his appointment is confirmed. Based on that an order is placed through the CPOE. After that the patient makes the payment to the biller and gets an invoice in return. After that he reports to the centre, signs consent for the treatment manually, is allocated a bed, his vitals are taken and the dialysis procedure starts. All the data pertaining to dialysis is logged manually in the DIS and DTR.

6.6 Data Analytics

The crude data received from the lab was compiled based on the biomarker which are used by the clinicians to comment on the adequacy and nutritional uptake of the patient undergoing dialysis. In the tables, a sample data is compiled from the crude data, depicting the values of biomarkers of patients in the last 5 months. As a reference, for the first patient, the standard values i.e Blood Urea Post-Dialysis-40; Blood Urea Pre-Dialysis- 100; Bicarbonate-22; URR-65%; kT/V 1.2; Haemoglobin- 9; Serum Calcium -8; Serum Phosphorus-5; Albumin-3.5;as advised by the clinician are entered for the biomarkers. Plotting the values of the biomarkers of the patient against the standard values, clearly highlights the variation of patient's values against the standard values.

6.7 Dashboards

The dashboard facilitates, quick decision making by the clinician based on the values of biomarkers of a patient for a predefined period. The clinician can decide on the parameters to be seen, the standard values of different biomarkers and the duration of period of study. The inputs in the form of these dashboards, can be incorporated for regular assessment, these can be developed a day prior to the appointment of the patient and can be shared with the clinician in advance for endorsing necessary medical prescription before starting of the dialysis.

Table 1

Date	ALBUMIN	BLOOD UREA (PRE DIALYSIS)	HEMOGLOBIN	SERUM CALCIUM TOTAL	SERUM PHOSPHORUS
02-05-2016	3.1	6.8	11.9	8.3	3.8
04-07-2016	3.3	12.5	11.8	8.1	4.2
04-08-2016	3.6	16.4	9.2	7.9	5.3
03-09-2016	3.7	14	8.9	8.5	4
03-10-2016	3.8	13.1	11.7	8.4	5
03-11-2016	3.9	16.3		8.5	6.3
03-12-2016	4.1	12.6	11.5	8.9	5.4
12-01-2017	3.8	19.2	9.1	8.3	7.2
04-02-2017	3.6	10.9	9.6	8.2	4.6

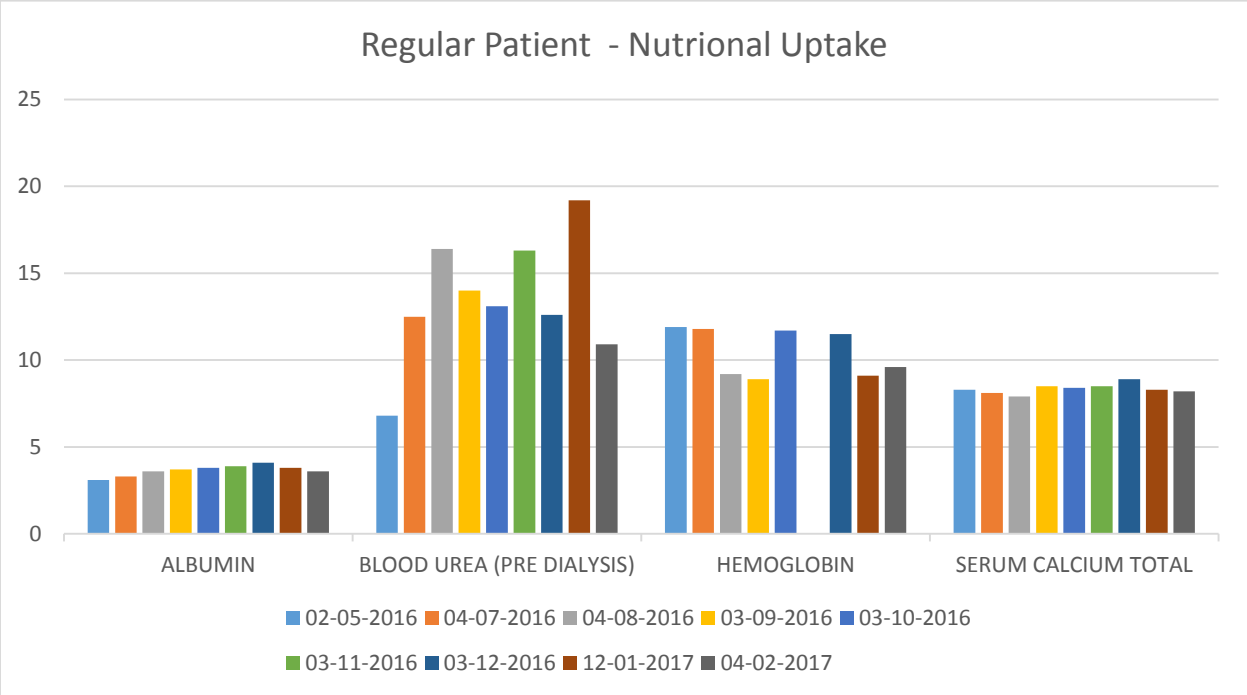


Fig 6.11

TABLE 2

Date	BICARBONATE	URR	BLOOD UREA (POST DIALYSIS)
02-05-2016	2.3	7.6	1.6
04-07-2016	2.2	7.5	3.1
04-08-2016	2	7.7	3.8
03-09-2016	2.2	7.7	3.2
03-10-2016	2.2	7.4	3.4
03-11-2016	1.9	7.7	3.7
03-12-2016	2.4	7.1	3.6
12-01-2017	1.9	7.7	4.3
04-02-2017	2.1	7.7	2.5

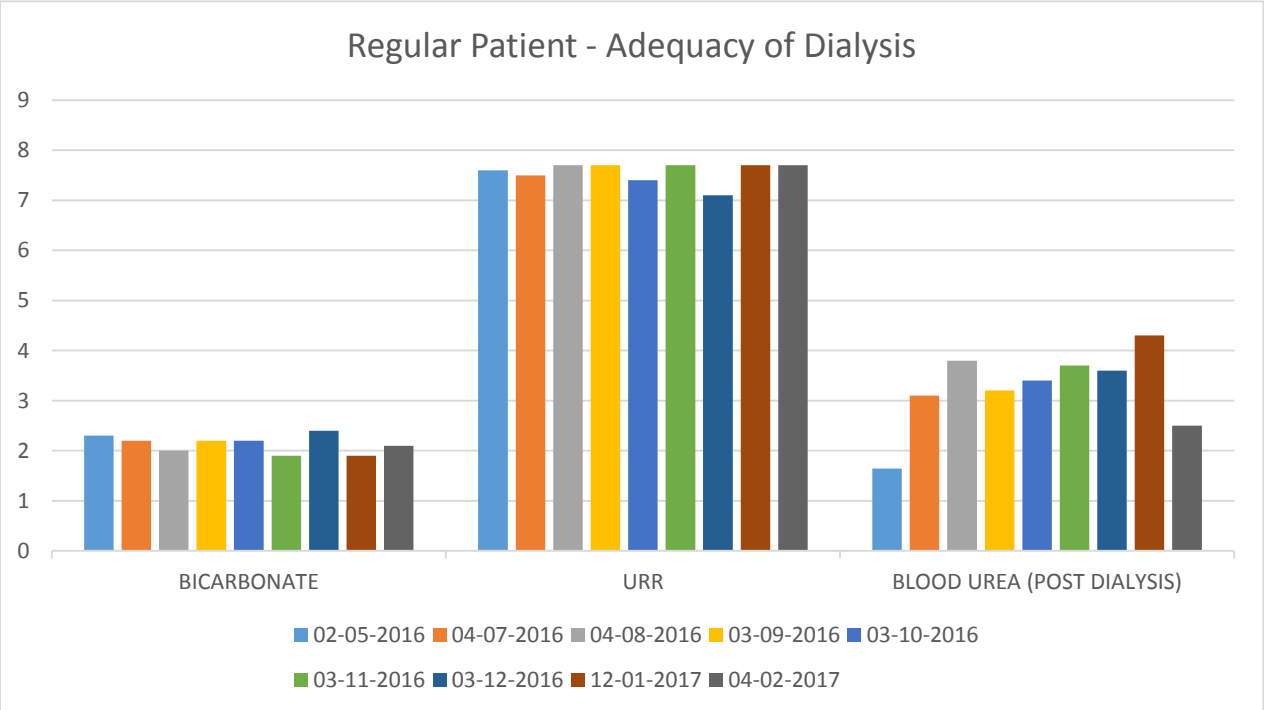


Fig 6.12

TABLE 3

Date	ALBUMIN	BLOOD UREA (PRE DIALYSIS)	HEMOGLOBIN	SERUM CALCIUM TOTAL	SERUM PHOSPHORUS
13-05-2016	3.7	12.4	10.1	9.1	3.3
22-07-2016	3.5	11.1	9.8	8.7	3.2
07-09-2016		9.6	8		
04-11-2016	3.6	12.5	7.9	8.5	3.8
09-12-2016	3.6	10.5	8.7	8.8	4.7
24-04-2017	3.7	13.4	10.9	8.6	3.7

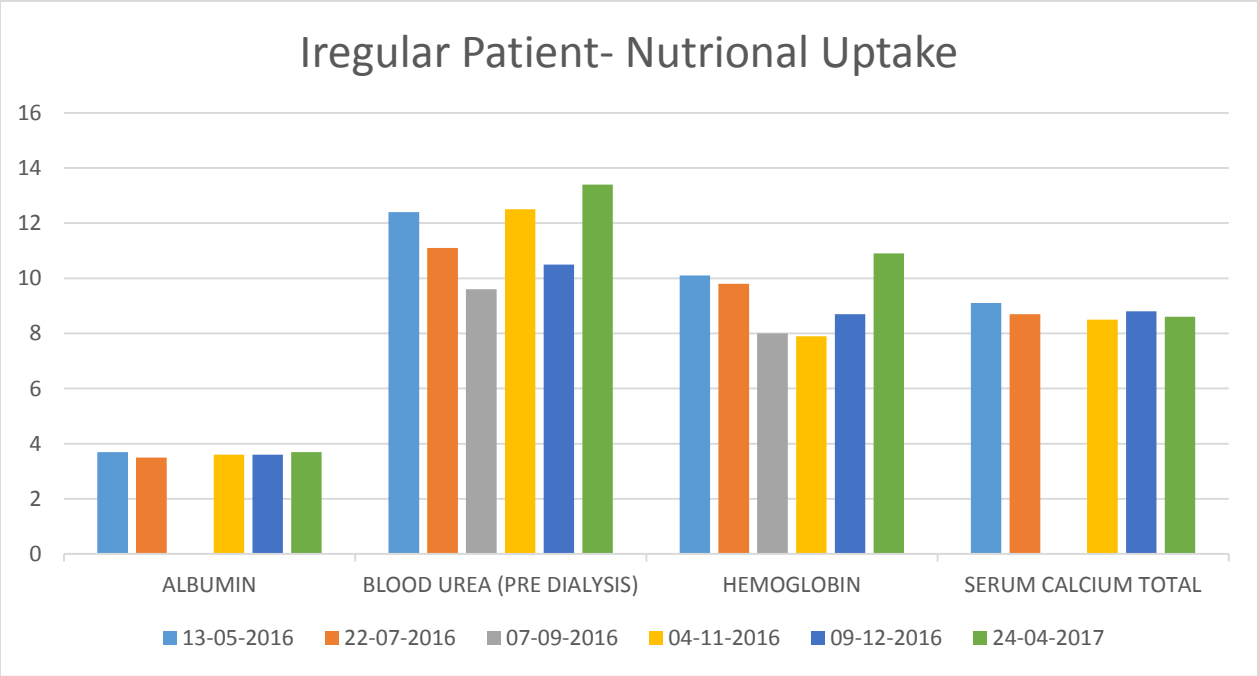


Fig 6.13

Table 4

Date	BICARBONATE	URR	BLOOD UREA (POST DIALYSIS)
13-05-2016	2	6.4	4.4
22-07-2016	2.3	6.6	3.7
07-09-2016	2.4	6.9	2.9
04-11-2016	2.1	6.8	4.1
09-12-2016	2.3	6.8	3.3
24-04-2017	2.5	7.3	3.6

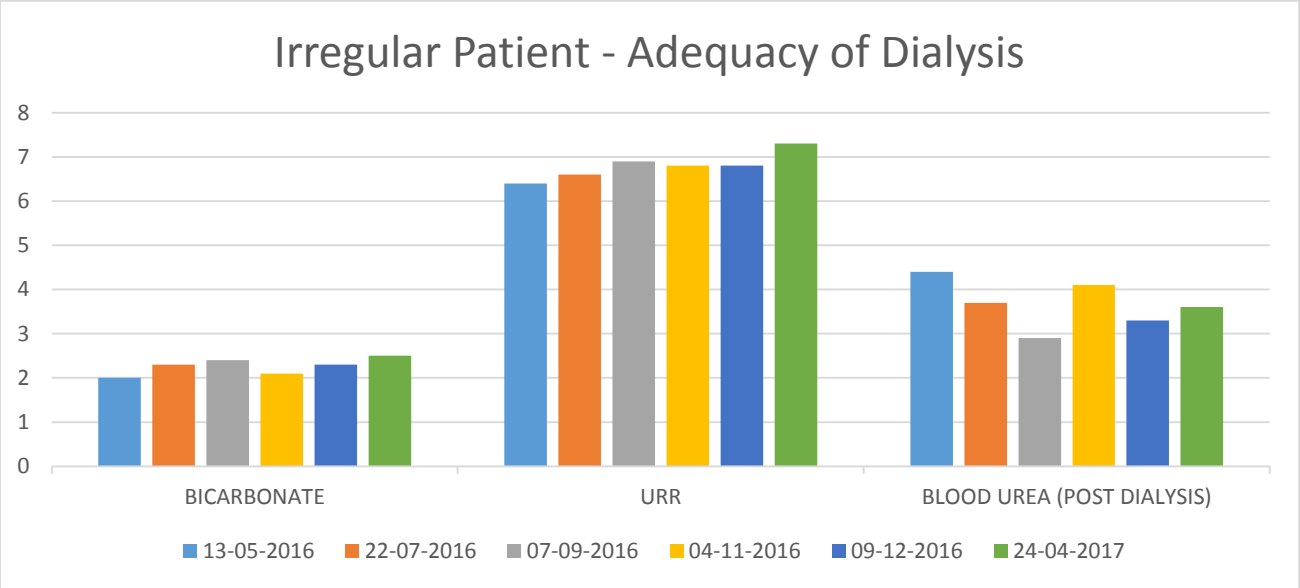
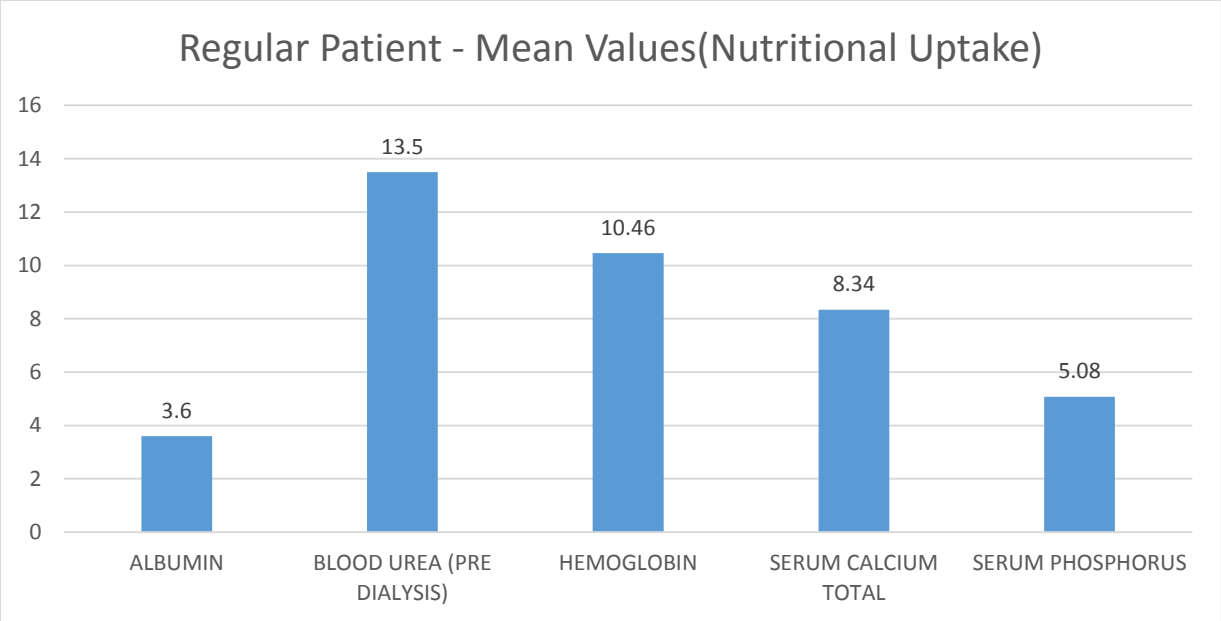


Fig 6.14


Regular Patient - Mean Values(Nutritional Uptake)
16
14
12
10
8
6
4
2
0
3.6
13.5
10.46
8.34
5.08
ALBUMIN
BLOOD UREA (PRE DIALYSIS)
HEMOGLOBIN
SERUM CALCIUM TOTAL
SERUM PHOSPHORUS

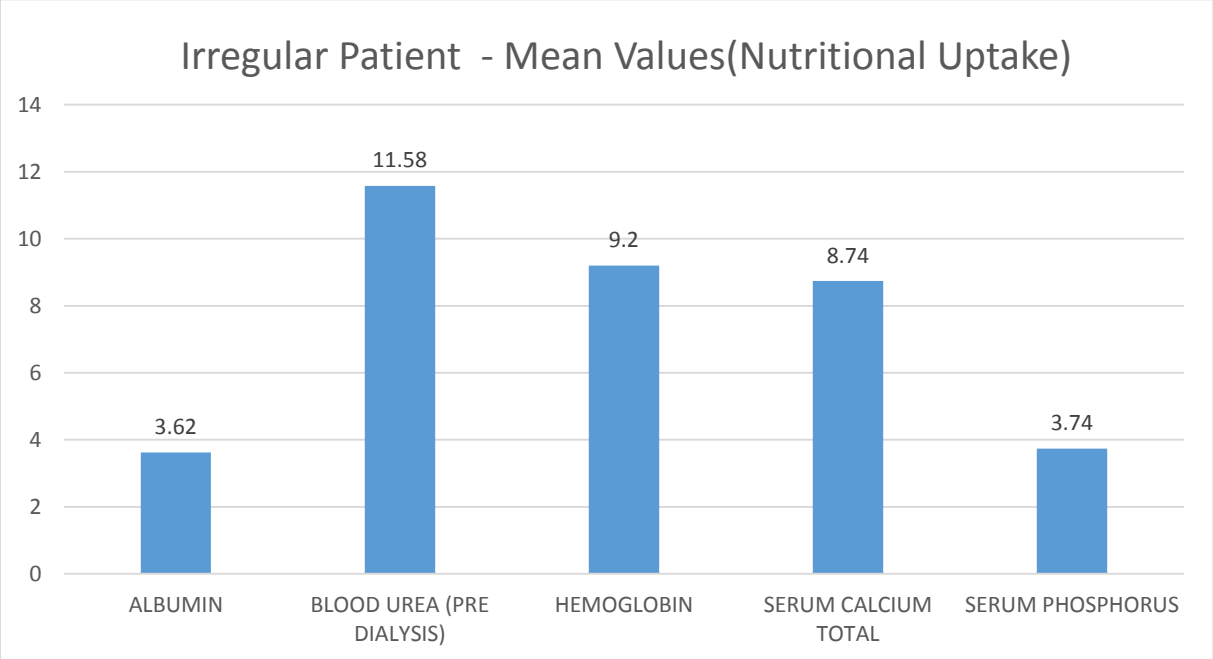
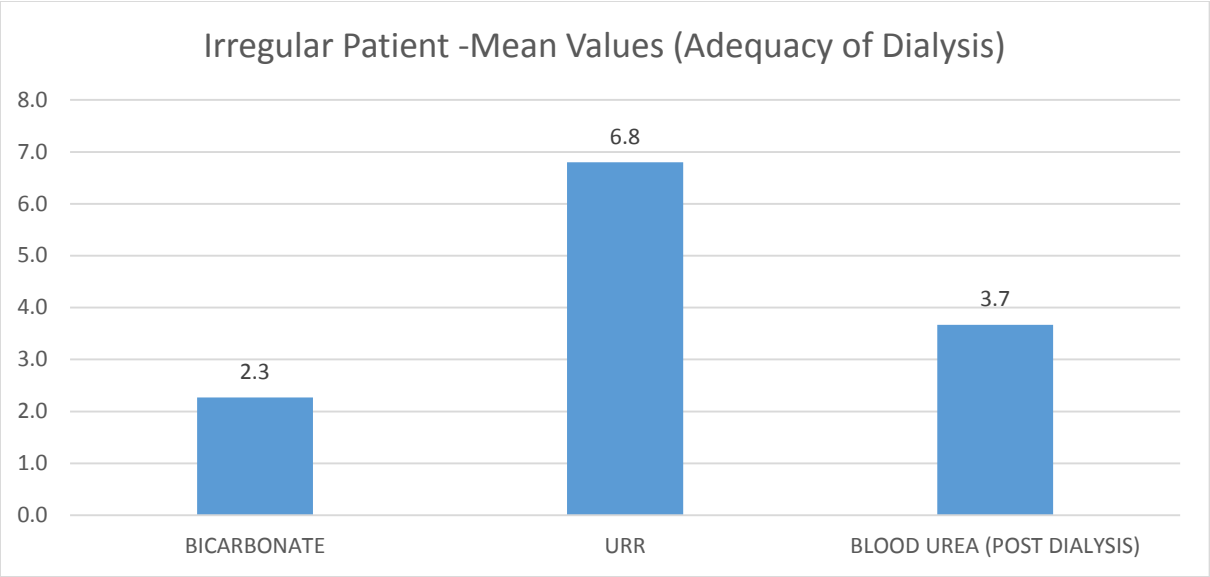

Irregular Patient - Mean Values(Nutritional Uptake)
14
12
10
8
6
4
2
0
3.62
11.58
9.2
8.74
3.74
ALBUMIN
BLOOD UREA (PRE DIALYSIS)
HEMOGLOBIN
SERUM CALCIUM TOTAL
SERUM PHOSPHORUS

Fig 6.15


Irregular Patient -Mean Values (Adequacy of Dialysis)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2.3
6.8
3.7
BICARBONATE
URR
BLOOD UREA (POST DIALYSIS)

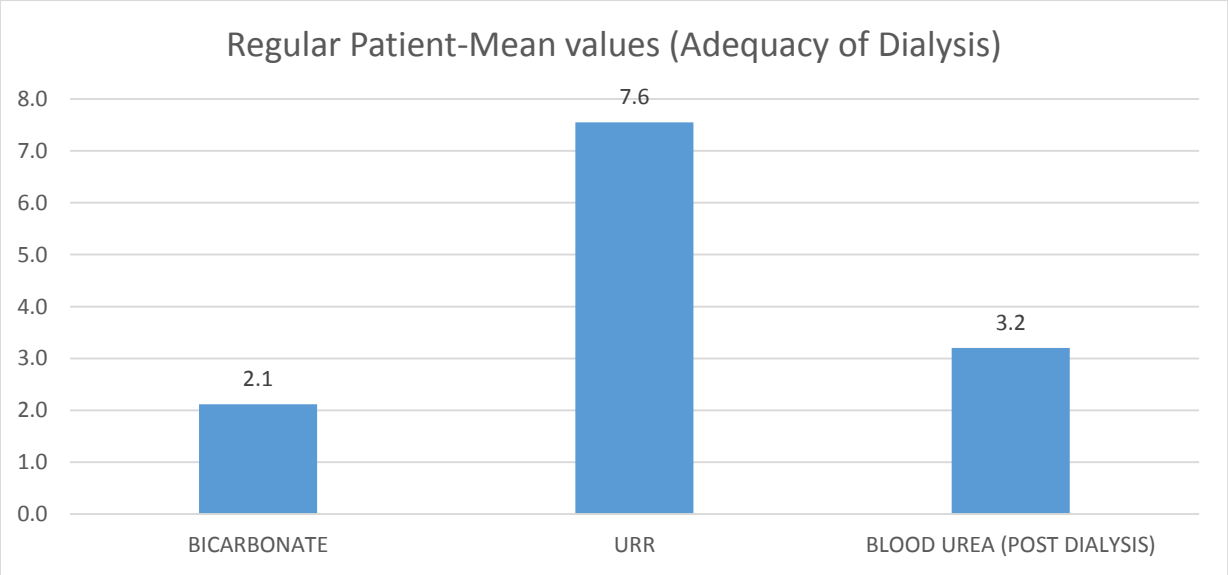

Regular Patient-Mean values (Adequacy of Dialysis)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2.1
7.6
3.2
BICARBONATE
URR
BLOOD UREA (POST DIALYSIS)

Fig 6.16

7. Discussion

During the course of study it has been revealed, that during the registration process, the demographic details of the patient are recorded however other important details related to the EMR i.e the lifestyle, the comorbidities, history of the disease, etc which can also be captured through the registration form, are missed out. The outpatient case sheet (OPC) is generated online and a printout is given for endorsing of the prescription and clinical assessment notes. The clinician is not able to encode the history, clinical assessment, provisional diagnosis, medication and investigation details as it compromises on the patient- doctor interface. Hence the details endorsed on the OPC are scanned again to keep a record of the transaction. The consent form, if viral markings are to be done, is also signed manually, which could be made digital or biometric.

In the dialysis centre, except for the order placement no other task is done online. The required data for the entire transaction during the dialysis procedure, from pre-dialysis assessment to post-dialysis and the intervening monitoring can be captured by use of portable devices. The scheduling of appointments for follow up can also be done online. Continuous and correct capture of data in the dialysis centre will facilitate smoother implementation of EMR.

The forms used for capturing dialysis data i.e the Dialysis Information Sheet, the Dialysis Treatment Record, the follow-up book, the consent form, the Outpatient Nursing Assessment can all be converted digitally for data capture and data through these forms can be continuously collected by portable devices. There is a need to adapt EMR to capture the complete details of the dialysis and the registration process matching the workflow at both these points.

As an organization, for optimising exploitation of EMR, incentives must be planned for the departments and it could be linked to the appraisals of the individual's performance.

A trustworthy, supportive and motivating approach will help for everyone to come on board for implementation of the EMR. A fresh training of the staff, and a review of the EMRs be carried out for one-time assessment of the gaps for all the departments, accordingly change request could be drafted for the vendor for necessary modifications in the software. Supporting staff in the form of clinical secretary or medical transcribers can be provided to the clinical staff for facilitating encoding and better implementation.

7.1 Benefits of Implementation

The implementation will accrue a number of benefits which broadly may be considered at two levels.

7.1.1 Organisational Benefits Following benefits are achieved at the organisational level :-

a) Reduction in manual and duplicate inputs.

b) Prevent multiple record handling.

c) Seamless distribution of information.

d) It will reduce the probability of errors.

e) Give the power of informed decision making.

f) Assist in providing timely therapeutic interventions.

g) Staff and the patients will feel engaged and motivated.

h) It will reduce the overall risk and the cost of operation.

7.1.2 Recommendations

To achieve optimum utilisation of the existing EMR as well its use after capturing of the desired information , the recommendations proposed can further be divided into two domains first related to the organisational and second at the functional level

7.1.2.1 At the organisational level

a) There is a requirement of automation or digitisation acceptance as a part of vision of the organisation.

b) For ensuring implementation adequate incentives or rewards may be instituted for the Staff.

c) For better sharing of information and implementation good interpersonal relations of the user, patients as well as the IT professionals is required.

d) There is a requirement of fresh training for the staff for making them aware about the features of the system

e) There is a requirement of supporting staff for clinicians for smoother implementation

7.1.2.2 At the functional level, the following is recommended:-

a) A need to exploit the existing EMR and its features for better understanding.

b) Capture of info at Point of Care through Tabs, Kiosks and Bed side instruments.

c) Optimise and Digitise the forms used for dialysis to prevent capturing of duplicate and missed out info.

d) Biometric and Digital signatures can be devised for consent.

8. Conclusion

Despite the inherent constraints of a generic EMR it is concluded that it is possible to meet the desired goals of automation and effective implementation with an ingenious and innovative approach.

Fig 8.1

In view of the quantum of data generated in each dialysis session, the frequency of dialysis and the prolonged period of its continuation, it becomes imperative that capturing up of data at all stages of dialysis is done earnestly. In the days to come this data will not only facilitate the input for the requirement of a national registry on CKD/ESRD it will also help in the patient health management and the associated logistic issues of Lab and Medications. But to a greater scale it will help in predictive analytics for better prognosis of the patient to direct timely interventions in therapy for desired health outcomes. Keeping with the pace of technology, real time data acquisition be considered from the dialysis devices for effective and accurate data collection and analysis.

Seeing the annual growth of around 10% in the dialysis patients, it becomes imperative that the dialysis domain is given due focus ,to generate desired revenue and further transcending the brand development of the organization to the next level.

Appx A

Questionnaire

1. What type of automation is used in the dialysis facility?
2. Is the automation process user-friendly?
3. Does it match up with the workflow of the dialysis process?
4. What type of entries are done in the EMR for dialysis?
5. Are there any duplication of entries carried out for dialysis procedure?
6. Are there any duplicate paper and electronic procedures adopted for data capture?
7. Do you get the required information for analysis from the EMR?
8. Are you able to access the required information as per your need at point of care?
9. Can you share the information of the patient with other department?
10. Is there any decision support system for clinician or nursing or technical staff?
11. Are there any dashboards for health performance of the patient?
12. What are the reasons for inadequate exploitation of the EMR?

Appx B

	A	B	C	D	E	F	G	H
1	MRNO		AGE	LOOKUPVALUE	SERVICENAME	RESULTVALUE	RESULTRANGE	ORDERED_DATE
2	JHN000139878		24.3	MALE	WBC	7.29	4.0-10.0	26/02/2017 05:37:22
3	JHN000164743		42.9	FEMALE	HEMOGLOBIN	11.3	12.0-15.0	30/04/2017 05:30:52
4	JHN000133052		18.3	MALE	RBC COUNT	2.25	4.5-5.5	31/12/2016 04:26:34
5	JHN000137651		72	FEMALE	MCH	29.0	27.0-32.0	05/11/2016 11:34:43
6	JHN000118686		2.9	MALE	MCHC	33.0	30.0-36.0	18/07/2016 17:41:17
7	JHN000130668		59	FEMALE	RDW	14.7	11.6-14.0	15/09/2016 05:56:31
8	JHN000045501		76.3	FEMALE	RBC COUNT	3.72	3.8-4.8	23/07/2016 05:26:33
9	JHN000101361		42.11	MALE	RBC COUNT	2.52	4.5-5.5	23/08/2016 16:43:32
10	JHN000137946		35.1	MALE	PLATELET COUI	200	150.0-450.0	06/12/2016 04:21:15
11	JHN000130180		45.3	MALE	WBC	10.32	4.0-10.0	17/12/2016 07:49:46
12	JHN000129492		31.5	MALE	MCHC	33.7	31.5-34.5	24/10/2016 04:19:09
13	JHN000133654		22.3	FEMALE	HEMOGLOBIN	10.9	12.0-15.0	17/01/2017 05:07:55
14	JHN000120050		33	MALE	RBC COUNT	2.62	4.5-5.5	25/07/2016 11:21:06
15	JHN000129492		31.5	MALE	ALBUMIN	2.6	3.5-5.0	20/10/2016 02:33:52
16	JHN000109064		55	FEMALE	ALBUMIN	4.4	3.5-5.0	06/05/2016 13:00:47
17	JHN000159007		68.2	MALE	HEMOGLOBIN	10.8	13.0-17.0	23/04/2017 12:00:16
18	JHN000155631		60.2	FEMALE	PLATELET COUI	179	150.0-450.0	15/03/2017 05:12:44
19	JHN000161160		55.3	FEMALE	SERUM POTASS	4.7	3.5-5.1	10/04/2017 13:00:28
20	JHN000103676		40.4	MALE	HEMOGLOBIN	10.3	13.0-17.0	23/08/2016 08:15:07
21	JHN000027370		32.6	FEMALE	BLOOD UREA (P	29	15.0-36.0	03/08/2016 07:24:14
22	JHN000090091		67.8	FEMALE	BLOOD UREA (P	20	15.0-36.0	26/09/2016 11:43:04
23	JHN000149037		84	FEMALE	BLOOD UREA	59	17.0-49.0	16/01/2017 03:20:57
24	JHN000131762		75.10	MALE	SERUM POTASS	5.9	3.5-5.1	07/11/2016 04:38:37
25	JHN000109476		53	FEMALE	BLOOD UREA	23	14.98-36.38	08/05/2016 11:46:29
26	JHN000160615		25	MALE	HEMOGLOBIN	13.0	13.0-17.0	11/04/2017 13:28:05
27	JHN000131125		63	MALE	SERUM PHOSPH	6.7	2.5-4.5	15/09/2016 04:13:18

Sample Crude Data

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