Internship and Dissertation Report
On
A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and it's Influence on Performance of Healthcare Professionals-Case Study
Delhi Cantonment General Hospital
(Feb - May 2017)

Internship and Dissertation Report
Submitted in Partial Fulfillment of the Requirements for the Award of

Post-Graduate Diploma in Health and Hospital Management

Batch (2015-17)

By

Col Avtar Singh Manhas

Enrolment No- PGDHM/2015/018

Under the guidance of

Dr Anandhi Ramachandran, Associate Professor, IIHMR, Delhi

International Institute of Health Management Research

New Delhi-2017

TO WHOMSOEVER MAY CONCERN

This is to certify that **Col Avtar Singh Manhas** student of MBA Hospital and Health Management (PGDHM) from the IIHMR Delhi has undergone internship training at **Cantonment General Hospital, New Delhi** from **15th February 2017** to 1**5th May 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.

I wish him all the success in all his future endeavors.

Dean, Academic and Student Affairs   Professor

The IIHMR Delhi, New Delhi   The IIHMR Delhi, New Delhi

(Cantonment General Hospital, Delhi Cantonment)

The certificate is awarded to

Col Avtar Singh Manhas

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

Post Graduate Diploma in Health and Hospital Management

And has successfully completed his Project on

**A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its
Influence on Performance of Healthcare Professionals-Case Study
Delhi Cantonment General Hospital**

Date15 Feb-15 May2017

Cantonment General Hospital, Delhi Cantonment

He comes across as a committed, sincere & diligent person
who has a strong drive & zeal for learning
We wish him/her all the best for future endeavors

Training & Development   **Zonal Head-Human Resources**

Certificate of Approval

The following dissertation titled **"A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals-Case Study Delhi Cantonment General Hospital"** at **Cantonment General Hospital, Delhi Cantonment,** 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

_____   _____

_____   _____

_____   _____

Certificate from Dissertation Advisory Committee

This is to certify that **Col Avtar Singh Manhas,** 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 **"A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals-Case Study Delhi Cantonment General Hospital"** at Cantonment General Hospital 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.

Internal Mentor
Dr Anandhi Ramachandran
Associate Professor
IIHMR, Delhi

External Mentor
Dr Gurdev Singh
MBBS,DGO,MBA,MHA
Chief Medical Officer
Cantonment General Hospital
Delhi Cantonment

FEEDBACK FORM

Name of the Student: Col Avtar Singh Manhas

Dissertation Organization: Cantonment Board Hospital, Delhi Cantonment

Area of Dissertation: A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals-Case Study Delhi Cantonment General Hospital

Attendance: (3 months) 15 Feb- 15 May 2017

Objectives achieved: Yes

Deliverables: Fulfilled

Strengths: Sincere and hardworking

Suggestions for Improvement: Further advancement in career

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):

Signature of the Officer-in-Charge/ Organization Mentor (Dissertation)

Date:
Place:

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals-Case Study Delhi Cantonment General Hospital"** and submitted by **Col Avtar Singh Manhas** Enrollment No. IIHMR-PG/15/018 under the supervision of **Dr Anandhi Ramachandran,** Associate Professor for award of Postgraduate Diploma in Hospital and Health Management of the IIHMR, Delhi carried out during the period from 15th Feb 2017 to 15th May 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.

Signature

Col Avtar Singh Manhas

Acknowledgement

I started off my training with a vision in my mind so as to be able to learn about the practical aspects of Healthcare Information Systems in a detailed manner.

I am thankful to **Dr Gurdev Singh**, CMO of Cantonment Board Hospital, Delhi Cantonment, who is also my external mentor for giving me the opportunity to carry out my dissertation and for his constant support and encouragement. I am thankful to him for the time and efforts he spent from his busy schedule. I wish to express my sincere gratitude to **Dr MK Hira**, SMO and **Mr Gaynendra Pal Singh** (IT Software Programmer) for his supervision, advice and guidance.

My heartfelt thanks to my mentors **Dr Anandhi Ramachandran, Associate Professor, at IIHMR, Delhi** for her tremendous help as a mentor and providing the much needed support, meticulous work habits and for answering my endless questions when I started my work.

I am immensely grateful to, **Dr Nishi Kant Bele, Associate Professor, IIHMR, Delhi** for constantly counseling, motivating and guiding me.

I am thankful to all the Clinical and Non Clinical Staff of the Cantonment Board Hospital who helped me in one way or the other to carry out my work successfully and to learn about the Hospital Information System (HIS) and those who were a part of my project without whose unconditional cooperation my study would not have been completed successfully.

I am also thankful to my colleagues from IIHMR, Delhi, especially **Dr Dalbeer Kaur Sahni,** who hold a special mention here for supporting me throughout the training and making it a great learning experience.

Col Avtar Singh Manhas

CONTENTS

LIST OF FIGURES

LIST OF TABLES

Table No	Title	Page No
8.1 to 28.1	List of tables	45-74

LIST OF APPENDICES

Serial No	Title	Appendix No	Page No
1.	Sample Questionnaire	1	112

ACRONYMS / ABBREVIATIONS

CGH   -   Cantonment General Hospital

Cantt   -   Cantonment

HIS   -   Hospital Information System

Dept   -   Department.

Fig.   -   Figure

IT   -   Information Technology

JR   -   Junior Residents

OPD   -   Outpatient department

IPD   -   Inpatient Department

OT   -   Operation Theatre

P.R.O   -   Public Relation Officer

SR   -   Senior Resident

Cmptr   -   Computer

Hosp   -   Hospital

EMR   -   Electronic Medical Record

HMIS   -   Health Management Information System

Yrs   -   Years

SECTION 1: INTERNSHIP REPORT

INTERNSHIP REPORT

(15thFeb – 15thMay 2016)

Introduction

Cantonments in India were originally established by the British Indian Army [1]. Currently, the Delhi Cantonment houses the Indian Army Headquarters, Delhi Area; the Army Golf Course; the Defense Services Officers Institute; military housing; Army and Air Force Public Schools; and various other defense-related installations. The cantonment also houses the Army Research and Referral Hospital, a tertiary care medical center of the armed forces of India.

There is a railway station within the cantonment, Delhi Cantonment Railway Station, from where trains depart for various parts of the country.

The Delhi Cantonment was established by the British in the year 1914. Till Feb 1938, the Cantonment Board Delhi used to be known as Cantonment authority. The area of the Cantonment is 10,791.88 acres. During the 2001 India census [3] Delhi Cantonment had a population of 124,452. Males constituted 61% of the population and females 39%. Delhi Cantonment has an average literacy rate of 77%, higher than the national average of 74%: male literacy is 83% and, female literacy is 68%. In Delhi Cantonment., 12% of the population is under 6 years of age.
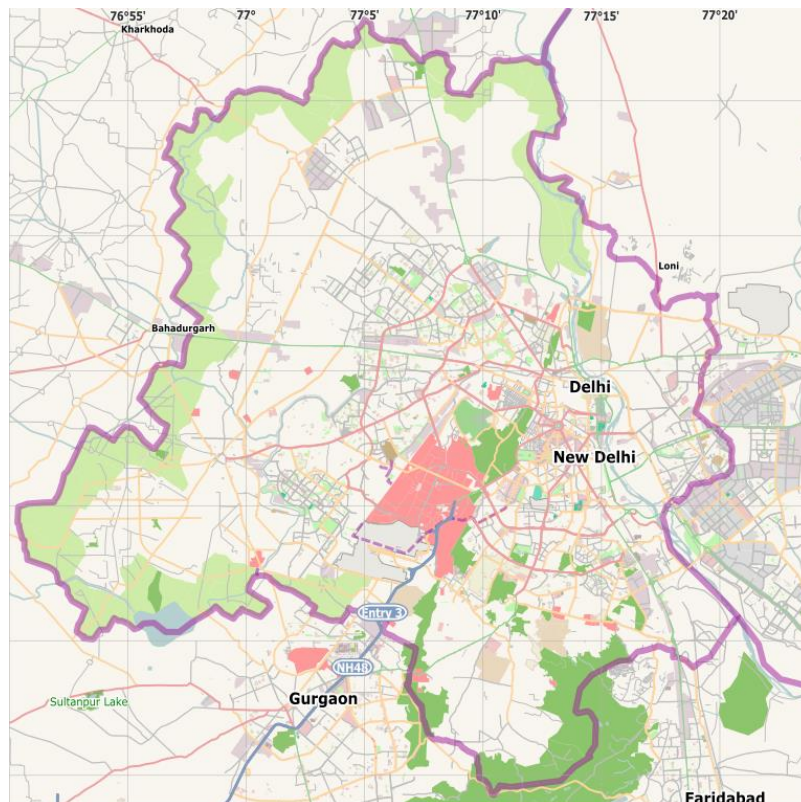
At the 2011 India census Delhi Cantonment had a population of 116,352. Males constituted ~58% (67,703) of the population and females constituted ~42% (48,649). Delhi Cantonment has an average literacy rate of 91.11%, higher than the national average of 79.9%: male literacy is 94.54% and, female literacy is 86.26%. In Delhi Cantonment., 11.36% of the population is under 6 years of age [2].

The Delhi Cantonment is as Class I Cantonment Board. Presently, the Cantonment is governed by the Cantonments Act, 2006 and various Policy letters and Instructions of the Ministry of Defense, Government of India issued from time to time. Though the Board functions as a local municipal body, yet it is under the administrative control of Directorate General Defense Estates, New Delhi and Principal Director, Defense Estates, Western Command, Chandigarh [3].

The Cantonment Board consists of eight elected Members, three nominated Military Members, three Ex-officio Members (Station Commander, Garrison Engineer and senior executive Medical Officer) and one representative of the District Magistrate. An officer of the Indian Defense Estates Services which is a central civil service is posted as the Cantonment Executive Officer (CEO) as well as the member secretary of the Board. The board is headed by the President Cantonment Board (PCB) who is the Station Commander and also presides over the meetings of the cantonment board. The Station Commander of the Army is the Ex-officio President of the Cantonment Board. At present **Brig. BK Rattan Pal** is the President of the Cantonment Board Delhi.

The term of the elected Members is of 5 years. The Vice President is elected from amongst the elected.

<u>**Organizational Profile**</u>

Cantonment General Hospitals have been raised in all Cantonments of the country to look after the civilian population living in and around the cantonments. These hospitals come under the Local Cantonment Board headed by a Chief Executive Officer (CEO) who is an officer of Indian Defense Estates Service cadre of Civil Services and works under the administrative control of Director General, Defense Estates and Government of India, Ministry of Defence. **Sh. B Reddy Sankar Babu, IDES** is the Chief Executive Officer of Delhi Cantonment Board at present.

One of the mandatory functions of the Cantonment General Board is to provide the basic health cover to the civilian population of Delhi Cantonment Area. The board has been performing this through Cantonment General Hospital located at Sadar Bazar, Delhi Cantonment.

Cantonment General Hospital **(CGH)** provides the basic health cover to the civilian population of Delhi Cantonment Area [4]. The Hospital made a modest beginning from one of the barracks of the old base hospital building at Sadar Bazar, Delhi Cantonment. The hospital was shifted to its present location in 1963 .The hospital is a **100-bedded unit** (under extension) at present, providing general medical and primary emergency care services including **Laboratory**, **X-ray** and **Delivery services.**

The hospital is managed by the permanent staff consisting of a CMO, 4 general duty doctors, a dental surgeon and other doctors on contractual basis. It has a full-time **dental clinic,** part-time **visiting specialist** of dermatology and ophthalmology. It has limited IPD services. It has in its premises a **Health Post of Delhi Government** which provides Maternal and Child Health Services including Antenatal Care and Immunization Services. It also has the **DOTS Centre of Delhi Government** providing treatment of tuberculosis. An **AYUSH clinic** run by Central Council for Research in Homoeopathy (CCRH) is also functional on daily basis. The hospital carries out **Birth & Death Registration**, an important function of Delhi Cantonment Board. It is implementing all the **National Health Programs** including Pulse Polio Program, School Health and Tuberculosis Control **[5].**

Mission,Vision and Values

The hospital has not developed any mission, vision or value statement

Structure of the Hospital -

The General hospital is housed in a Three floor building with the following constitution:-

Ground floor - Has the Reception and Registration center, Emergency, Casualty room, Ortho, Gynecology , Ophthalmology, ENT, Medical, Psychiatric, Skin , Ayurveda and Homeopathic OPDs, Minor OTs , Radiology (X ray & USG) , ECG room, Immunization and Injection room , Family planning Counseling room , Labor room , Physiotherapy room, a DOTS center , main Pharmacy , Dressing room and Plaster room.

The first floor has the Administrative block , Dental department , Path Lab , Pharmacy store , Ayurveda store , Family ward (18 beds) and a conference room .

The Second floor has the Major OT 2, VIP rooms (06 capacity   ) , Private wards

(18 capacity), Male ward (20 capacity   and CSSD

The Basement has the AC plant Linen store, Furniture store, Pump house and

Generator set

Ambulances - The hospital has two mobile dispensaries to cater for distribution of

medicines, it has two BSA and one ALS.

Distribution of beds

Gen. Medicine	16
Surgical Ward	16
New Born	03
Obs/Gyne (Maternity)	18
Pediatrics	06
Casualty & Observation	04
Isolation	04
Post OP.	18
ICU	06
Private Ward	09
Total	**100**

Staff

 The hospital has the following staff:-

The hospital is headed by a CMO (In charge) under whom are the following staff:-

- **Permanent** - Doctors - 04 , Nurses - 02 , ANM - 04 , Technicians - 02 , Pharmacist - 02, Administrative staff - 13

- **Contractual** - Doctors - 28,Nurses -35 , Technicians -1,Pharmacist - 04

Outsourced Services

The hospital has outsourced the following services

- Security -   30 persons

- House Keeping and waste disposal -   75 persons

- Maintenance & operation of Lifts & pumps

- Maintenance of equipment

- Fire fighting

- Laundry

- Kitchen

Services not catered for in the Hospital

The hospital has not catered for the following services:-

- Blood Bank

- Mortuary

Departments

Cantonment General   Hospital provides care through the following Departments:

- Orthopedics.

- Obstetrics & Gynecology

- ENT

- Skin

- Ophthalmology

- Medical

- Clinical Nutrition.

- Dentistry.

- Psychiatry

- Physiotherapy

- Health Check.

- Radiology

- Path and Lab

- DOT centre

- AYUSH clinic

Pictorial Tour of the Hospital

FULLY AUTOMATIC BIO ANAYLSER

DENTAL UNIT

MINOR OT

ULTRASOUND

PHYSIOTHERAPY

CSSD

HOMOPATHY CLINIC

LABOUR ROOM

LABOUR WARD

OPD BLOCK / बाह्य रोगी विभाग

BIRTH/DEATH REGISTRATION

INTENSIVE CARE UNIT

RECEPTION

AYURVEDIC CLINIC

PEDIATRICIAN

EMERGENCY

DENTAL

CARE FOR SENIOR CITIZENS

FEMALE WARD

FAMILY CARE DEPTT

ECG

ENT

SKIN OPD

PHARMACY

LABOUR ROOM

BIRTH/DEATH REGISTRATION

PATHOLOGY

MOBILE DISPENSARY

CRITICAL CARE AMBULANCE

SECTION II: DISSERTATION

CHAPTER 1: INTRODUCTION

Title of the Dissertation

A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals-Case Study Delhi Cantonment General Hospital.

Introduction

Hospital Information System (**HIS**) is an element of health informatics that focuses mainly on the administrational needs of hospitals. In many implementations, a HIS is a comprehensive, integrated information system designed to manage all the aspects of a hospital's operation, such as medical, administrative, financial, and legal issues and the corresponding processing of services. This study will help in increasing the understanding about HIS and its scope. It will help understand architecture of HIS that is usually followed. The study will also help to assess the current awareness, knowledge level and attitude of health care providers towards HIS at Cantonment General Hospital, Delhi. The study will help analyze the current usage level of HIS at Cantonment Board Hospital, Delhi, and the future trends it could follow.

 Information Management System at the National Level: The necessity of sound information system as a support to the various developmental activities of the Health sector in India was identified as early as Bhore committee report soon after the independence. The national health policy of India (1983) inter-alia states that appropriate decision making and program planning in the health and related fields is not possible without establishing an effective health information system and that nationwide organizational set up should be established to procure essential health information which may provide support for the local management of the health care and effective decentralization of the activities.

The National Health Information Systems provide the inputs in the formulation of regional and global health policies. The call for action to improve the information infrastructure is global as stated by World Health Organization time and again.

The Health Management Information System (HMIS) do exist in India. The organizational arrangement of HMIS and the agencies responsible are at three levels namely central, state and district. At the central level, Central Bureau of Health Intelligence (CBHI), Statistics Division in the Department of Health And Family Welfare and Sample Registration System (SRS) are there, which are managing various health related data which is being received from all part of the country through various states and districts healthcare agencies**.**

At the ground level that is at the level of various hospitals including Government and private the system of data collection is still manual and not based on IT systems in India. With a deliberate attempt from the central Government in terms of giving more priority to healthcare, provisioning of more funds and formulations of few policies at the national level in healthcare sector, this problem can be addressed at the earliest.

Therefore, there is a requirement to computerize all our data which is originating from various Government and private hospitals in our country. To do this, there are HIS which are already available in the market to suit the customized requirement of various hospitals in the country.

After a deliberate monitoring of present process and functioning of the hospital during the internship, it was clearly indicated that the Cantonment General Hospital at Delhi Cantonment requires improvement in planning, organizing and implementation of HIS at the earliest for efficient functioning and management of the hospital.

Rationale of the Study

Users' awareness knowledge acceptance is important for successful implementation of HIS. Hence, the **study aims** at a comprehensive study of clinical and non-clinical staff of all the departments of the Cantonment General Hospital with respect to gain info, knowledge, willingness and acceptance for successful implementation and utilization of HIS at the hospital and analysis of the facilities present by means of a preformed questionnaire.

Problem statement

The general problem is, despite the significant benefits of adopting HIS described in the literature, many barriers related to technology, policy, organizational culture, and finance stall implementation. EMRs are not in wide use by all health care professionals, despite increased pressure by consumers and regulatory agencies to provide a solution to medical errors. Various studies have proved that deaths occurred because of medication errors. Health care cost is high and HIS implementation is complex and expensive proposition.

Despite the well IT qualified staff which is available at the Cantonment General Hospital, Delhi Cantonment, the HIS Dhanvantri Software system which was procured four years back was not implemented on ground.

One have to understand the perceptions of health care practitioners as potential end users of HIS, which may contribute to effective adoption and successful technology training to support workflow.

CHAPTER 2 : REVIEW OF LITERATURE

Review of literature

A **hospital information system (HIS)** is essentially a computer system that can manage all the information to allow health care providers to do their jobs effectively. These systems have been around since they were first introduced in the 1960s and have evolved with time and the modernization of healthcare facilities. The computers were not as fast in those days and they were not able to provide information in real time as they do today. The staff used them primarily for managing billing and hospital inventory. All this has changed now, and today hospital information systems include the integration of all clinical, financial and administrative applications.**[6]**

Modern **HIS** includes many applications addressing the needs of various departments in a hospital. They manage the data related to the clinic, finance department, laboratory, nursing, pharmacy and also the radiology and pathology departments. The hospitals that have switched to HIS have access to quick and reliable information including patients' records illustrating details about their demographics, gender, age etc. By a simple click of the mouse they receive important data pertaining to hospital finance systems, diet of patients, and even the distribution of medications. With this information they can monitor drug usage in the facility and improve its effectiveness. Many hospitals have as many as 200 disparate systems combined into their **HIS**.

Hospital information systems have become very advanced and new innovations are continuously being introduced. But a HIS is useless if it confuses the hospital employees. The system must be user friendly and should include training by the vendors. A good **HIS** offers numerous benefits to a hospital including but not limited to the delivery of quality patient care and better financial management. The HIS should also be patient centric, medical staff centric, affordable and scalable. The technology changes quickly and if the system is not flexible it will not be able to accommodate hospital growth. An effective **HIS** also delivers benefits such as:

- Enhances information integrity

- Reduces transcription errors

- Reduces duplication of information entries

- Optimizes report turnaround times

Modern hospital information systems typically use fast computers connected to one another through an optimized network. These computers are programmed to collect, process, and retrieve patient

care and administrative information ensuring better ROI and delivery of service. If the hospital authorities have more relevant information they can make better decisions.

HIS leverage a highly optimized core library that ensures the delivery of operational and administrative information is required by users. A centralized information system can be customized according to the specific requirements of a hospital. A hospital can tell the solution provider its needs and the applications can then be molded to deliver exactly what was demanded. For instance, you can demand a solution that is based on RDBMS for easy retrieval of information. You can also ask the vendor for a HIS that has user friendly features and a multilingual interface that can be used by a diverse workforce.

History of HIS

In the 1960s, large hospital systems began to acquire mainframe computers, primarily for business and administrative functions. In the 1970s, lower-cost, minicomputers enabled placement of smaller, special purpose clinical application systems in various hospital departments. Early time-sharing applications used display terminals located at nursing stations. In the 1960s and 1970s, a small number of pioneering institutions, many of them academic teaching hospitals with federal funding, developed their own hospital information systems (HISs). Vendors then acquired and marketed some of the successful academic prototypes. In the 1980s, widespread availability of local area networks fostered development of large HISs with advanced database management capabilities, generally using a mix of large mini- and microcomputers linked to large numbers of clinical workstations and bedside terminals. When federal funding for HIS development diminished in the mid-1990s, academic centers decreased, and commercial vendors increased their system development efforts. Interoperability became a main design requirement for HISs and for electronic patient record (EPR) systems. Beyond 2010, open system architectures and interconnection standards hold promise for full interchange of information between multi-vendor HISs and EPR systems and their related subsystems[6].

HIS Review

Richard Hillestad, alongwith other affiliated authors from Santa Monica, California broadly examine the potential health and financial benefits of health information technology (HIT), by comparing health care with the use of IT in other industries. It estimates potential savings and costs of widespread adoption of electronic medical record (EMR) systems, models important health and safety benefits, and concludes that effective EMR implementation and networking could eventually save more than $81 billion annually—by improving health care efficiency and safety—and that

HIT-enabled prevention and management of chronic disease could eventually double those savings while increasing health and other social benefits. However, this is unlikely to be realized without related changes to the health care system [10].

Kathrin M Cresswell, David W Bates & Aziz Sheikh in their article "Ten key considerations for the successful optimization of large-scale health information technology" published on23 April 2016   brought out that implementation and adoption of complex health information technology (HIT) is gaining momentum internationally. This is underpinned by the drive to improve the safety, quality, and efficiency of care. Although most of the benefits associated with HIT will only be realized through optimization of these systems, relatively few health care organizations currently have the expertise or experience needed to undertake this. It is extremely important to have systems working before embarking on HIT optimization, which, much like implementation, is an ongoing, difficult, and often expensive process. Some key organization-level activities that are important in optimizing large-scale HIT systems. These include considerations relating to leadership, strategy, vision, and continuous cycles of improvement. Although these alone are not sufficient to fully optimize complex HIT, they provide a starting point for conceptualizing this important area [11].

Morgan Price, Alex Singer & Julie Kim MEng in one of the study **"Adopting electronic medical records,** *Are they just electronic paper records"* brought out to understand the key challenges to adoption of electronic medical records (EMRs) in office practice, and to better understand these challenges in a Canadian context.   Study design was mixed-methods study. Participant in this study were health care providers and staff in 5 primary care offices. In this level of EMR adoption was assessed, and field notes from interviews and discussion groups were qualitatively analyzed for common challenges and themes across all sites. The main findings were electronic medical record adoption scores ranged from 2.3 to 3.0 (out of a theoretical maximum of 5). Practices often scored lower than expected on use of decision support, providing patients with access to their own data, and use of practice-reporting tools. Qualitative analysis showed there were ceiling effects to EMR adoption owing to how the EMR was implemented, the supporting eHealth infrastructure, lack of awareness or availability of EMR functionality, and poor EMR data quality. Many practitioners used their EMRs as "electronic paper records" and were not using advanced features of their EMRs that could further enhance practice. Data-quality issues within the EMRs could affect future attempts at using these features. Education and quality improvement activities to support data quality and EMR optimization are likely needed to support practices in maximizing their use of EMRs [12].

John Ovretveit and his teammates in the article "Improving quality through effective implementation of information technology in healthcare" describe an implementation of one information technology system (electronic medical record, EMR) in one hospital, the perceived impact, the factors thought to help and hinder implementation and the success of the system and compare this with theories of effective IT implementation. To draw on previous research, empirical data from this study is used to develop IT implementation theory. Here the reults were that the Swedish implementation was achieved within a year and for fewer than half the budget, with a generally popular EMR which was thought to save time and improve the quality of patient care. Evidence from this study and findings from the more problematic USA implementation case suggests that key factors for cost effective implementation and operation were features of the system itself, the implementation process and the conditions under which the implementation was carried out[13].

Virginia D. Chavis in his dissertation report "Organizational Learning and Large-Scale Change adoption of Electronic Medical Records, M.S., University of Phoenix, 2004 brought out that despite implementation of electronic medical record (EMR) systems in the United States and other countries, there is no organizational development model that addresses medical professionals' attitudes toward technology adoption in a learning organization. The purpose of this study was to assess whether a model would change those attitudes toward use of an EMR system. The research questions examined whether EMR experience, age, job role, years in specialization, and learning culture does influence technology adoption. Organizational learning, sociocultural model, fifth discipline model, and the Dimensions of Learning Organization Questionnaire® model theories were used to guide the study. The research methodology was a mixed-method electronic and paper survey. The unit of analysis was 1576 medical professionals at St. Joseph's Hospital and Medical Center. After data collection, the resulting information was analyzed using correlation analysis, two-sample tests, and analysis of variance. A significant positive correlation was found between technology adoption and learning culture. A clear recommendation is that executive management planning to implement an EMR should focus on human factors, group relations, and learning cultures, in order to reduce barriers for those most likely to adopt it. EMR should enhance positive social change by accelerating the diffusion of complete, accurate, and timely medical knowledge that will benefit not only the organization but the patient [14].

Multiple functions of EMR, which included data from physical examination, laboratory, past medical history, tests, medication administration, radiology, treatment, daily charting, referral, diagnoses, etc., were found in the literature reviewed to play a role in the decision making process

not only for patient care but for management and health policy as well (**Hayrinen, Saranto, & Nykanen , 2008**)[15].

Miller and Sim (2004) expressed that EMR has the highest potential for improving quality among HIS as it has the widest range of capabilities [16].

Benefits of Utilization

Benefits associated with HIS: Much of the literature centered on HIS shared similar views of the positive benefits that the integration of HIS renders. HIS is being promoted within the healthcare industry as a vital tool used to not only achieve benefits such as reduced medical errors and improved patient outcomes, but also to help accomplish the goals of healthcare reform, such as: increased access to care, enhancement of workforce development and training, improved healthcare delivery systems, and culturally competent outreach and education (Custodio, Gard, & Graham, 2009). Garrido, Gerhardus, Rottingen, and Busse (2010)[17] found that health technologies can include a wide range of interventions used in health promotion, treatment, diagnosis, and any other intervention applied with the aim of improving the performance of the health system and overall health of a population.

Throughout the past twenty years the Institute of Medicine (IOM) in the U.S. has presented a series of reports promoting the increased utilization of information technology in the field of healthcare in order to achieve higher quality care and reduce costs. Other recent studies support the IOM's reports, since their findings show that measurable improved health benefits derive from the adoption and effective utilization of health information technologies (HIT) (Buntin, Burke, Hoaglin, & Blumenthal, 2011)[18]. The benefits associated with HIT are said to include error reduction, support of team-based patient care, and improvement in the integration of best practices in healthcare, enabling patients to become actively engaged in their own care, and producing more efficient services (Westbrook et al., 2009)[19]. DePhillips (2007) claimed that one of the fastest and most efficient ways health systems realize these benefits is through the implementation of the

electronic medical record (EMR). This centralized record could help with better informed clinical decisions, in turn minimizing medical mistakes and duplication efforts of recreating records for each patient encounter.

Among the positive pictures painted of HIT usage, there are also rising problems associated with HIT utilization. There is a readily accepted assumption that benefits are correlated with HIT usage; however, the IOM 2011 reported that HIT was not adequately tested and that features that are required to obtain one HIT benefit may conflict with efforts to achieve another or other benefits. There are increasing reports that HIT is becoming a distraction or a cause of miscommunication and if poorly designed and implemented HIT can create new hazards (IOM, 2011). Examples of unintended consequences or induced harm from HIT use include: medication dosing errors, failure to detect fatal illnesses, and delays in treatment due to poor user and computer interactions or loss of data (IOM, 2011)[20].

Benefits associated with EMR. "A growing body of literature promotes the implementation of EHRs as this technology has been associated with improving patient safety, improving coordination of care, enhancing documentation, and facilitating clinical decision making and adherence to evidence-based clinical guidelines" (Chen, Garrido, Chock, Okawa, & Liang, 2009, p. 323)[21]. Advantages linked with EHR include improved revenues, interoperability, improved communication, remote access of patient information, development of data for research and quality improvement, optimized billing and reimbursement services, increased access to affordable care, increased speed in patient encounters, increased security, and a reduction of medical errors, paperwork, and healthcare costs. (Zandieh et al., 2008; Yamamoto, 2006; Himmelstein, Wright & Woolhandler, 2009; Sykes, Venkatesh, & Rai, 2011)[22]

Research Question

The central research question of this study involved describing health care professionals' perceptions of HIS and the emerging themes. Guiding the study, the research questions helped to identify the perceptions of health care professionals' concerning HIS. The research questions further helped in determining and identifying barriers to integration of HIS. The central research question in the study was, "What are the perceptions of health care professionals toward HIS use at a Cantonment General hospital, Delhi Cantonment?" Following research sub questions guided the research:

1. What is HIS?

2. What is the scope of HIS in Healthcare Professionals?

3. What is their awareness level about latest health IT technology like HIS/EMR (Hospital Information System/ Electronic Medical Records)?

4. What is the perception of healthcare providers about HIS with respect to various attributes like its use, reliability etc.?

5. How do health care professionals describe their experiences of HIS use?

6. What barriers impede health care professionals' acceptance of HIS?

General Objective

To study the proposed HIS to be implemented in the Cantonment General Hospital and understand the perception of the staff towards proposed implementation of HIS.

Specific Objectives

1. To understand the computer awareness and usage among the hospital staff (both clinical and non-clinical).
2. To explore the awareness of the hospital staff towards HIS.
3. To learn about their perceptions towards perceived benefits, functions of HIS.
4. To get to know the potential barriers towards implementation of HIS as perceived by the hospital staff.

Research Justification

As the world is advancing towards new technology and so is India, Indian healthcare industry still lags behind. Indian healthcare sector have to cover a large gap to be able to utilize the advance technologies like HIS in health sector and provide the best health care possible to the patients.

CHAPTER 3: RESEARCH METHODOLOGY

Research Methodology

Research Design: Thorough review of literature was done for secondary research. Primary study was descriptive.

Target Sample: Clinical and Non-Clinical Hospital Staff.

Sample Size: 70 clinical and Non-clinical staff members of the hospital

Sample Selection :   Convenient Sampling. The inclusion criteria for sampling staff was those who are either directly interacting with the patients or maintain various clinical and administrative data/records in the hospital.

Methods : Primary Data - Quantitative Method, Desk Review of the HIS

Tools: Structured Questionnaire, Documentation Tools - Flow Chart

Data Analysis Method : Microsoft Excel 2010 was used to analyze the data

Results:

Time of Study: 15th Feb to 15th May 2017

Data Collection: 1st Mar to 5th Apr 2017

Limiting Factors

   a) Participant Bias

   b) Time duration of 3 month

   c) 100 bedded hospital with 55 operational beds only.

HOSPITAL INFORMATION SYSTEM

(HIS)

Hospital Information System

HIS is a comprehensive, integrated information system built for managing the operations in running health care facilities (Hospitals). HIS as any other integrated system , needs time for developing , require special type of professional skills for development and software production but most importantly it costs money for development , installation , support and upgrade .[6]

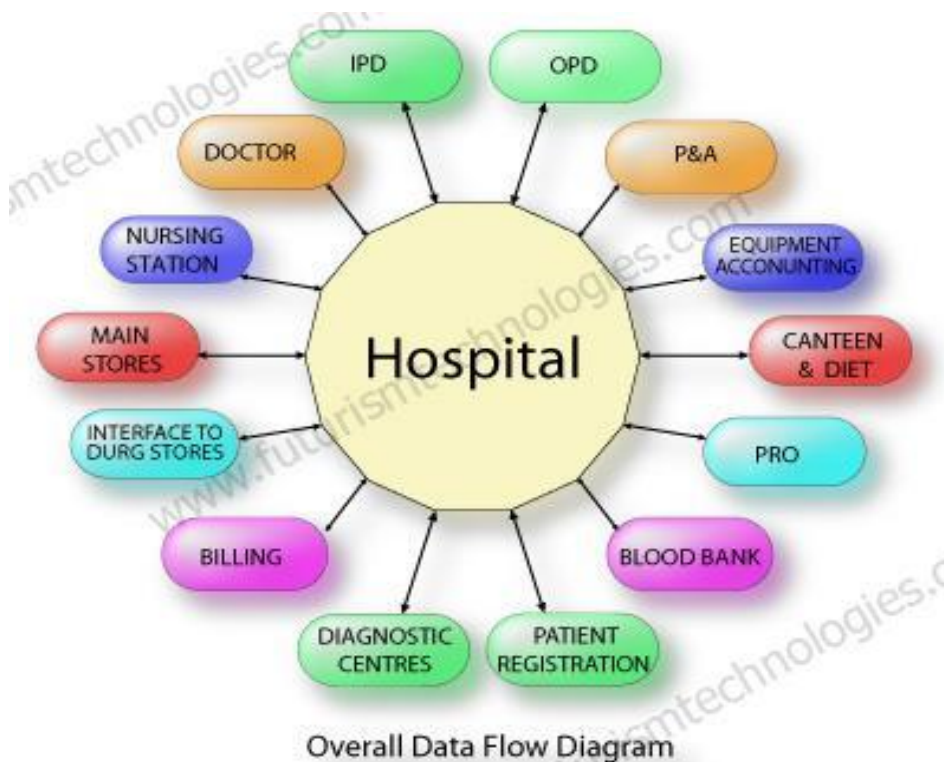A general block diagram of HIS is shown in the figure:

Fig1: General data flow block diagram of HIS (Mtechnologies.com)

Architecture

Hospital Information System architecture has three main levels, Central Government Level, Territory Level, and Patient Carrying Level. Generally, all types of hospital information system (HIS) are supported in client-server architectures for networking and processing. Most work positions for HIS are currently resident types. Mobile computing began with wheeled PC stands. Now tablet computers and smartphone applications are used.

Enterprise HIS with Internet architectures have been successfully deployed in Public Healthcare Territories and have been widely adopted by further entities.[7] The Hospital Information System (HIS) is a province-wide initiative designed to improve access to patient information through a central electronic information system. HIS's goal is to streamline patient information flow and its accessibility for doctors and other health care providers. These changes in service will improve patient care quality and patient safety over time.

The patient carries system record patient information, patient laboratory test results, and patient's doctor information. Doctors can access easily person information, test results, and previous prescriptions. Patient schedule organization and early warning systems can provide by related systems.

Functional split

HIS has data warehousing as the main topic, hence a more static model of information management. HIS is often composed of one or several software components with specialty-specific extensions, as well as of a large variety of sub-systems in medical specialties from a multi-vendor market. Specialized implementations name for example Laboratory Information System (LIS), Policy and Procedure Management System,[8] Radiology Information System (RIS) or Picture archiving and communication system (PACS).

Architecture is based on a distributed approach and on the utilization of standard software products complying with the industrial and market standards must be utilized (such as: UNIX operating systems, MS-Windows, local area network based on Ethernet and TCP/IP protocols, relational database management systems based on SQL language or Oracle databases, C programming language).

Portable devices such as smartphones and table computers may be used at the bedside.

Aim

Hospital Information Systems provide a common source of information about a patient's health history. The system has to keep data in a secure place and controls who can reach the data in certain circumstances. These systems enhance the ability of health care professionals to coordinate care by providing a patient's health information and visit history at the place and time that it is needed. Patient's laboratory test information also includes visual results such as X-ray, which may be reachable by professionals. HIS provide internal and external communication among health care providers.

The HIS may control organizations (a Hospital in this case), official documentations, financial situation reports, personal data, utilities and stock amounts. The HIS also keeps in a secure place: patients' information, patients' medical history, prescriptions, operations and laboratory test results.

The HIS may protect organizations, handwriting errors, overstock problems, conflict of scheduling personnel, and official documentation errors like tax preparations errors.

Systems administrator/database administrator

- **IT Administrators**

The systems administrator-database administrator is responsible for systems administration to ensure the high uptime of the system and for handling all database back-up and restoration activities.

- **Application specialist and trainer**

The hospital's application specialist together with the software vendor is involved in all the activities required for implementing the application software. Trainers train and retrain new employees in the hospital.

- **Hardware/network engineers**

Hardware/Network engineers are responsible for maintaining the hardware and network systems in the hospital. They undertake all troubleshooting activities that may be required to keep the system online and patient data available to doctors and nurses.

Standardization

There is no standardization, except for data formats and for data interchange, as with the HL7 initiative supported by ISO.

- Efficient and accurate administration of finance, diet of patient, engineering, and distribution of medical aid. It helps to view a broad picture of hospital growth

- Improved monitoring of drug usage, and study of effectiveness. This leads to the reduction of adverse drug interactions while promoting more appropriate pharmaceutical utilization.

- Enhances information integrity, reduces transcription errors, and reduces duplication of information entries.[9]

- Hospital software is easy to use and eliminates error caused by handwriting. New technology computer systems give perfect performance to pull up information from server or cloud servers.

Advantages

1. Hospital Information System helps in maintaining a totally secured database of Patients and business information. This information can be available at your fingertips.

2. Hospital Information System helps in improved healthcare delivery by providing medical personnel with better data access, faster data retrieval, higher quality data and more versatility in data display.

3. Hospital Information System helps in improving efficiency, both on the cost and the clinical care perspective. This is achieved by avoiding duplications, repetitions, delays, missing records and confusions.

4. Hospital Information System helps to force orderliness and standardization of the patient records and procedures in the clinic and increasing accuracy & completeness of medical records of Patient.

5. Hospital Information System helps as a good managerial tool to provide total, cost-effective access to complete and more accurate patient care data to offer improved performance and enhanced functions.

6. Hospital Information System helps in gathering information to meet management challenges.

7. Hospital Information System helps to educate patients about their diseases of surgical procedures through pictures and animations.

Objective:

To Provide an integrated Solution for the Hospital, which
- Helps in Efficient Management of the Hospital.
- Enhance Patient Care
- Improve work efficiency
- Improve Fiscal Control
- Eliminate the chances of any Pilferage
- Enable the Growth of the Hospital

What you need
- Be fully informed about the Vital Stats of the Hospital.
- Lesser dependency on middle & Lower Management. Full control on the staff.
- Take corrective actions based on the data instantly.
- Helps you to Plan any future activity.
- Ultimate Aim – **Better Patient Care with Efficiency**.

Modules

Structuring Medical Records to carry out functions like admissions ,discharge, treatment history etc:

Patient Registration:

This function of Hospital Management Information System deals with registering the new Patient either for OPD or IPD and giving unique Identification Number to the Patient. This number is unique through out the System for identifying the patient. The patient can be registered either at IPD Front Office or at OPD Reception. The OPD or IPD identification number is also created for each separate visit of the patient. This is also a part of registering patient. IPD/OPD ID is used for tracking of medical records of the patient for that particular OPD visit or IPD admission. All the medical record of the patient are identified by combination of numbers i.e. Patient ID and OPD/IPD ID. The numbers gives flexible search in terms of finding patient's History Record.
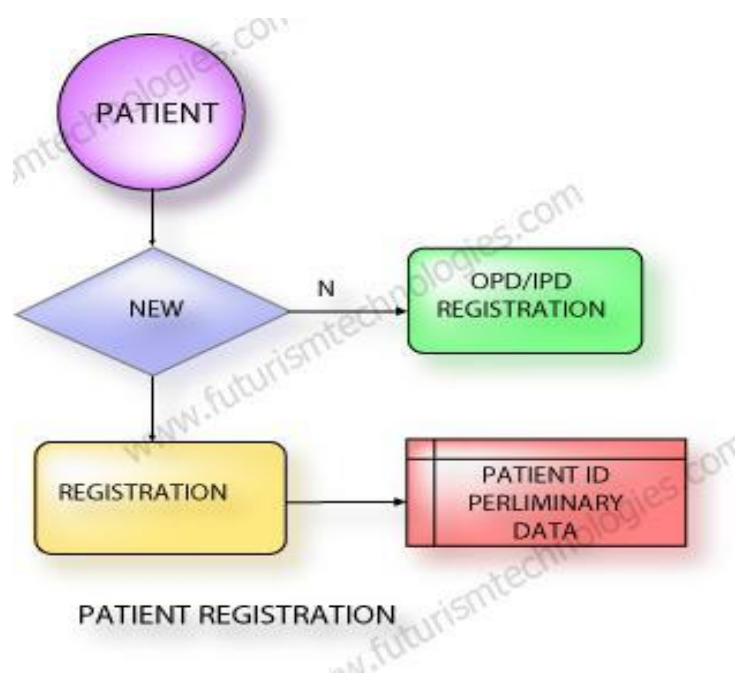
Fig 2- Patient Registration (Mtechnologies.com)

OPD / IPD Investigation Cases:

This Module of Hospital Management System deals with all kinds of Investigations suggested by Doctors. The function enables the entry of Investigations /Procedures for a particular patient. The entered investigations are rooted through the Billing/Cash office and once the patient pays for the Investigations the entries of the same goes to respective Diagnostics Center. This flow is not compulsory of IPD patients since the Billing for IPD patients is done at the time of Discharge. Investigation requisition is created and printed with function and the same is available at respective diagnostics center for preparation of Reports.
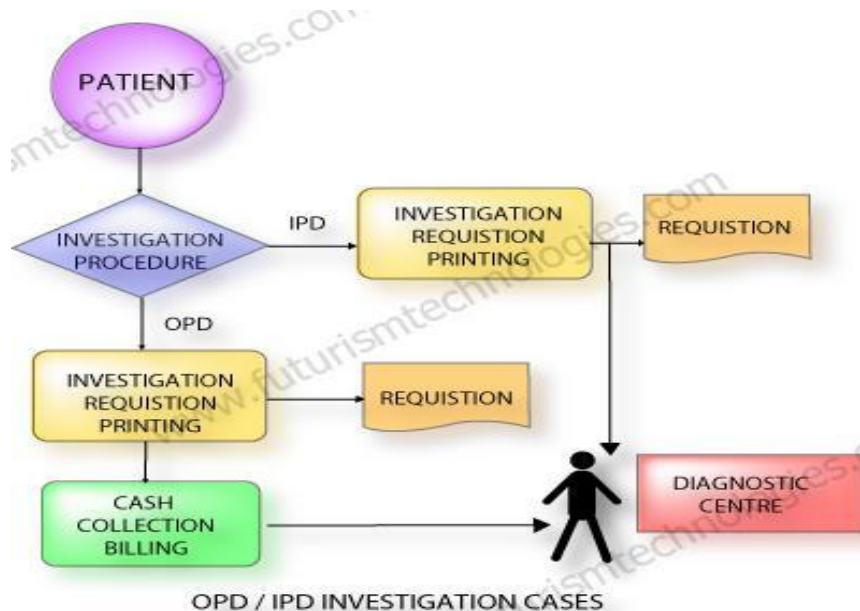

Fig 3- OPD/IPD Investigation cases diagram (Mtechnologies.com)

IPD Admission And Ward Allocation

This function Patient IPD Admission gives facility to process patient admission and allocate Bed to patient. System identifies the patient as new IPD patient or internal referred from hospital OPD/CMO. This function gives information on vacant beds in a Hospital. Occupancy status on that particular position can be find out while allocating the Bed. The main function Patient Admission facilitates admitting the patient according to requirement, considering the type of admission and the patient condition. The admission of the patient can be direct / Referred from a consultant / Hospital. The category of the patient can be Company, Self, Government Schemes, Insurance, and MLC depending on that the admission procedure is completed. Once the patient is admitted in the Hospital the Room charge starts from the time of Admission. The case paper of the patient is printed from the system and is send to the respective Nursing Station. Once the Admission of the patient is completed the IPD Identification Number is created by the system for that particular Admission of Patient. The IPD Admit Card is also printed along with the Case Paper. The system informs with Audio Visual alert to the respective Nursing Station about admission of the patient under them and to prepare Room for patient. In case of MLC, system stores the details of the Police Station, Name of the official informed about Medical Legal Case.
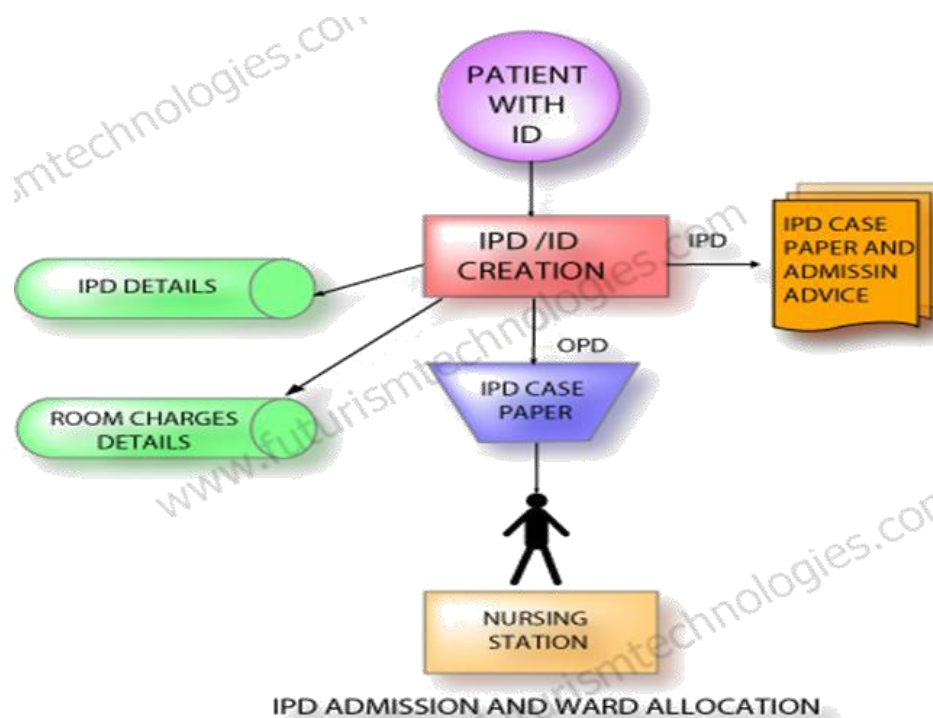

Fig 4- IPD Admission and ward allocation diagram (Mtechnologies.com)

Patient Shifting

This function of Hospital Management System facilitates to Shift patient from one Room to other inside the Hospital. With this facility patient's actual position can be updated on line so that the internal functions such as Billing, Investigations, Surgery are planned. The position of the patient is very important since all the charges like Surgery. Procedures, Investigations are related to Room Category.

Deposits, Advances, Refunds, Discounts And Concessions

This function of Hospital Management System facilitates all kind of financial transactions from the patient. Function plays vital role in payment recovery from patients time to time during the stay. The Advances from the patient depends on the Type of Admission and the Patient category is prompted by the System. The Interim Bill vs. Advances ratio is also maintained to carry out recovery planning. Advances and the deposits accepted by the Billing/Cash counter are directly posted into Accounts. Refund cases are considered for excess Advances from the Patient. The Accounts Official authorizes this transaction and then refund is processed. In case of Company category patient the ration analysis between Interim Bill and the Authority letter amount by the company is compared for further action. If patient is to be given Discounts then the authorized person authorizes the Amount and the discount is processed. The discount categories are flexible and can be changed by the administrator. This facilitates easy way to keep track on the discounts and concession.

Following are the main reports / outputs generated by HIS:

Patient List-Admitted / Discharged

This report gives information on admitted/discharged patients during certain time period. This facilitates management to know the Admission vs. Discharges ratio.

Bed Occupancy Reports

This report gives information on Bed Occupancy at any given time room category wise.

Ward Allocation Reports

This report gives allocated rooms report for tracking of patient.

Interim Bill v/s Advance Report

This report gives the ration of Interim Bill vs. Advances paid by the patient with the percentage of payment.

Admission / Discharge Register

Admission and Discharge register is maintained by the system. This report gives details of patient Admission and discharges during specific period.

Consultant wise patients

This report gives Doctor Wise patients at any point of time to know referring or In-charge doctor.

Appointment List

The appointments for consultants are maintained on the system Performed operation list.

Diagnostic Centres

This module enables to get patient's investigation, procedure record from different locations i.e. IPD, OPD, Casualty.

Automated Clinical Laboratory Systems & Radiology Information System:

This function of HIS covers Laboratory System for Pathology, Radiology, Cardiology, Neurology, and Chest Medicine. The prescriptions given by the Doctors are routed through billing system to respective Diagnostic Centers.

Pathology

Laboratory module starts with receiving the online request from doctors. Laboratory personnel can also generate requests. This facilitates investigations for referral patients. Tests are grouped under various sections and sample type (specimen). Based on the request the user can input the sample and generate the sample number. Results can be inputted based on the sample type. Results can be inputted either to one test or multiple tests. If the test result requires approval, the supervisor has to approve the result. Test results are available to concerned doctors. Test report

can be made confidential. Tests can be performed only after the billing is done. This rule is exempted when the case is declared as Urgent.

Integration of tests Ordered from Clinical Modules Comprehensive On-line Laboratory Reports

Fast Entry of Results

Enables Doctors to see the Results On-Line from any Location at any time Up-to-date status about request

Provision for templates of Input of test Results

Radiology

Radiology module caters to services such as X-ray, Scanning, Ultra sound etc. Scheduling of Radiology resources is possible. The system stores all the result details of various tests and makes a Report based on the Test Results. These Tests are carried out both for Inpatient and Outpatient. The system stores all the details (like patient number, Test Report like X-Ray, Scanning details) and for each scan the system generates a unique number for the image. Investigations can be done only after the billing is done. This rule is exempted when the case is declared as Urgent.

CT Scanning: Direct Capturing of CT Scanned images, Easy Reporting facility
MRI: Easy reporting

X-Rays: Direct Capturing of X-Ray images

Sonology

- Sonography
- Reporting
- Capturing of Images

Cardiology -ECG Notes

Neurology- EMG Reporting

Prescriptions Discharge Card

Blood Bank

This module is developed keeping in view the legal and other requirements of operating the Blood Banks. It deals in detail with blood transfusion centers and the component laboratories and works as is online interactive system. It also generates legal as well as internal operation records.

Functions

- Donors data entry, Details of Donors such as Name, Address, Contact Numbers, Blood group are maintained in the system through Donors data entry.
- The details can be printed as and when required. The mailing list from the available data of donors can be printed for Correspondence.
- Investigation Data Entry
- Various tests details are stored in the system for as per rules of Blood Bank.
- Maintains data of tests
- Tests data details required for Blood Bank records are stored into the system with specific results on HIV, HB details.
- Facilitates component level administration of the blood units
- Keeps track of distribution / disposal of the whole blood and the components
- Signals expiry dates and components characteristics

Reports

- Blood Stock Register
- Donor register as per FDA requirements
- Investigation Report
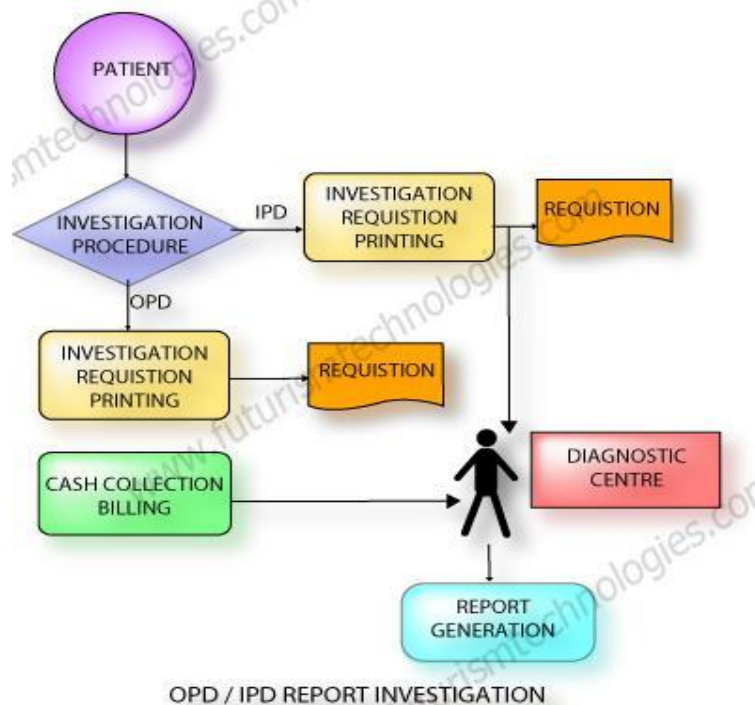- Blood Issue Register
- Demographic data of Donors

Fig 5- Radiology Information System

(Mtechnologies.com)

Database is the heart of Hospital Information system. It consists of an orderly written document encompassing the patient's identification, health history, physical examination findings, laboratory reports, treatment, surgical procedure reports and hospital course. When complete, the record should contain the data to justify investigations, diagnosis, treatment, and length of stay, results of care and future course of action". Thus, it becomes a tool:

☐ To provide a means of communication among physicians, nurses and other allied health care professionals

☐ To provide Continuity of patient care, help in medical education and research

☐ To provide information for the quality review of patient care

☐ To protect legally the physician, patient, hospital and helps in third party payment.

☐ Failure to maintain an accurate, timely and complete database spoils the usefulness of HIS.

Medical Records are valuable to patients, physicians, nurses, teachers, students, and health care institutions, and research teams, national and international organizations.

* Advantages of having good database can be taken from Advantages of HIS.

<u>Need of Networking in HIS</u>

Networking plays an important role in Hospital Information System, with new applications that improve patient care and drive down spiraling healthcare costs. However, rapid changes in next generation wired and wireless healthcare applications mean that the network is no longer an option, but a necessity. HIS providers are under increasing pressure to provide an infrastructure that can be optimized for these next-generation applications. Applications such as electronic Medical records (EMR) and wireless monitoring and the increasing use of handheld devices and broader imaging distribution all drive the need for network upgrades to provide a more robust, higher-performing, and secure network infrastructure. This infrastructure is critical to reduce staff wait times and allow staff and patient mobility, equipment tracking, and broader integration of data systems. even with the need to control costs, HIS providers are still expected to fund network growth as more and more devices are connected via the wired and wireless network. Although higher performance and lower total Cost of ownership (TCO) may be conflicting goals, Hospitals find HIS exceed performance and cost expectations, but can do so while providing a more secure and flexible network infrastructure that can scale to meet growing connectivity demands. Depending on the size and function of the institution, hospital network architectures can vary significantly in complexity and scope. Although the basic architecture for a hospital network is similar to the architecture of other campus networks, responding to the dynamic changes in improved patient care and cost control requires significantly more planning and strategy than was previously required. HIS networks demand greater flexibility in supporting a wide range of medical devices and applications including EMR, PACS, collaboration, handheld devices, wireless patient monitoring, and other services. As more and more wired and wireless services are used and the network must support patient care, an efficient network is no longer a luxury, it is a necessity.

Online MIS

This is a unique tool in the hands of top management. This module shows a screen where all current activities in terms of revenue are displayed and this screen is refreshed automatically after every 10 seconds. Simply saying, by looking at this screen, top management can find out the collection of various departments in OPD & Indoor, Outstanding of General and panel patients, No. Of admissions, Discharge of the day and so on.

Fig6: Screen shot-HIS

Salient Features:

  i.   Complete information of Hospital Activities in terms of revenue.
  ii.   Auto Refresh screen every 10 seconds.
  iii. Details of Running & Outstanding payments for general & Panel Patients
  iv.   Panel wise billing & Outstanding
  v.   Consultant wise visit report
  vi.   Details of Admission & Discharges
  vii. All data available for any selected date range.
  viii. Daily Collection Report.
  ix.   Room Occupancy report.
  x.   Panel Wise Report.

xi.   Patient Treated report.
xii. Department Wise billing details.
xiii. Bills Modification Details.

CHAPTER 4 : DATA COLLECTION AND

DATA ANALYSIS

Data Collection and Data Analysis

Ethical considerations:

- Before proceeding with the questionnaire, **consent** of the respondent was taken.

- Confidentiality of the respondents was maintained.

Data was collected and interpreted through Questionnaire given to 70 clinical and non-clinical staff of the hospital. Questionnaire was designed to include questions about their demographical details, awareness of staff about their computer literacy, whether they have the access to the clinical data or not and their perception towards the HIS/EMR benefits. No open ended questions were asked.

Questionnaire which was given to the staff is attached as **Appendix A**

Data Collection and findings

Demographic Details

Distribution of Sex Ratio: There was more number of females than the males' staff sample available in the cantonment board hospital [Figure 7].

Figure 7: Distribution of Sex Ratio

Figure 1
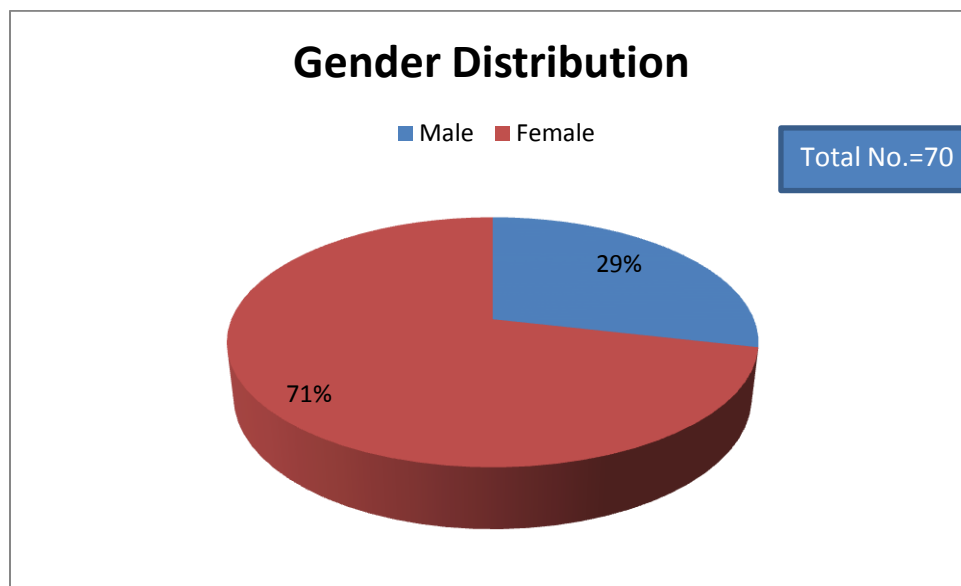
The 71% of clinical staff were the females working in the hospital. The maximum number out of this sample was the nursing staff who would be directly related to the maintenance of the patient records.

Distribution of Staff According to the profession:

Table 8.1: Staff distribution according to Professions

Occupation	Staff
□ Administrative support staff	2
□ Family physician	4
□ Imaging technologist	3
□ Specialist physician	25
□ Laboratory technician	4
□ Nurse	30
□ Pharmacist	2
Total	**70**

Figure 8: Staff Distribution as per profession.
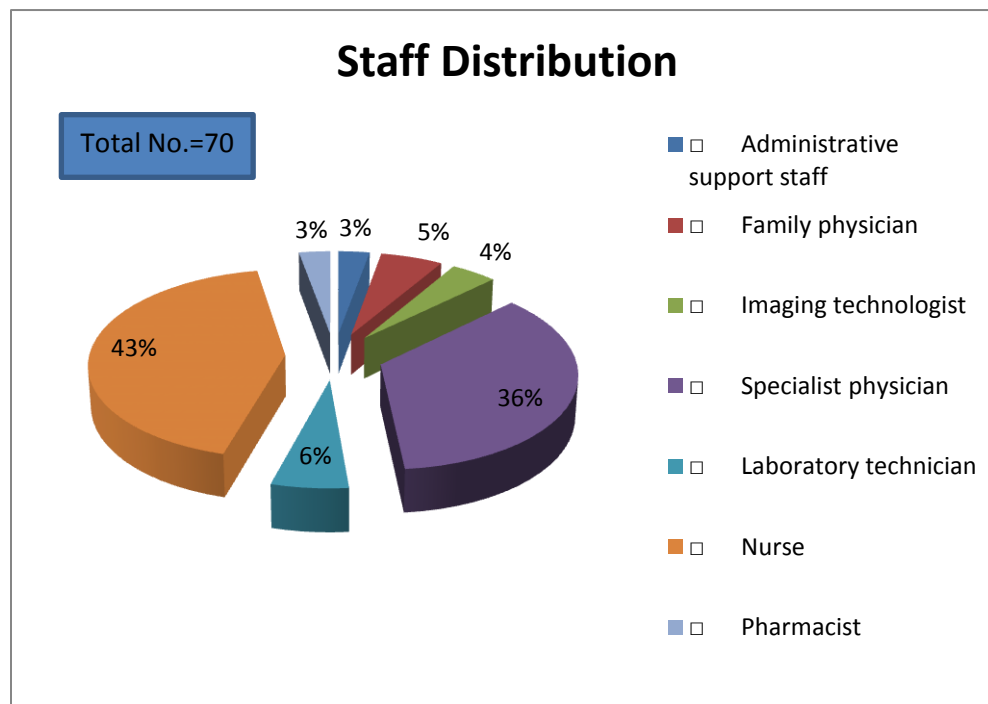
While taking the sample it was ensured that all the dept. of the hospital is covered, hence administrative department, family physicians and specialist. Lab, nurses and pharmacist were addressed.   50% were nurses who will be maintaining the patient's data the most.

Age profile

Table 9.1:   **Age profile of the sample staff**

Age	Staff
□ < 30 yrs	49
□ 30- 40 yrs	11
□ 40-50 yrs	5
□ > 50 yrs	5
Total	**70**

Figure 9:   Age profile of the staff.
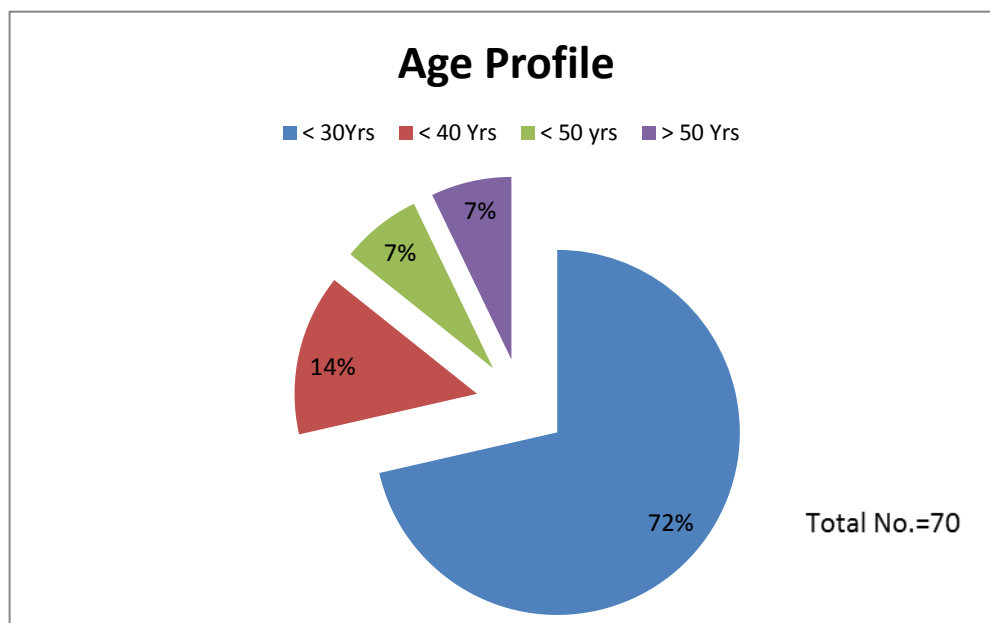
72% of the samples were below 30 yrs of age, 14% between 30-40 yrs and 7% each in between 40-50 years and more than 50 yrs of age groups.

Work Experience in terms of years

Table 10.1: Work Experience of the staff

Work Experience(Yrs)	Staff
□ Between 1-5yrs	30
□ Between 5- 10 yrs	20
□ Between 10-15 yrs	11
□ Between 15-20 yrs	8
□ > 20 yrs	1
Total	**70**

Fig 10: Work Experience
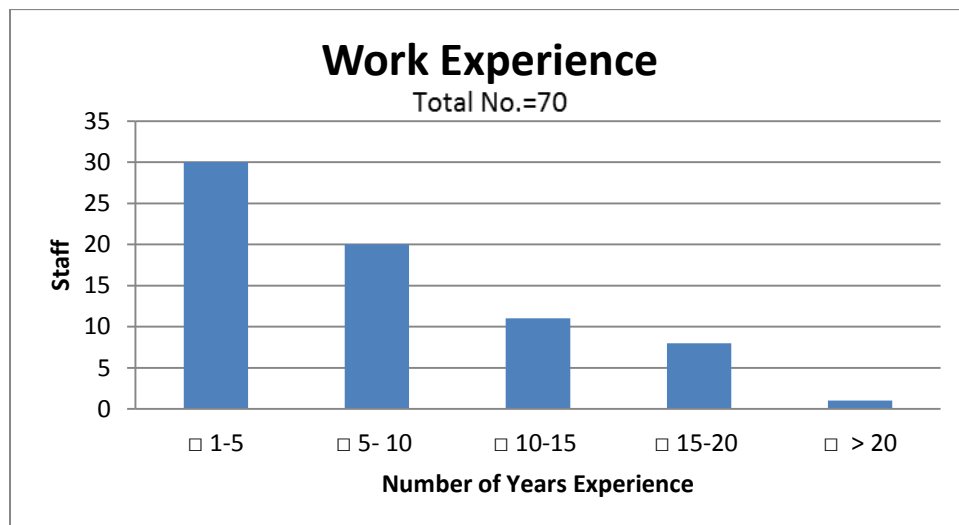
The work experience of approx. 45% of the staff is less than 5 years, between 5-10 is approx. 35% and rest of the 20% is between 10-20 years. The Hospital is having less experienced staff because maximum staff is hired on contractual basis.

Work experience on Computers

Table 11.1: Work experience on Computers

Work Experience(Yrs)	Staff
< 5 years	15
5-10 years	41
>10 years	14
Total	**70**

Fig 11: Worked on Computers
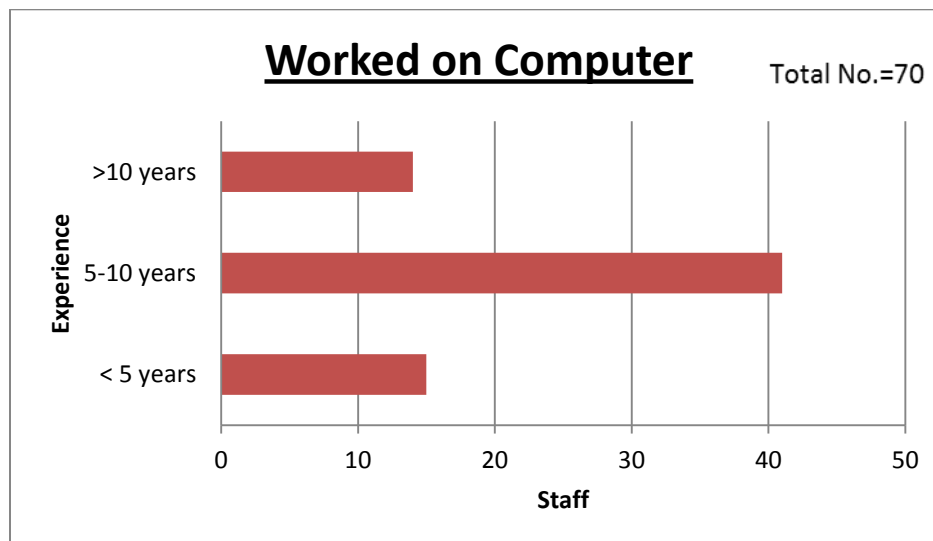
15% of the staff have less than 5 yrs of experience on computers,41% staff have 5-10 yrs of experience and 14% have more than 5 yrs of experience.

Access to Computer

Table 12.1: Access to Computers

Location	Staff
Home	29
Workplace	11
Home & Workplace	30
Total	**70**

Fig 12: Access to Computers.
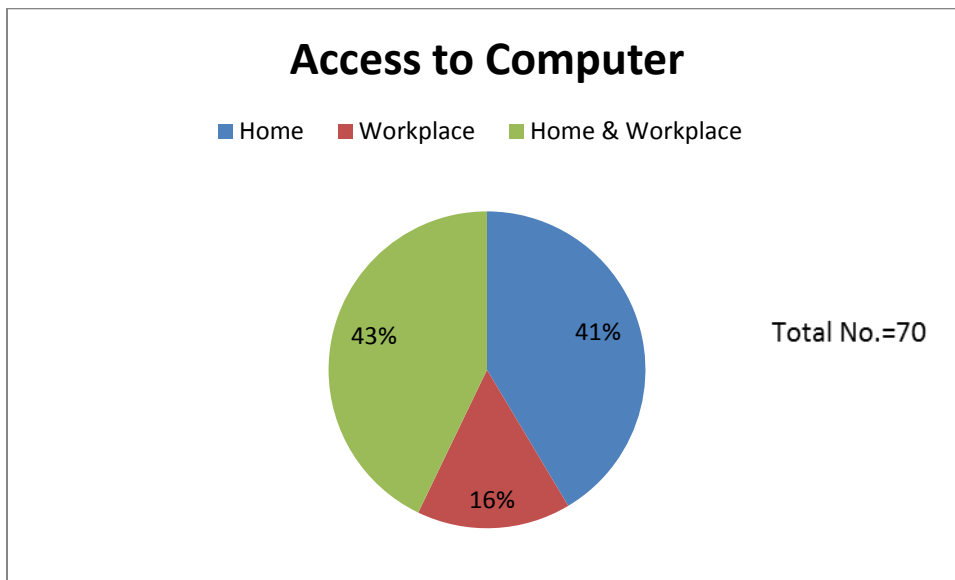
Out of the total 70 sample staff, 29 members have the excess to the computers at home, 11 at the work place and 30 at both home and work place. This means that maximum staff have the excess to the computers.

Ability to use Software

Table 13: Ability to use Software

Work Experience(Yrs)	Staff
Word	-
Access	-
Excel	-
Email	**-**
Powerpoint	**-**
Internet	**-**
more than one software	**70**
None	**-**

The sample selected have the ability to use **more than one** software. This means that the staff employed at the hospital has the knowledge on how to work on computers. Therefore, it implies that EMR/HIS can be implemented effectively.

Usage of the computer at the work place

Table 14.1: This table is showing usage of the comptr at the work place.

Work Experience(Yrs)	Staff
1-2 hours	55
2-5 hours	10
> 5 hours	5
Total	70

Fig: 13   Fig is showing usage of the comptr at the work place.
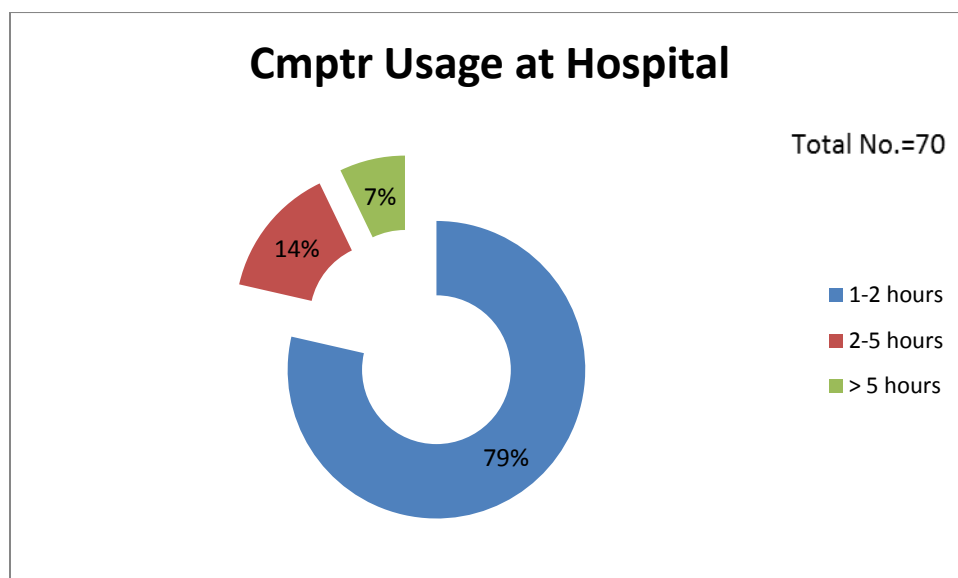
79% sample could only use 1-2 hrs of computers at work place, 14% for 2-5 hrs and 7% only for more than 5 hrs.

Staff providing direct care to patients

Table 13.1: This table is showing details of those staff providing direct care to patients.

Direct care	Staff
Yes	50
No	20
Total	70

Fig 14: Staff providing direct care to patients.
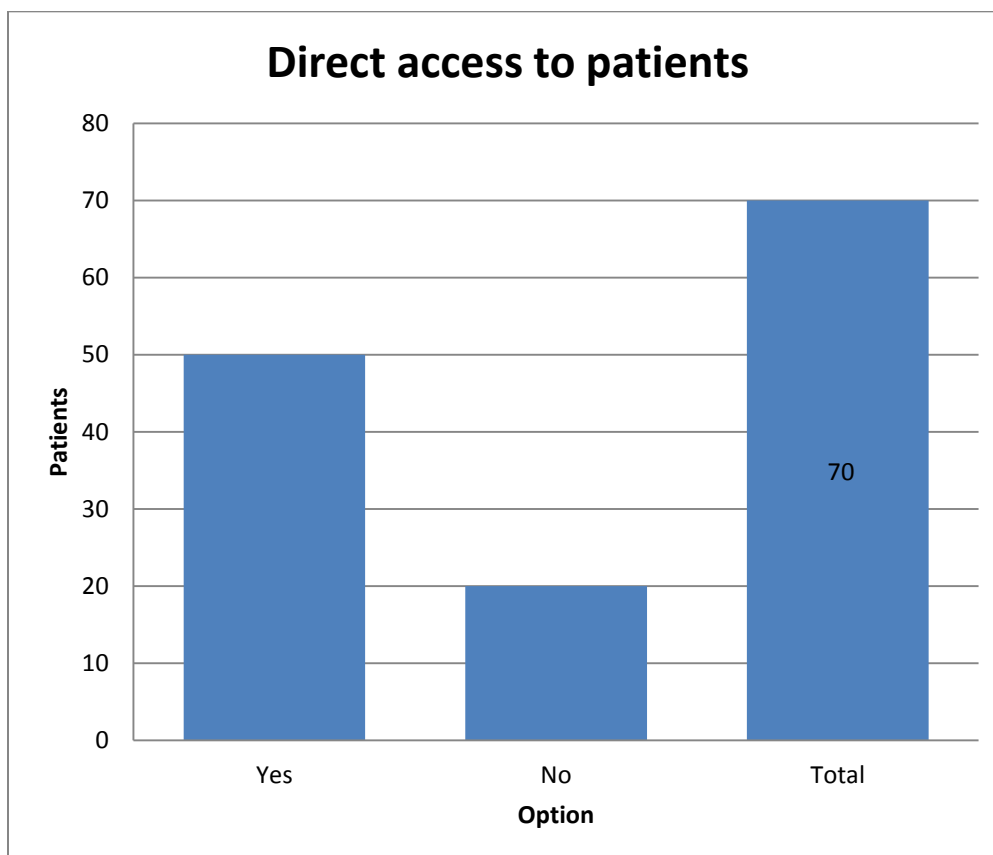
Table:14.1   Showing staff needing clinical data at work of OPD/IPG Patients.

Clinical Data	Staff
Inpatients	20
Outpatients	10
Both	40
Total	**70**

Fig 15: Staff needing clinical data
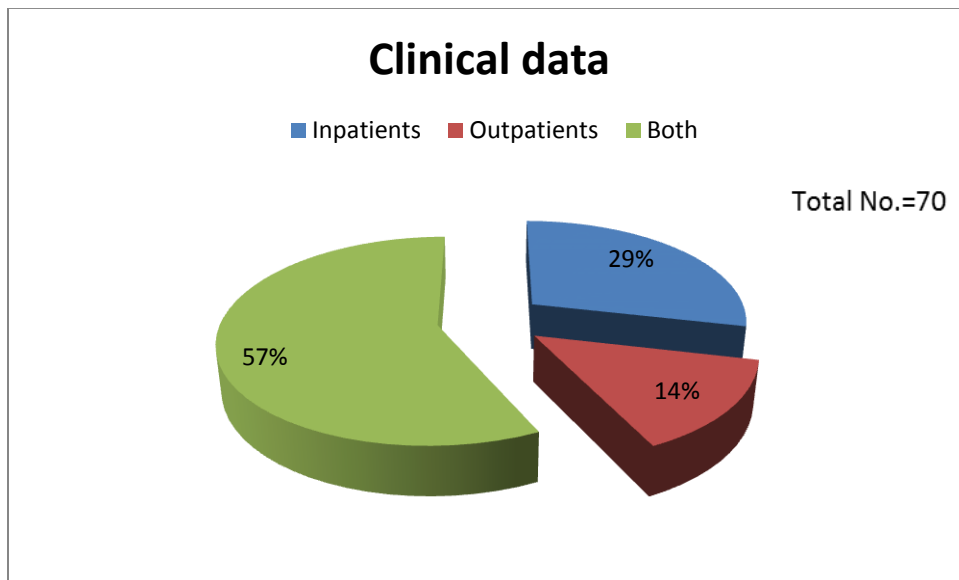
57% of the staff agrees that they need data for both IPD and OPD. 29% think its required for IPD and 14% for OPD.

Awareness to HIS

Table:14.1   Showing Knowledge of staff about HIS.

Option	Staff
Yes	32
No	38
Total	**70**

Fig 16: Staff's Knowledge about HIS
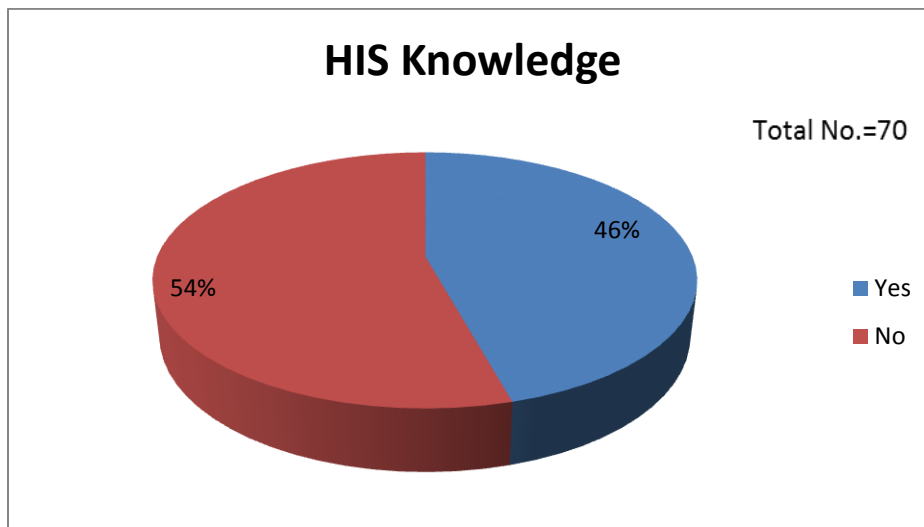
54% of the staff says that they don't know about HIS. 46% have the knowledge about HIS.

Table14.1: Usage of HIS by the staff.

Duration	Staff
Less than a month	10
1-3 months	5
4-6 months	6
7-12 months	2
1-2 years	2
3-5 years	5
Till date	-
Never	40
Total	**70**

Fig 17: HIS Usage by the Sample Staff.
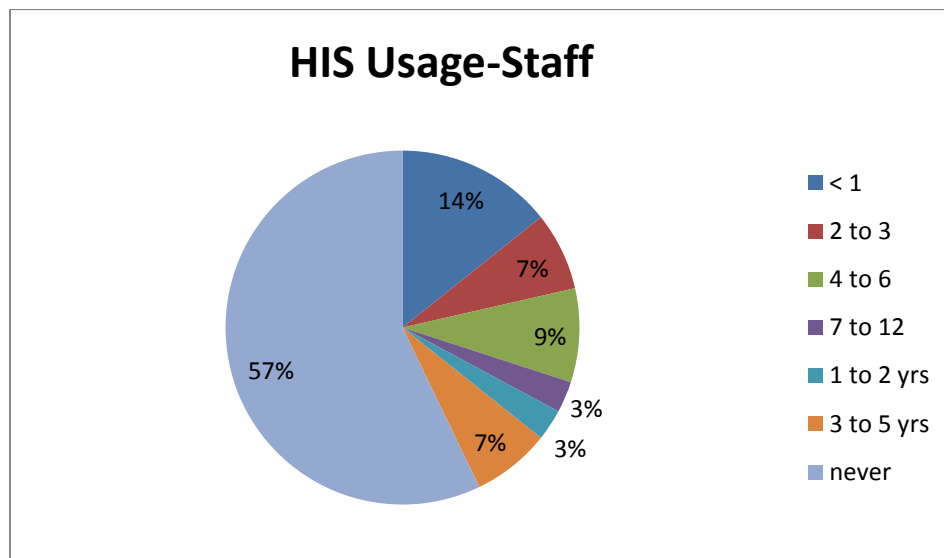
57% staff never used HIS, however 14% have used for less than 1 month.

Table:15.1   Info of the proposed implementation of HIS.

Option	Staff
Yes	49
No	11
Somewhat	10
Total	**70**

Fig 18:   Showing proposed info about the implementation of HIS
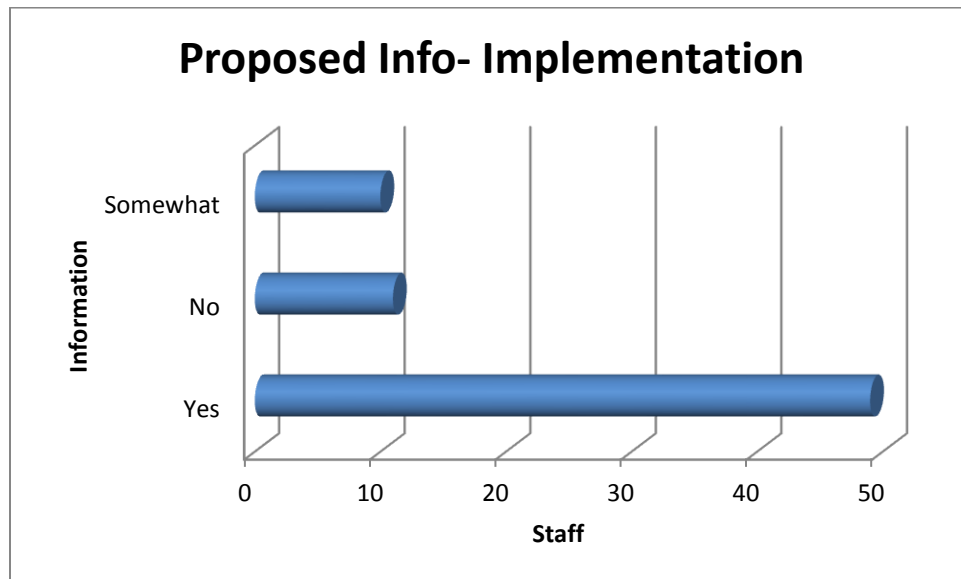
49 staff members knew about HIS Implementation. 10 members had somewhat idea about implementation; however 11 member s did not have any idea about HIS.

Table: 16.1   Showing staff's awareness about their duties while using HIS .

Option	Staff
Yes	20
No	40
Somewhat	10
Total	**70**

Fig: 19   This Fig is s showing staff's awareness about their duties while using HIS
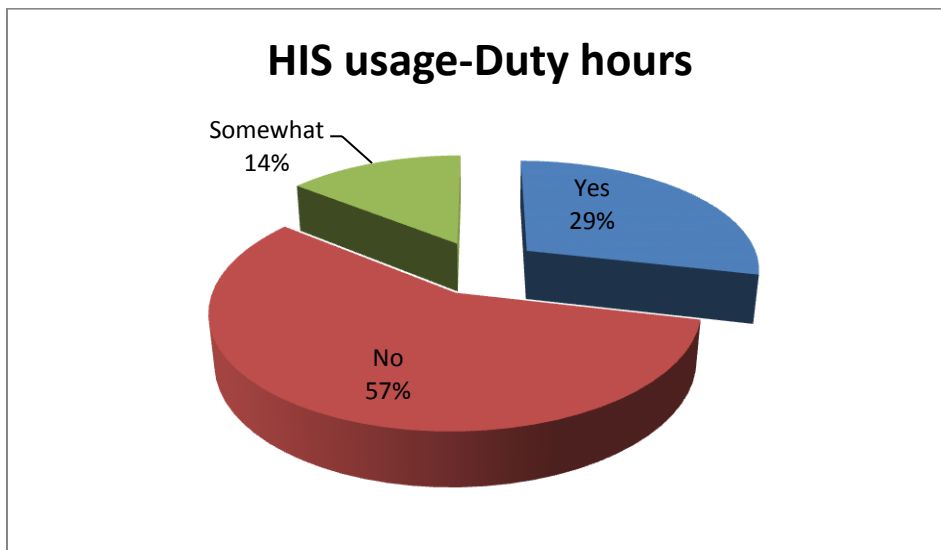
57% Staff was not aware about their duties while using HIS, 29% staff was aware and 14% knew somewhat about using HIS during duty hours.

Table:17.1   Showing description of the proposed usage of HIS.

Option	Staff
Clinical decision making	20
Access patient information	30
Collecting patient information	16
Use the system at backend	4
Other	-

Fig 20:   Proposed usage of HIS amongst the staff
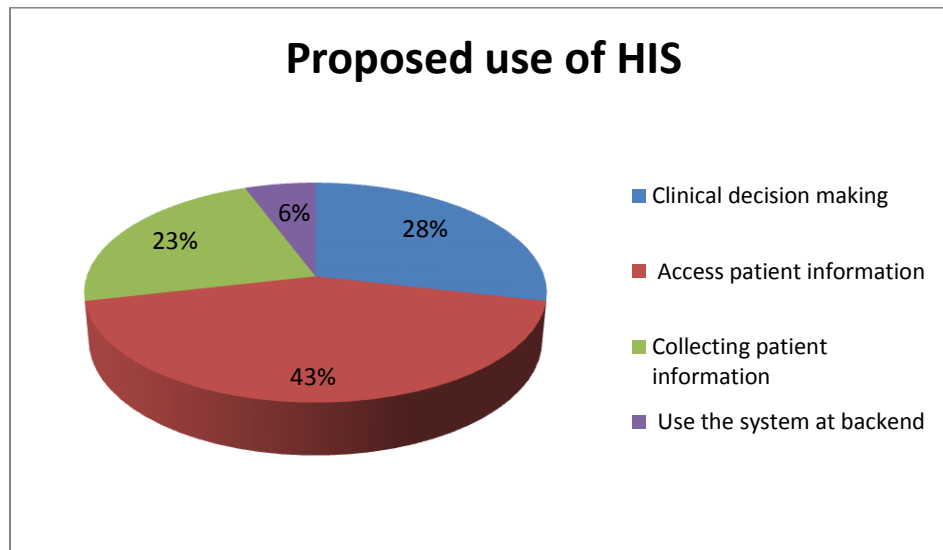
As far as usage of HIS is concerned amongst the staff, 43% knew that they can access patient info, 28% knew that they can make clinical decisions, 23% thought they can collect patients info amd 6% thought that they can use system at backend.

Perception towards HIS/EMR Benefits

Table: 18.1   Showing satisfaction of staff in overall use of the EMR if implemented.

Option	Staff
Highly satisfied	50
Moderately satisfied	9
Neither satisfied nor dissatisfied	3
Moderately dissatisfied	5
Not satisfied at all	3
Total	**70**

Fig 21: Overall satisfaction level of the sample staff for EMR usage.
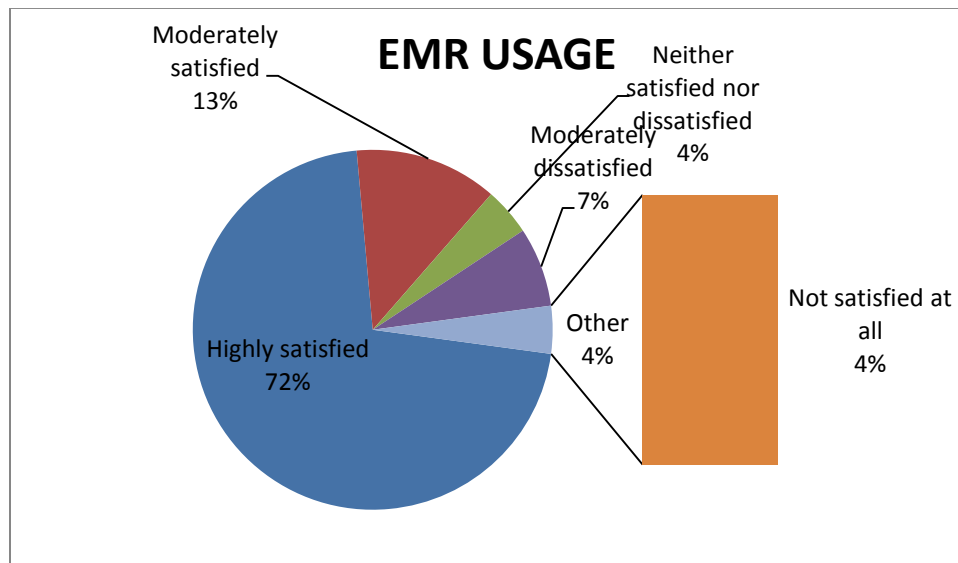
72% Staff members were higly satisfied, 13% moderately satisfied, 7% moderately dissatisfied, 4% neither satisfied nor dissatisfied

Table 19.1 Level of agreement or disagreement in respect of HIS with each of the following statements below

Statements	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable	Total
Improve productivity	5	40			25		70
Improve quality of care	6	38			26		70
Make job easier	3	41			24		70
Enhance coordinate care	2	43			25		70
Improve patient info amongst providers	3	39			28		70
Improve quality decision-making	10	40			20		70
Reduce risk to patient safety	10	50			10		70
Total	39	291			158		490

Fig 22: Level of agreement or disagreement in respect of HIS
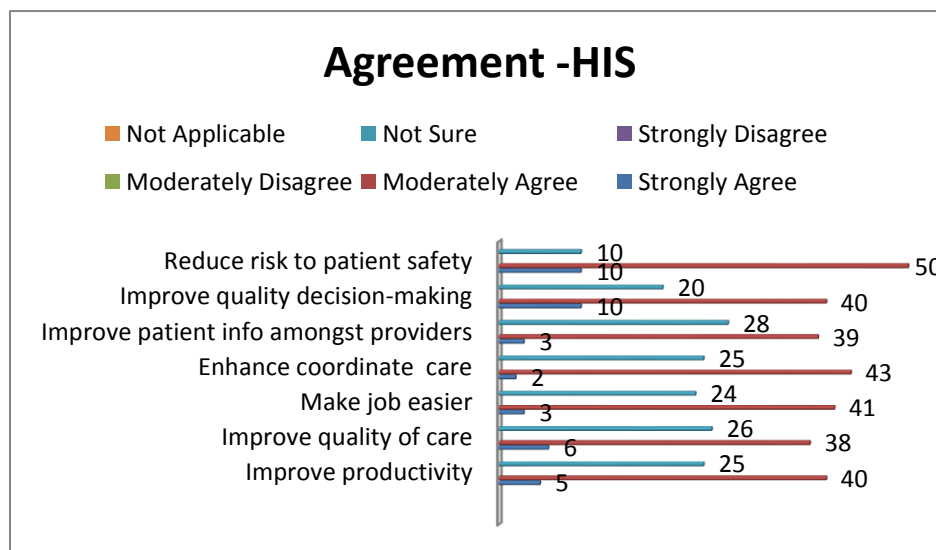
Statement							
Functions and benefits		30	10		30		70
Improve quality of care & reduce errors	10	19	1		40		70
Improve quality of practice	5	30	20		15		70
Increase practice productivity	1	29	10		30		70
Physicians devote time required for EMR Training	10	30	16		14		70
EMRs induced hard work	30	29	8		3		70
EMRs need time for training	50	11	5		4		70
EMR benefits outweigh the costs	45	15	5		5		70
Impact on cost	35	15	10		10		70
Impact on security	50	15	3		2		70
Patient acceptance	43	20	3		4		70
Privacy	40	20	7		3		70
Complexity	38	12	10		10		70
Response time for patient	50	11	5		4		70
Training needs	45	20	3		2		70
Physicians resistance	20	40	4		6		70
Total	472	346	120		177		

Table 20.1:   Level of agreement or disagreement regarding EMR with each of the following statements below

Figure above is amply clear giving various details of level of agreement amongst the staff members for HIS usage. Most of them moderately agree to the above statements

Fig 23:   Level of agreement or disagreement regarding EMR
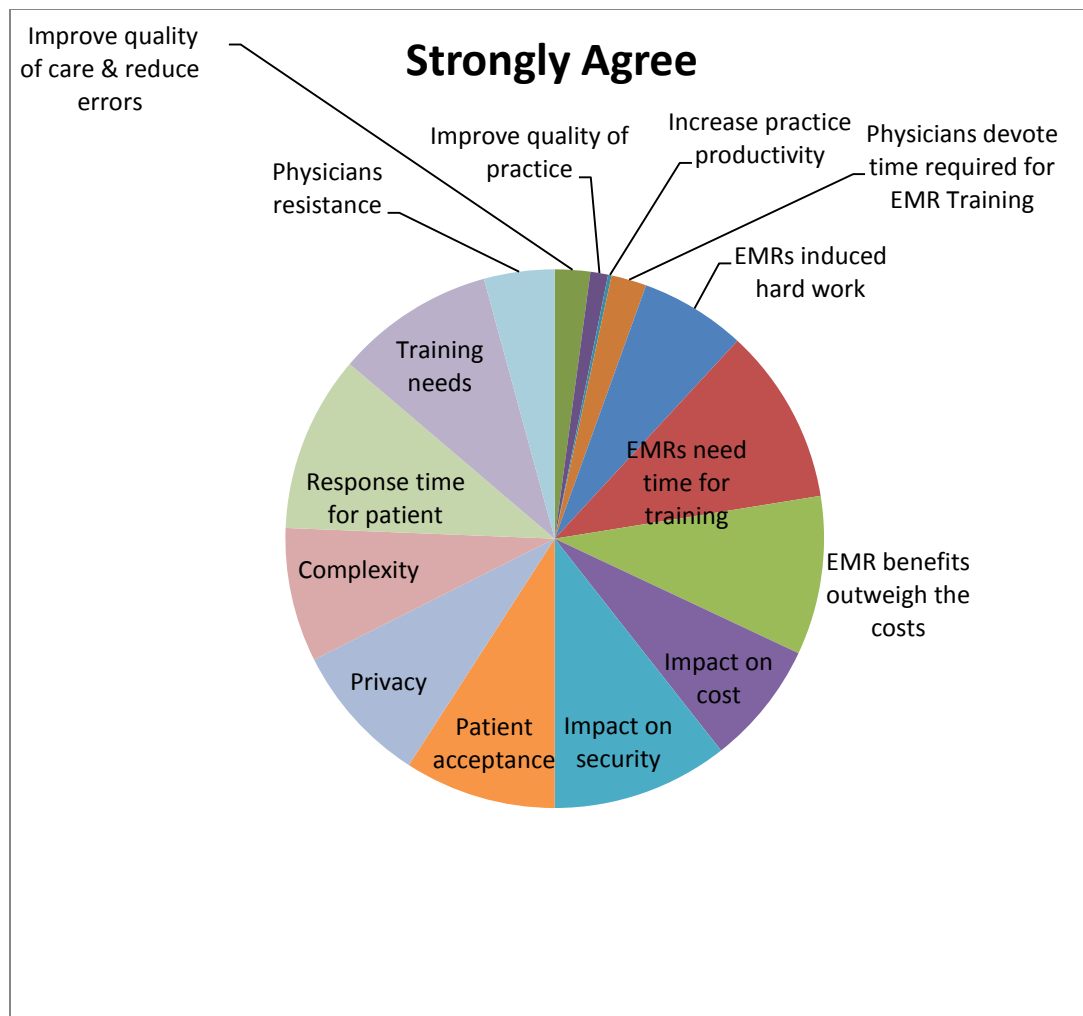
Strongly Agree

The 16 qualities/ functions as stated above, maximum of the staff member strongly agree that if EMR is implemented will increase the overall standard of the hospital in all departments.

Table 21.1:   Functions of the HIS perceived.

Option	Staff
Display of lab results	51
Display of radiology reports	63
Display of clinical notes and reports	22
Display of height, weight and allergies	60
Nuclear medicine	15
Display of radiology images	46
Entry/Display of diagnoses and medications	25
Display of other ancillary clinical data	32
Prescription alerts drug-drug, allergy and dose	20
Display of demographics	28
Time trended clinical data display	20
Structured documentation (Templates)	49
Physician order entry (tests and medication orders)	20
Prescription writing	41
Workflow inbox for office and/or hospital results	52
Decision support (guidelines, expert logic, reminders/alerts)	35
Preventative health reminders	16
Medical management reporting – notification by diagnoses	10
Medical management reporting – disease management reporting	6

Fig 24:   Functions of the HIS perceived

HIS Functions - Perceived

Function	Value
Medical management reporting – disease…	
Medical management reporting – notification…	
Preventative health reminders	
Decision support (guidelines, expert logic,…	
Workflow inbox for office and/or hospital…	
Prescription writing	
Physician order entry (tests and medication…	
Structured documentation (Templates)	
Time trended clinical data display	
Display of demographics	
Prescription alerts drug-drug, allergy and dose	
Display of other ancillary clinical data	
Entry/Display of diagnoses and medications	
Display of radiology images	
Nuclear medicine	
Display of height, weight and allergies	
Display of clinical notes and reports	
Display of radiology reports	
Display of lab results	

Most of the staff members knew about the functions of HIS. Maximum staff thought that it would only display radiological reports of the patients and least number of staff knew that HIS can do disease management reporting.

Table 22.1: Level of agreement or disagreement regarding HIS usage with each of the following statements below

Statements	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable
HIS is easy to use/ will be easy to use		43			27	
The effort required to access to information in HIS is/ will be acceptable		46			24	
The response time from HIS is/ will be acceptable	5	40			25	
HIS is integrated with my workflow	5	50			15	
HIS adequately provides /will provide for the privacy and security of my patient's information	6	54			10	
HIS adequately provides /will provide for the privacy and security of my information	3	47			20	
I am aware of my privacy and security obligations with respect to HIS	4	46			20	
My patients can find out who has accessed their health information through HIS.		10			60	
Logging into HIS is/ will be acceptable			40	20	10	
The features in HIS enable/ will enable me to perform my work well	10	51			9	

Fig 25:   Level of agreement or disagreement regarding HIS usage with each of the following statements below.
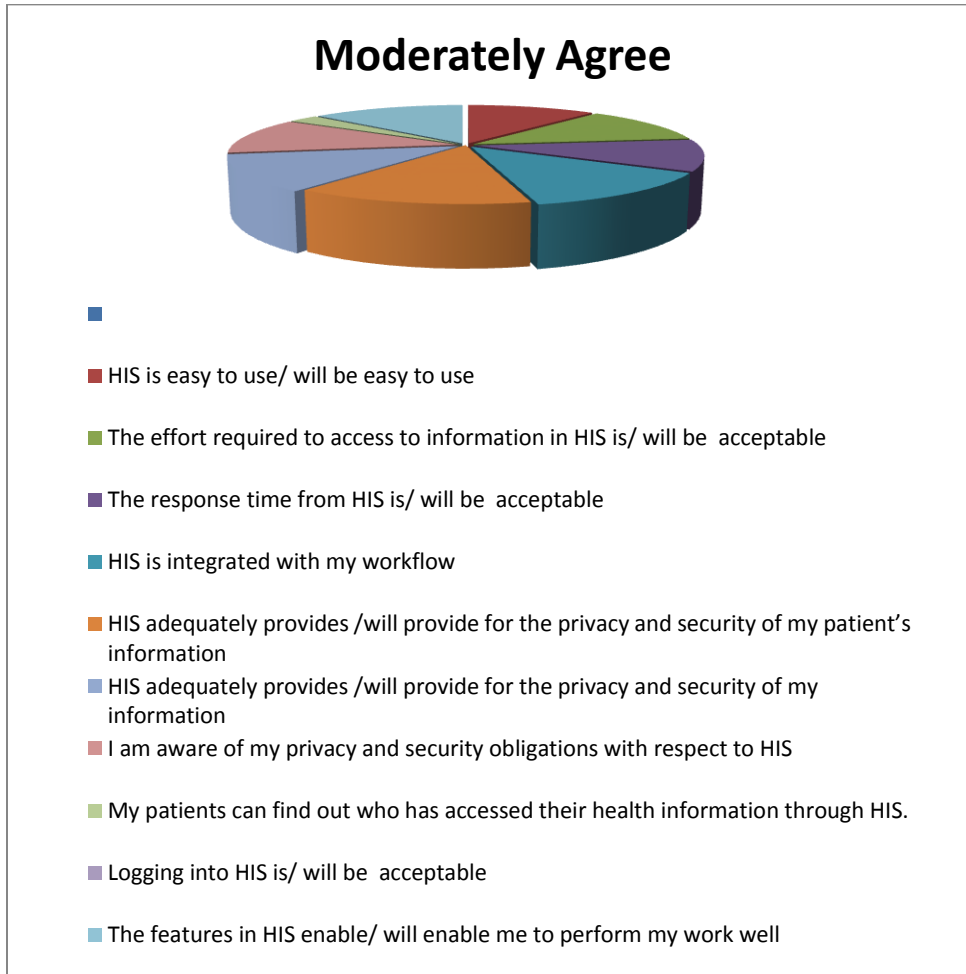
The above figure displays the various functions and info of HIS. The staff moderately agrees to the above statements.

Table 23.1: Acceptance level regarding the quality of info HIS will provide.

Option	Staff
Highly acceptable	15
Moderately acceptable	40
Neither acceptable nor unacceptable	-
Moderately unacceptable	-
Not at all acceptable	-
Not aware	15

Fig 26: Acceptance level regarding the quality of info HIS will provided
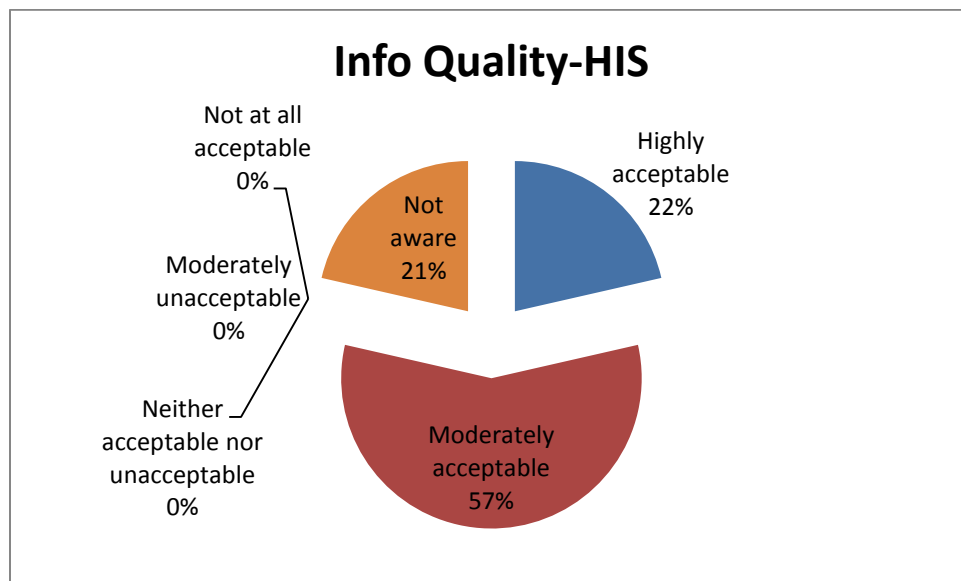
57% of the staff does agree that info provided by HIS is of good quality. However most of

the staff was also unaware about HIS.

Table 24.1: Level of agreement if HIS is implemented

Statements	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable
The implementation process of HIS at this Hospital if customizable to survey deployment settings acceptable		51	0	0	19	0
Consultation with users during implementation of HIS is acceptable		50	0	0	20	0
The current level of training for HIS is acceptable		0	0	50	20	0
The level of on-going support provided for HIS is acceptable		0	0	10	60	0
Workflow analysis and redesign if well integrated in the implementation process of HIS acceptable		60			10	0

Fig 27: Level of agreement if HIS is implemented.
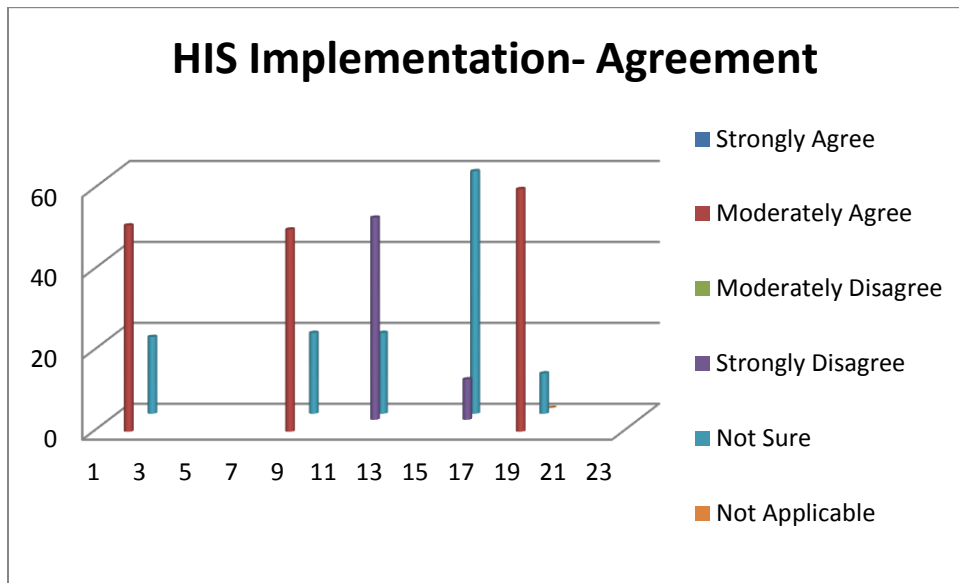
Mostly staff here moderately agrees with the implementation of HIS at this hospital. Also there is staff that is not sure about it.

Table 25.1: Barrier exists in use of HIS in clinical practice.

Option	Staff
□ Lack of Helpdesk support resources for HIS	61
□ Login takes too long sign in to use the HIS	5
□ Login is a complicated process (multiple logins) to access HIS	6
□ Lack of HIS's integration with other clinical systems	-
□ HIS does not align with clinical workflow □	-
□ Too many other work demands	-
□ Lack of knowledge/confidence to use HIS	62
□ Mix of paper and electronic systems	60
□ Insufficient availability of computers or hardware equipment to access HIS	65

Fig 28:   Barrier exist in use of HIS in clinical practice
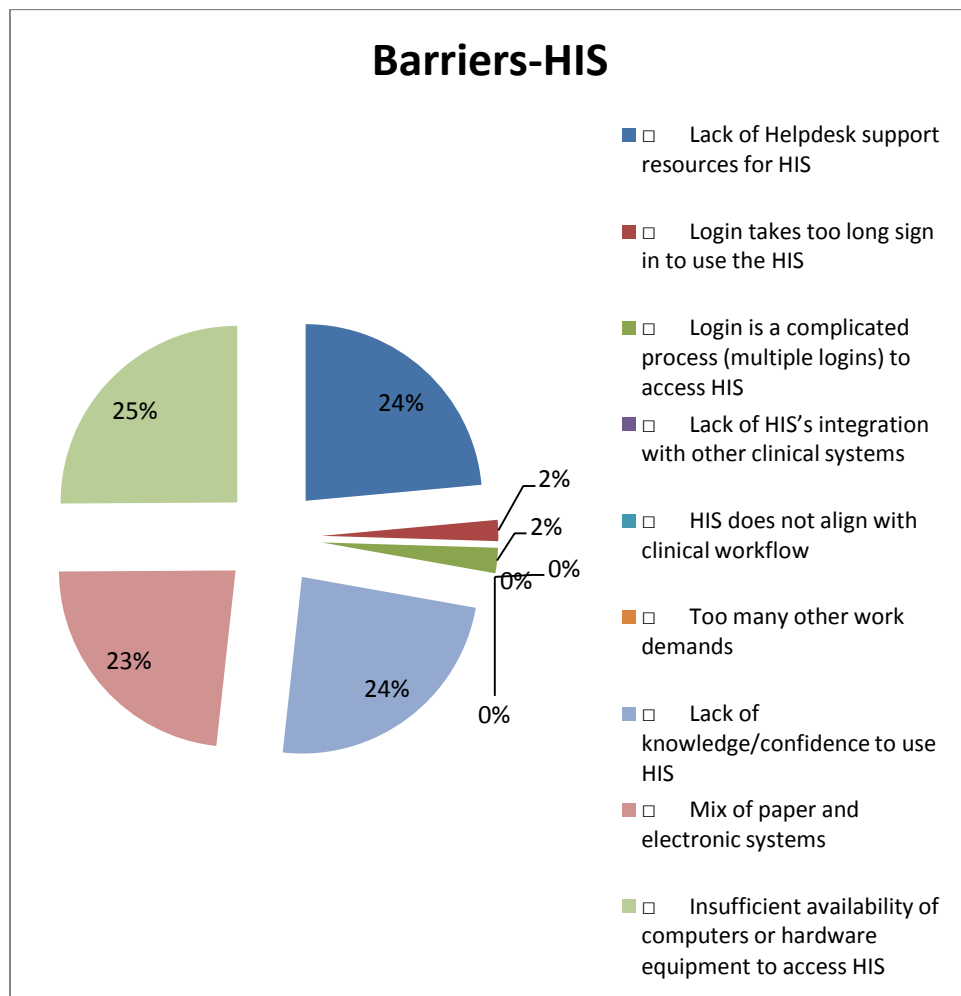
Staff has apprehensions regarding various barriers in implementation of HIS. Most important ones are lack of helpdesk support, lack integration, lack of knowledge about how to use it and also they think that it would be mix of paper and electronic system use.

Table 26.1: Recommendation to other healthcare providers for implementation of HIS

Option	Staff
□ **Definitely**	60
□ **Probably**	10
□ **May or may not**	-
□ **Probably Not**	-
□ **Definitely not**	-

Fig 29:   Recommendation to other healthcare providers for implementation.
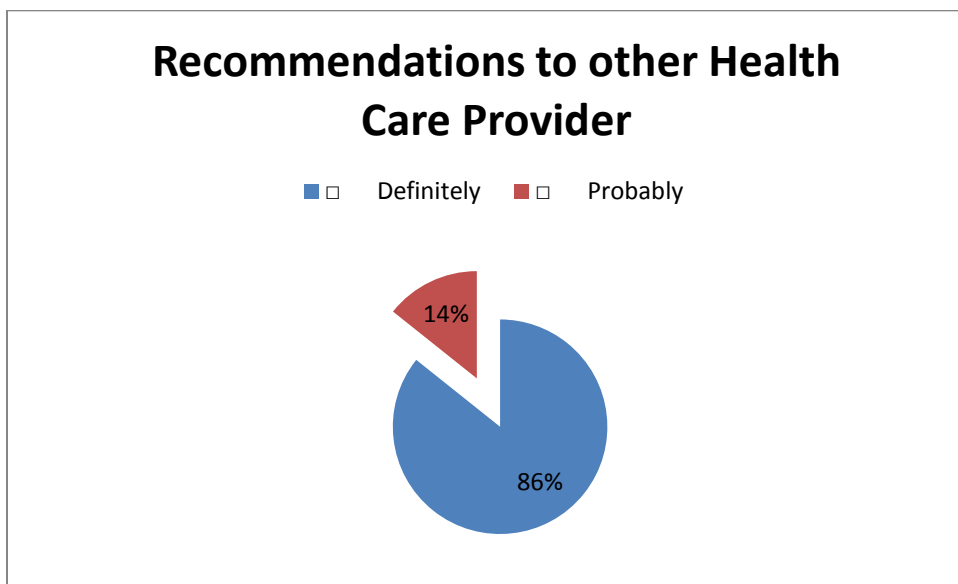
86% of the staff wanted to definitely recommend HIS to other firms / Healthcare professionals and only 14% said probably.

Table 27.1: How do you foresee the future HIS implementation.

Option	Staff	Total
I believe the computer systems will save the hospital money	65	70
I believe the cost of learning new computer systems is not worth the benefits	-	70
I would like to move to a paperless system as soon as possible	67	70

Fig 30: How do you foresee the future HIS implementation
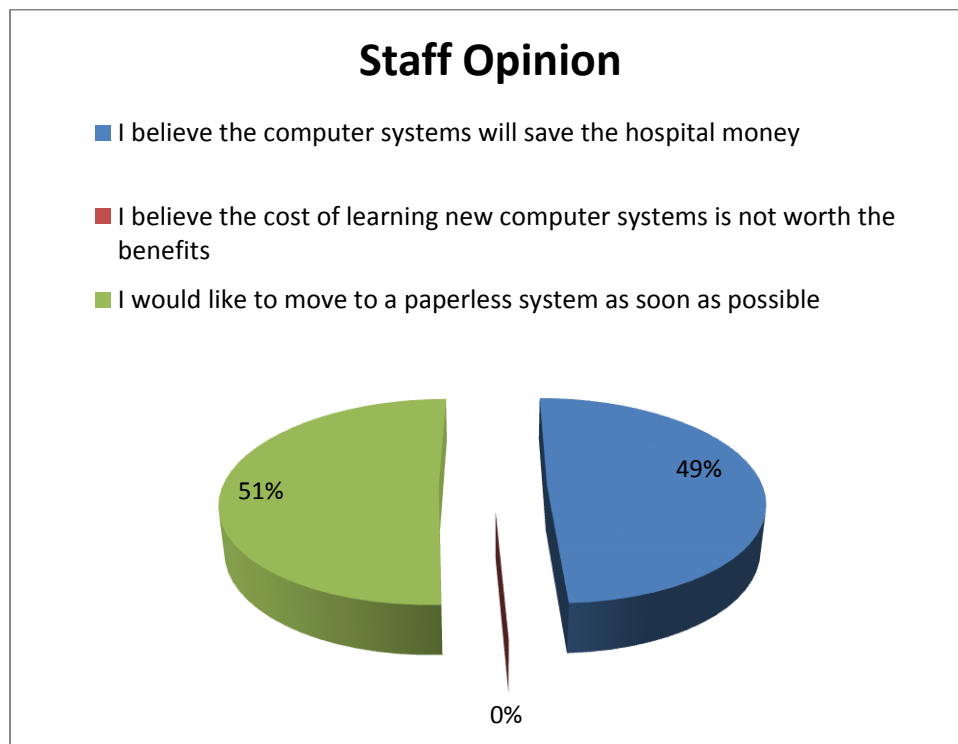
51% of the staff is of the opinion that they would like to move to the paperless system as soon as possible and 49% says that HIS will save hospital money.

Table 28.1:   Paper records are more useful than paperless records

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
61	9	-	-	-

Fig 31:   Paper records are more useful than paperless records
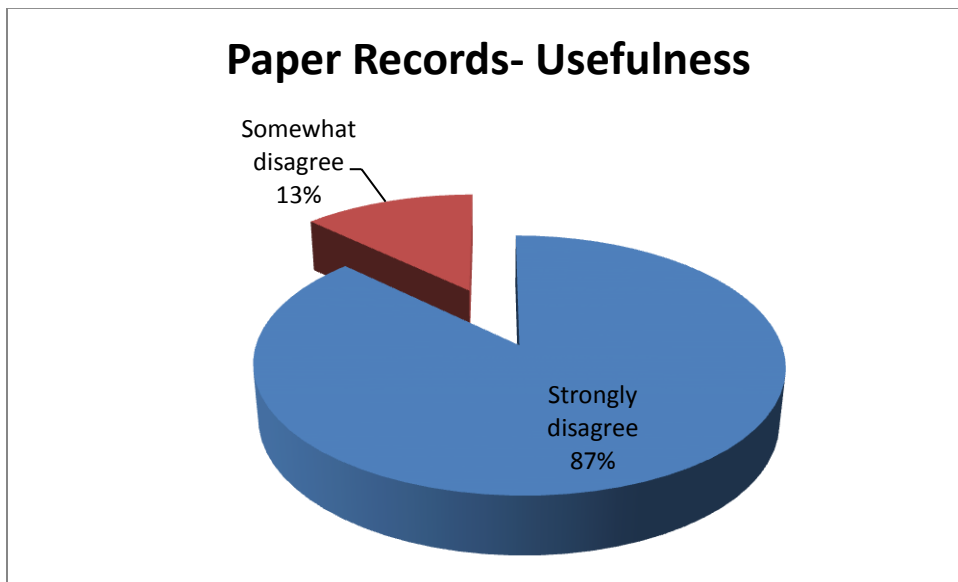
87% staff strongly disagree that that paper records are more useful than electronic records.

13% somewhat disagree with it.

CHAPTER 5:   FINDINGS AND RESULTS

Findings and Results

The purpose of this study was to explore health care professionals' perceptions of the use of HIS, various benefits and barriers for its implementations. 70 clinical and non-clinical staff members participated in the study. The review of patterns and themes occurred in relation to the perceptions of health care professionals to HIS use as expressed by the participants. The following research questions were the focal point of the analysis of the case study:

1. What is HIS?

2. What is the scope of HIS in Healthcare Professionals?

3. What is the current awareness level about health IT in Indian healthcare providers?

4. What is their awareness level about latest health IT technology like HIS/EMR (Hospital Information System/ Electronic Medical Records)?

5. What is the perception of healthcare providers about HIS with respect to various attributes like its use, reliability etc.?

6. What challenges do health care professionals have in transitioning from paper records to HIS?

7. How do health care professionals describe their experiences of HIS use?

8. What barriers impede health care professionals' acceptance of HIS?

Data Collection

Interaction with hospital staff: Upon the receipt of approval from the Delhi Cantonment Board the study began at Cantonment General Hospital. The study included my interactions with the health care professionals who were not part of the study. Health care professionals used for my initial interactions were appropriate for the study because they had similar roles as those in the study sample. Each participant provided care at the case study hospital and had more than one year work of experience at the study hospital. Of the five participants with whom I interacted, two were physicians, one was a physician assistant, one was a registered nurse, and one was a pharmacist.

The purpose of the my initial interaction was to validate the sample questionnaire which I was to give them for the primary research, to ascertain whether the questions would produce enough data to illustrate themes and to assess the clarity and appropriateness of the questions. Each participant understood the need for his or her verbal recommendations to improve the questionnaire. Each participant signed the consent form prior to receiving the survey. Each health care professional verbally agreed that these questions met the purpose of the study. The health care professionals agreed the HIS use at the case study hospital had extensive capabilities and usefulness, while some agreed they had some mixed emotions in the use of HIS/ EMR.

Feedback from my daily interaction resulted in making minor modifications to the questions. With the garnered feedback I received from the interaction, it was sufficient to address the research questions of the study.

Data collection through Questionnaire process

The questionnaire was prepared under the following main headings to know about the perception of the staff of the hospital regarding HIS:-

- Demographic Details

- Computer Literacy

- Access to clinical data

- Awareness to HIS

- Perception towards HIS/EMR Benefits

Seventy (70) participants, who had common characteristics including (a) employed both permanent & contractual by the Cantonment General Hospital, (b) employed in the hospital for at least one year, and (c) over the age of 21 years. The study sample had little work experience in their previous medical center.

The study subjects were clinical and non-clinical staff of the hospital. One clinical and one non-clinical staff of the hospital were selected every day. Care was taken to ensure that there was no repetition of the subjects. They were given a questionnaire to fill. The staff members who were not able to understand the language were verbally communicated and made to understand the questionnaire and then their answers/response filled after the informed written consent.

Results: The results are depicted by text, tables, and figures.

Data Analysis

Data analysis process: Analysis of the data had three stages: data transcription through questionnaire, labeling of the transcribed notes, and coding using the unified theory of acceptance and use of technology, which was the theoretical framework for the study.

Data analysis steps: The research questions guided the research to explore health care professionals' perceptions of the use of HIS. Based on the research questions, the first step was the collection of info through daily interaction with the staff. Thereafter the questionnaire was prepared and data collected for analysis.   The following is a description of the process.

- With my daily interaction with the hospital staff and review of literature, few significant words, phrases, and statements emerged. The most commonly used words used were confidentiality (15), accessibility (13), appropriately (13), communication (13), consistently (12), effectively (11), legibility (10), cumbersome (10), and training (8). No differences appeared in the common words used among the different health care professionals. The cataloging process provided me the questions to be asked in the questionnaire and thereafter the initial background for the findings.

- Using **Microsoft Excel 2010**, the data was collected, created and analyzed.

- Details of the primary data collected was under the following headings:-

Demographics Details

Participants provided demographic information. The demographics of the participants included the discipline and role in the hospital, the length of employment in the study hospital, gender, and age range.

Fig 7 gives the details that 71% of clinical staff was the females working in the hospital and 29% were male. The maximum number out of this sample was the nursing staff who would be directly related to the maintenance of the patient records.

Fig 8 gives the distribution of staff according to the profession**.** Of the 70 participants, 21% participants were physicians, 3% participants were pharmacists, 43% were registered nurses, 3% were admin staff and pharmacist each respectively and 6% were lab technicians.

Fig 9 gives the details of age profile of the staff.   72% of the samples were below 30 yrs of age, 14% between 30-40 yrs and 7% each in between 40-50 and more than 50 yrs of age groups.

Analysis: The demographic analysis shows that the staff at the hospital is young, maximum female and highly qualified to undertake any new project efficiently at the hospital

Computer Literacy

In this section of the questionnaire, details of the staff were asked regarding the computer literacy, access to cmptrs ,software knowledge etc.

Fig 10 gives the details of the work Experience of staff in number of years. The work experience of approx. 45% of the staff is less than 5 years, between 5-10 is approx. 35% and rest of the 20% is between 10-20 years. The hospital is having less experienced staff because maximum staff is hired on contractual basis that are young.

Fig 11 gives the details of the work experience on Computers. 15% of the staff have less than 5 yrs of experience on comptrs, 41% staff have 5-10 yrs of experience and 14% have more than 5 yrs of experience.

Fig 12 gives the details about the staff that have excess to computers.

Out of the total 70 sample staff, 29 members have the excess to the computers at home, 11 at the work place and 30 at both home and work place. This means that maximum staff has the excess to the computers.

Table 13.1 gives details about the ability to use Software**.** The sample selected has the ability to use **more than one IT** software. This means that the staff employed at the hospital has the knowledge on how to work on computers. Therefore, it implies that EMR/HIS can be implemented effectively.

Fig: 12 is showing usage of the computer at the work place. 79% sample could only use 1-2 hrs of computers at work place, 14% for 2-5 hrs and 7% only for more than 5 hrs.

Analysis: As far as the computer literacy is concerned, maximum staff is computer literate, have access to computer at home and work places. They have the ability to work on various software programs**.**

<u>**Access to clinical data**</u>

Table 13.1: This table is showing details of those staff providing direct care to patients. 50 staff members are directly providing care and 20 indirectly.

Fig 14 is showing staff needing clinical data at work of OPD/IPG Patients. 57% of the staff agrees that they need data for both IPD and OPD. 29% think it's required for IPD and 14% for OPD.

Analysis: Maximum sample staff knows the importance of clinical data requirements for administration and patient care.

Awareness to HIS

Fig 14 is showing knowledge of staff about **HIS**. 54% staffs say that they don't know about HIS. 46% have the knowledge about HIS.

Fig 14 is showing **HIS** usage by the sample staff. 57% staff never used HIS, however 14% have used for less than 1 month.

Fig 15 is showing proposed info about the implementation of HIS**.** 49 staff members knew about HIS Implementation. 10 members had somewhat idea about implementation; however 11 members did not have any idea about HIS.

Fig 16   is s showing staff's awareness about their duties while using HIS.

57% Staff was not aware about their duties while using HIS, 29% staff was aware and 14% knew somewhat about using HIS during duty hours.

Fig 17 is showing proposed usage of HIS amongst the staff. As far as usage of HIS is concerned amongst the staff, 43% knew that they can access patient info, 28% knew that they can make clinical decisions, 23% thought they can collect patients info and 6% thought that they can use system at backend**.**

Analysis:　　Approximately 50% staff did not have the previous knowledge about HIS; however they knew that Dhanwantri HIS was bought by the management and will implemented subsequently.

Perception towards HIS/EMR Benefits

Fig 18 is showing overall satisfaction level of the sample staff for EMR usage. 72% Staff members were highly satisfied, 13% moderately satisfied, 7% moderately dissatisfied, 4% neither satisfied nor dissatisfied

Table 19.1 is showing the level of agreement or disagreement in respect of usage of HIS at CGH. Figures above are amply clear giving various details of level of agreement amongst the staff members for HIS usage. Most of them moderately agree to the above statements.

Table 20.1:　　This table is showing the details of level of agreement or disagreement regarding EMR. The 16 qualities/ functions were listed, maximum of the staff member strongly agree that if EMR is implemented which will increase the overall standard of the hospital in all departments.

Fig 21:　　This figure is showing functions of the HIS perceived. Most of the staff members knew about the functions of HIS. Maximum staff thought that it would display radiological reports of the patients and least number of staff knew that HIS can do disease management reporting

Fig 22:　　This figure is showing level of agreement or disagreement regarding HIS usage with each of the following statements below**.** The above figure

displays the various functions and info of HIS. The staff moderately agrees to the above statements.

Fig 23: This figure is showing acceptance level regarding the quality of info HIS will provided. 57% of the staff do agree that info provided by HIS is of good quality. However, most of the staff was also unaware about HIS.

Fig 24: This figure is showing details regarding the various barriers which exist in use of HIS in clinical practice. Staff had apprehensions regarding various barriers in implementation of HIS. Most important ones are lack of helpdesk support, lack integration, lack of knowledge about how to use it and they also think that it would be mix of paper and electronic system use if the HIS is implemented.

Fig 25: This figure is showing recommendation to other healthcare providers for implementation of HIS. 86% of the staff wanted definitely to recommend HIS to other firms / Healthcare professionals and only 14% said they will probably recommend.

Fig 26: This figure is showing the details of the question asked as to how you foresee the future of HIS implementation. 51% of the staff is of the opinion that they would like to move to the paperless system as soon as possible and 49% says that HIS will save hospital money.

Fig 27: This figure is showing the details of the question asked as to "Paper records are more useful than paperless records." 87% staff strongly disagree that

that paper records are more useful than electronic records. 13% somewhat disagree with it.

Analysis: Maximum staff at the hospital is aware about perception towards HIS/EMR benefits. They have the opinion that if this HIS is implemented, the patient care, administration and the efficiency of the hospital will improve manifolds.

.

CHAPTER 6: DISCUSSION

DISCUSSION

The Cantonment General Hospital is a well-managed hospital as far as administration of the hospital is concerned. However, to further improve the quality care and administration of the hospital, there is a need to implement HIS immediately. Dhanvantri HIS is already procured and is lying unused at the hospital.

Dhanvantari Software

The software helps to handle the entire administration of hospitals and healthcare facilities. Typically, such a software includes various modules that help doctors manage their assignments and schedules, carry out patient registration, maintain store inventory records, keep track of medicine, administration, maintain blood bank (with available blood type) details, individual record of patients with their test reports, nursing and housekeeping service details, financial information, including final billing & payments, insurance details and much more. After the customized software is implemented and integrated into the system, patient care and hospital administration becomes an easy job. The software improves inpatient and outpatient management. By effectively managing appointments scheduling, it reduces their waiting time. Today, it is not possible to imagine a hospital without it. A reliable and efficient system ensures smooth operation of the medical center. With management software in place, hospitals can easily send patient information and ensure faster reports. Also, there is a reduction in operating costs due to high operational efficiency. When systems and processes are automated lesser resources are required for managing operations, resulting in improved work flow. It requires a lot of decision making which is highly difficult if there is no strong management system in place. Since you need precise and accurate implementation at every stage, the automation system in the hospital has to be self-sufficient. A reliable, cost-effective, and efficient system becomes the backbone of the success of a medical center. There are **several benefits** of installing full-fledged software.

Benefits:

    a. It will improve documentation of the patients and the administrative staff.

    b. The hospital will use the system to access patient information and support the clinical decision maker for clinical decision making (registration/ front desk/, claims, patient diagnosis, lab reports, radiological reports, treatment etc).

    c. The system will be beneficial for use at backend (administrator/ report generation etc.)

    d. HIS will improve productivity of the entire staff of the hospital.

    e. Its implementation will improve the quality of care and will enhance the ability to coordinate the continuity of care of the patients at the hospital.

    f. HIS will improve sharing of patient information amongst providers

    g. HIS will improve the quality of decision-making

    h. HIS will reduce risk to patient safety

    i. Avoid errors and track every single detail.

    j. Improve data security.

    k. Establish CGH as technically advanced hospital amongst the govt hospitals in Delhi.

Various Modules of Dhanvantri software

OPD: - When a patient comes to the reception desk, a new registration number is automatically allotted to him. His/her personal details like Name, Age, Sex, Address etc. and the services desired are fed into the software. OPD Billing / Collection Billing of all OPD patients with complete details of Patient Information, Services provided like Consultation, Laboratory, X-ray, Ultrasound, Medicines, Procedures etc. along with Payment details. The software is developed with the aim of better Patient care and all the patient were benefited by the system. The user of the system finds it convenient to use and resulted in easy compilation of administrative reports (department-wise/ laboratory-wise). The searching process of old patient record becomes easy and convenient. Old patient record is traced only by Registration Number and thus reducing the time needed for administrative formalities required in the process of patient care. System is installed at OPD Registration Counter and making it convenient use for the patient as they are used to old habit. Readable Central Registration slip containing the

room number makes them reach the right room in the hospital, previously handwritten often not readable resulting difficulty in finding room number. It helps to adept in simplifying the complex appointment scheduling process of patients so that the ordeal of the patients waiting endlessly for their turn can be eliminated. Also, it would enable the doctors to reduce their dependence on staff regarding such issues. Through this software we can generate registration fee electronically and manage that slip for tracking of such things like number of patient came to the hospital, total amount collected day wise etc. It also helps in streamlining the Patient's **Appointments & Scheduling Process**.

Impact of the project:

•   Role out of Hospital Automation has resulted in better Patient care mechanism.

•   Helped in speedy processing of administrative part of patient care and the process of manual compilation of various health reports, which otherwise a time consuming exercise.

•   Old Patient details need not to be entered again as they are picked from old CR Number thus reducing the time of registration.

IPD: - When a patient comes to the reception desk for admission, a Separate new registration number is automatically allotted to him. His personal details along with the details of Admission, Room, Consultant, Surgeon, Diet, etc. and the Advance Payment made are fed into the software. The Software will record all this information and print the related documents. IPD Billing of all IPD patients with details of Patient Information, Services provided on daily basis like Room rent, Operation, Delivery, Oxygen & Other Gases, Consultation, Nursing Charges, Laboratory tests, X-ray, Ultrasound, Medicines, and Procedures etc. IPD Collection of part payment along / Full Payment details/ Refunds/Credit Notes. This information will provide the data for all MIS reports. The medical record software must be able to generate the electronic medical records for the convenience of the doctors and clinic management. This helps in keeping a tab on the medical history of patients which can be retrieved any time in the future. Additionally, it relieves hospital administrators from the maintenance of paper documents and registers for such purpose. Systematic reviews and meta-analyses that

obtain original research data on individual participants enrolled in trials have been described as the gold standard of review. However, they may take longer and be more resource intensive than other types of review. The authors describe potential advantages and disadvantages of the individual patient data (IPD) approach, including benefits from improved data quality, benefits afforded by the type of analyses that can be done, and advantages in achieving consensus around results. It also helps to maintain blood bank (with available blood type) details, individual record of patients with their test reports etc. Complete Inpatient Management Module that manages all your hospital inpatient functionality from Patient registration to the billing with a complete tracking of Patient records. With built in Ward Management and Nursing Station Management, ICU. ICU availability, the IPD gives a 360 degree view of the entire admitted patient movement from admission to discharge.

Features:

- Wards, Floor, Room & Bed Configuration.
- Patient Indoor Admission, Bed Allocation & Transfers.
- Payment Receipts.
- Bed Occupation Matrix (Floor wise/Room Category wise)
- Medical Observation and Nursing Notes.
- Patient Face Sheet/Consent Forms/Daily Vital Charts/Glucometer-Blood Sugar Chart/ Prescription Chart/ Duty Doctors/Visiting Doctors Sheet etc. (Case File formats)
- Requisition of Pharmacy and Stores for Medicines & Consumables.
- In Patient Report.
- Bill Charges Entry and Provisional Bill Generation.
- Patient Limit.
- Patient Dues Report.
- Patient Discharge & Final Bill Generation.
- Discharge Card Preparation.
- Medical Certificates Generation.
- MLC Entry /Police Form/Injury Report
- Patient History Tracking.

Hospital Inventory: It is highly important to keep track of the stock of medicine available with the hospital. This helps the medical offices to replenish the out of stock medicines in a timely manner. But most importantly, the Inventory software also sends regular alerts when a particular drug nears its expiry date. This facilitates the doctors and clinic administrators to discard them at the right time thereby making way for the fresh stock. It plays a crucial role in cost control by enhancing productivity and efficiency. Inventory costs are minimized through the avoidance of repetitions and duplications. The software can also help reduce delays and confusion, which are caused by missing or incomplete records. This application can also be looked upon as a management tool, which offers the functionality of amassing different kinds of data into usable reports. A computerized inventory management system makes everything from inputting information to taking inventory easier. Doing a hand count of inventory can take days, but with a computerized inventory management system, the same process can be done in a matter of hours. With a manual system, the data is only as accurate and up to date as the last hand count. With a computerized inventory management system, the pharmacist can pull a report and instantly see how many units are on the floor, how many have gone and which medicines are consuming the fastest. It provides the entire operation with insight and actionable information regarding both inbound and outbound product flows - as well as the added ability to drill down into details if needed. The nature of durable and non-durable goods is that issues and errors do occur. Inventory software identifies and tracks the various issues that could occur, and through reports and analytics, provides guidance regarding the factors impacting quality. It helps in to generate accurate financial reports and supply chain visibility. These issues will not be a problem if one always remembers that HIS is to assist doctors' decisions, and **doctors' autonomy should be prime focus**.

Explanations related to the perceived perception of the end users.

The 85% staff at the CGH, Delhi perceived that they will be highly satisfied if the EMR/HIS are implemented at the hospital. Perceptions of the staff are listed below:-

a) HIS will be easy to use.

b) The effort required (i.e. number of clicks, screens, scrolling) to complete an action or access to information in HIS will be acceptable.

c) The response time from HIS will be acceptable.

d) HIS is integrated with workflow.

e) HIS adequately will provide for the privacy and security of patient's information

f) HIS adequately will provide for the privacy and security of clinical and non-clinical staff's information.

g) Staff was aware of privacy and security obligations with respect to HIS implementation

h) Patients can find out who has accessed their health information through HIS.

i) Logging into HIS will be acceptable.

j) The features in HIS will enable the staff to perform work well.

k) HIS will be reliable in its performance.

Perceived Benefits and Barriers Relationship with the Users

The CGH staff agrees that it will improve the productivity, the quality of care, will make job easier, will enhance the ability to coordinate the continuity of care, improve sharing of patient information amongst providers, improve the quality of decision-making and reduce risk to patient safety. Staff also agrees that there will be few barriers in implementation process of HIS for example lack of Helpdesk support resources for HIS, login takes too long to sign in to use the HIS, login is a complicated process (multiple logins) to access HIS, too many other work demands, lack of knowledge/confidence to use HIS, it will have mix of paper and electronic systems use at the same time and insufficient availability of computers or hardware equipment to access HIS. The above staements do coraborates with the review of literature done in the study. **Please refer ROL from [10] to [22].**

The above mentioned perceived perceptions and barriers if addressed by the management correctly and efficiently, then the Dhanvantri HIS will have no problem in being implemented effectively at CGH, Delhi Cantonment.

CHAPTER 7:   RECOMMENDATIONS

Recommendations

The purpose of the study was to explore health care professionals' perceptions of the use of HIS, benefits and various barriers exists in its implementation. The problem statement under study called for understandings of health care leaders regarding the adoption of HIS. In spite of the many benefits of HIS and the potential improvement in health care, many challenges emerged in transitioning from paper records to HIS. Keeping in mind the various findings above, few recommendations are given below for successful implementations of the HIS at the Cantonment General Hospital:

Recommendations regarding structure perspective

From the literature accessed for this study, it is found that when any organization decides to bring in a new system in its culture, the main hurdle they face is resistance from employees. However, in the case of CGH, the employees resistance is not there and are willing for the change. The Dhanvantri HIS when bought initially lacked correct implementation process in the hospital. Following structural perspective changes are recommended:-

- **Select competent leader for conducting change**

  Select competent leader for conducting the change in current culture of of CGH. While choosing the leader, main emphasis should be on the abilities and skills of the leader. Skills of a good leader include dedication, openness, creativity, fairness, assertiveness and leader must influence the employees.

- **Create a clear vision regarding new system**

  A clear vision is required to provide future picture so that employees can see how new system will look like and work. Vision will show them the picture of upcoming system in which they will work. Vision will help to clear decks of expensive and time consuming clutter, to align individuals and to facilitate major changes by motivating actions.

- **Motivate the employees to accept new system.**

  Motivate the employees to accept the upcoming system. Motivation can be built up by communicating a clear vision of new system among the employees. It can

also be achieved by assuring them that they will not lose their jobs and by announcing some current and future bonuses.

Recommendations regarding people perspective.

During studying literature we come to know that skills of employees can be improved by training and awareness programs. Employees of CGH do have enough knowledge and skills as far as IT are concerned, however, they are not much aware about the HIS. To improve the skills of employees regarding computer proficiency and HIS knowledge, following are some recommendations that need to be considered:-

    • **Arrange awareness programs for employees**

    Awareness regarding IT and HIS should be assured by arranging awareness programs so that employees of CGH could get some knowhow of role of IT and HIS in health sector. The main aim of awareness programs will be making employees to come across the potential benefits and usefulness of HIS. They will become familiar with the role of IT and HIS in their field.

    • **Arrange training workshops for employees**

    Training of employees should be assured by arranging workshops to improve their computer and HIS proficiency. It will help employees to get some practical knowledge regarding HIS.

    • **Hire competent computer and IS instructors**

    Competent computer and IS instructors should be hired for awareness, training and education of employees.

Recommendations regarding technology perspective.

Previous studies regarding HIS implementation shows that if there is lack of IT in any organization then implementation of information system will face hurdles and it may fail. CGH do not have sufficient IT infrastructure to support HIS implementation. CGH needs to establish sufficient IT infrastructure so that they can start the implementation process of HIS. For establishing the IT infrastructure, CGH needs to consider following suggestions:

    • **Establish an IT department in CGH**

    CGH should establish an IT department. The director of IT department will be responsible for hiring the IT staff which includes IT coordinator, academic coordinator, network administrator, application administrator, IT instructors,

network specialist, application specialist and system technicians. This team will collectively work for establishment of IT department in CGH and educating the employees regarding computer and HIS applications.

• **Hire head of IT department**

Identify and hire head of IT department. Head of IT department will be responsible for managing the technical and financial resources required to develop and maintain IT infrastructure in CGH to meet the requirements so that implementation of HIS could be initialized.

• **Hire IT and academic coordinator**

Hiring of IT and academic coordinator should be done by coordination of top management of CGH and head of IT department. The responsibilities of IT coordinators will be the establishment and maintenance of IT infrastructure. The academic coordinator will be responsible for the awareness, training and education of employees of CGH regarding IT and HIS.

• **Hire IT staff**

Hiring of IT staff should be done by head of IT department, IT coordinator and academic coordinator. IT staff include network administrator, application administrator, network specialist, application specialist, system technician and IT instructors.

• **Establish IT and telecommunications infrastructure in CGH**

IT department should establish IT and telecommunications infrastructure in CGH. This will require hardware and software acquisition, installation, repairing, monitoring, security, backups, and training services.

Recommendations regarding process perspective.

The main problems which will be faced by the employees in current system are related to efficiency of system. Current system is paper based so, processes related to information sharing, creating and maintaining patient records, and inventories become time-consuming. Computerized system is a key to solve the faced problems. In this regard CGH when decides to implement HIS will bring efficiency in their system. When new system will be introduced then it will change all the processes. It means that the processes which are currently conducted manually, after implementation of HIS these

processes will be done on computers. So these processes need to be re-designed. For re-designing the processes, following recommendations should be considered by system Designer:-

- **Motivate employees to participate in process designing**

Motivate the employees to participate in process designing as they will be the future users of the new system.

- **Ensure active involvement of employees in process designing**

Active involvement of employees in process designing should be assured so that the way in which they are conducting various processes could be understood in better way.

- **Employees requirements should be considered**

The processes should be re-designed according to employee's requirements.

- **Employee's satisfaction should be assured while designing process**.

It means that if employees will not show satisfaction for new system then it may fail and all the effort towards HIS implementation becomes useless.

Recommendation regarding implementation approach

Recommendations that need to be considered for the selection of implementation approach are:

- **Parallel implementation approach should be followed for implementation of HIS in CGH.**

Parallel implementation approach is recommended because it offers to run parallel both the paper based system and new system for some period of time to reduce the system failure risk. If problems are experienced in new system, it will be easy for the organization to move back to the old system, so that problems in the new system could be resolved without disturbing the routine working. If the new system meets the criteria, then organization will disable the old system and use the new system for future. This process requires proper planning and control.

- **HIS need to be implemented in phased manner.**

    - ✓ **PH 1-** OPD Module and IPD Module
    - ✓ **PH 2-** Administration, Diagnostic Labs and Pharmacy Modules

- **Duration for implementation- One year**
- **Stages for implementation to be followed religiously.**

- **Hospital to have proper agreement for AMC.**

General Recommendations

- This core group should directly function and report to CMO at the CGH, Delhi Cantonment, who shall be overall in-charge for the implementation of HIS.
- Regular review of the progress needs to be ensured so that HIS is implemented effectively and completely.

CHAPTER 8 : CONCLUSION

<u>Conclusion</u>

Health IT is becoming a chief component of the health system. IT application has wide scope in streamlining the healthcare that is being provided to the patients. Health IT have improved the quality of care that is being provided to the patients. HIS is one of the main modules among health IT that is used to improve the healthcare quality being imparted to patients. HIS have helped to standardize the quality healthcare. It has helped to reduce many errors that were common in health system and have proven to be highly useful to mankind. HIS is still at its initiation stage and should be explored further to gain maximum output from it.

HIS is being able to successfully assist the healthcare providers to deliver quality healthcare to the patients. But there have been few ethical and legal issues regarding its use. These issues will not be a problem if one always remembers that HIS is to assist doctors' decisions, and **doctors' autonomy should be prime focus**.

India has advanced a lot in IT sector but still lags behind in health IT when compared at global level. Indian healthcare system need to focus on development in health IT and make the best benefit out of it.

Cantonment General Hospital, (CGH) was raised with aim to look after the medical requirements and public health of civilian population living in and around the cantonments. It comes under the governance of Local Cantonment Board. The hospital is a **100-bedded unit** (under extension) at present, providing general medical and primary emergency care services. All Central and State Government sponsored health schemes / programs are being implemented successfully. Specialists in the fields of medicine, gyane&obs, surgery, pediatrics, psychiatrics, orthopedics, ENT,

ophthalmology, radiology, dermatology and pathology have been engages. Ayurveda Clinic, Homeopathic Clinic, DOTs Centre, Immunization Centre and AIDs detection Centre are also being run. Renowned hospitals in Delhi have been empanelled for treatment of employees and their dependents.

The hospital has a daily foot fall of 500 persons attending various OPDs and the trend is that the strength will increase as the quality of services is improving. Most of the patients are from middle class or the lower strata of the society as the hospital is catering to the civil population staying in the cantonment area.

It was felt that there is a need to implement HIS in the hospital so that the overall functioning of the hospital improves. This in turn would also suggest about infrastructure modification.

Hence, this study was undertaken with objectives to examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals at Cantonment General Hospital, Delhi Cantonment, to review and understand HIS and its scope in healthcare industry to study functional capabilities and architecture of HIS, to review various types of HIS commercially available in market, to Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals, to know the perception of HIS at Cantonment Board Hospital, Delhi.

The study was conducted by taking feedbacks in a form of Questionnaire given to 70 staff members clinical and non- clinical. Questionnaire was designed to include questions seeking awareness of hospital staff about the HIS services and their

satisfaction level. More so data on relevant aspects were also collected through daily interactions and direct observations.

The analysis of data collected clearly indicated that hospital staff is eager to learn and implement HIS at Cantonment General Hospital. The study also gives the insight to the healthcare professionals about the benefits of Hospital Information System (HIS) and it's Influence on Performance of Healthcare Professionals. The study recommends that the process of implementation of HIS to be streamed lined systematically and efficiently at the earliest.

<u>REFERENCES</u>

REFERENCES

[1]. Document, http://www.cbdelhi.in/Documents/ca2006.pdf

[2]. http://www.census2011.co.in/census/city/62-delhi-cantonment.html

[3]. THE CANTONMENTS ACT, 2006 # NO. 41 OF 2006 [13th Sept, 2006.]

[4]. www.wikepedia .org

[5]. ww.cbdelhi.in

[6] Mtechnologies.com

[7] "Healthcare territories that use MHO Hospital Information System". Webmhc.com. Retrieved 2012-09-18.

[8] Jump up ^ "Policy and Procedure Management Systems for Hospitals (2012)".Policy Stat LLC. 2012-07-18. Retrieved 2012-07-18.

[9] Jump up ^ "Hospital information systems definition given by US based". Consultant.com. Retrieved 2012-04-15.

[10] Richard Hillestad, alongwith other affiliated authors from Santa Monica, California broadly examine the potential health and financial benefits of health information technology (HIT)

[11] Kathrin M Cresswell, David W Bates & Aziz Sheikh in their article "Ten key considerations for the successful optimization of large-scale health information technology" published on23 April 2016

[12] Morgan Price, Alex Singer & Julie Kim MEng in one of the study "Adopting electronic medical records, Are they just electronic paper records"

[13] John Ovretveit and his teammates in the article "Improving quality through effective implementation of information technology in healthcare"

[14] Virginia D. Chavis in his dissertation report "Organizational Learning and Large-Scale Change adoption of Electronic Medical Records, M.S., University of Phoenix, 2004G

[15]   Hayrinen, Saranto, & Nykanen , 2008, Definition, structure, content, use and impacts of electronic health records: A review of the research literature Kristiina Hayrinen¨ a,∗, Kaija Sarantoa, Pirkko Nykanen ... (2008)291–304 293…

[16] Miller and Sim (2004) Physicians' use of electronic medical records: Barriers and solutions.Health Affair (Millwood), 23, 116- 126. doi:10.1377/hlthaff.23.2.116

[17]   Custodio, Gard & Graham 2009). Garrido, Gerhardus, Rottingen, and Busse (2010)

[18]   Buntin, Burke, Hoaglin, & Blumenthal, 2011), IOM, US. pdf from MMHA 6600 at Walden University. The Benefits Of Health Information Technology: A Review Of the recent. Buntin, Find Study Resources.

[19] Westbrook et al. 2009, 2011),OM, US. Benefits associated with HIT.

[20]   IOM 2011, US. Increase utilization of HIT.

[21]   Chen, Garrido, Chock, Okawa, & Liang, 2009, p. 323) The Kaiser Permanente Electronic Health Record: Transforming and streamlining…

[22]   Zandieh et al., 2008; Yamamoto, 2006; Himmelstein, Wright & Woolhandler, 2009; Sykes, Venkatesh, & Rai, 2011).

APPENDICES

SAMPLE OF QUESTIONNAIRE

A Perspective Study on Examining the Benefits of Hospital Information System (HIS) and its Influence on Performance of Healthcare Professionals- Case Study Delhi Cantonment General Hospital

Informed Consent

Dear Sir/Madam,

I am Col Avtar Manhas, studying (M.B.A Health and Hospital Management) at the International Institute of Health Management Research (IIHMR) Delhi. As a part of my course I am undertaking a research study titled: "A Perspective Study on examining the benefits of Hospital Information System (HIS) and its influence on Performance on Healthcare Professionals".

This study focuses on assessing the awareness, knowledge and attitude of clinical and non-clinical staff in your hospital regarding HIS. It is hoped that this study will bring to light the potential benefits of HIS that can be utilized during proposed implementation of HIS in the hospital. Further this would also bring to limelight the perceived barriers that may arise during implementation and provide recommendations for addressing them. It is hoped this study would be helpful for effective use of proposed HIS for betterment of hospital performance and quality of care.

I would be grateful, if you could take few minutes to complete the questionnaire below. The information you provide will remain highly confidential, your privacy maintained through anonymous and will not be divulged to any third party.

Demographic Details

1. **Name of the respondent:_____**
2. **Age: _____**
3. **Gender:_____**
4. **Phone no.(not mandatory required in case of clarification of response during analysis):_____**

5. Education
   a. **Diploma**
   b. **Bachelors (BSc Nursing/ MBBS/ BDS)**
   c. **Technician**
   d. **Master (MSC Nursing/ MS/MD)**
   e. **Other**

6. **What is the nature of your profession?**
   □ **Administrative support staff**
   □ **Family physician**
   □ **Imaging technologist**
   □ **Specialist physician (please specify):_____**
   □ **Laboratory technician**
   □ **Nurse**
   □ **Pharmacist**
   □ **Other (please specify)_____**

7. **What is your position?   (Example Matron/ Supervisor/ Consultant/ HOD/ Resident etc) please mention _____**

8 **Ward/ Specialty/ Department_____**

9a. Work experience: Total (years)_____
9b Current Hospital:_____

Computer Literacy

10.   Have you worked in Computer before?
   a.   **< 5 years**
   b.   **5-10 years**
   10 years
11   Where do you have access to computer?
   Home
   Workplace
   Home & Workplace
   None
12.   The ability to use Software
   Word
   Access
   Excel
   Email
   PowerPoint
   Internet
   more than one software
   none
13.   Computer Knowledge
   Less than moderate
   moderate
   more than moderate (good)
   Very good (Highly proficient)
14.   Usage of computer in work (daily)
   less than 1 hour
   1 – 2 hours
   2- 5 hours
   > 5 hours

Access to clinical data

15.   Do you currently provide direct care to patients?
   a.   **Yes**
   b.   **No**

16.   Do you need clinical data in your work?
   a.   **Inpatients**
   b.   **Outpatients**
   c.   **Both**

Awareness to HIS
17.   Do you know what Hospital Information System (HIS) is?
   a)   **Yes**
   b)   **No**
18.   Have you ever used the HIS earlier/ till date?
   a.   **Less than a month**
   b.   **1-3 months**
   c.   **4-6 months**
   d.   **7-12 months**
   e.   **1-2 years**
   f.   **3-5 years**
   g.   **Till date**
   h.   **Never**

19. **Have you been informed of the proposed implementation?**
   a. Yes
   b. No
   c. Somewhat

20. **Are you aware of your duties using HIS**
   a. Yes
   b. No
   c. Somewhat

21. **How would you describe your proposed "use" of HIS?**
   l. **I will use the system for clinical decision making (patient diagnosis/ treatment etc)**
   m. **I will use the system to access patient information and support the clinical decision maker (admin/ finance)**
   n. **I will use the system for collecting patient information (registration/ front desk/ claims etc)**
   o. **I will use the system at backend (administrator/ report generation etc.)**
   p. **Other please mention_____**

Perception towards HIS/EMR Benefits

22. **In general, how much will you be satisfied in overall use of the EMR if implemented?**
   a. **Highly satisfied**
   b. **Moderately satisfied**
   c. **Neither satisfied nor dissatisfied**
   d. **Moderately dissatisfied**
   e. **Not satisfied at all**

23. **Please indicate your level of agreement or disagreement with each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	No Ap
a) HIS will improve my productivity						
b) HIS will improve the quality of care						
c) HIS will make my job easier						
d) HIS will enhance our ability to coordinate the continuity of care						
e) HIS will improve our sharing of patient information amongst providers						
f) HIS will improve the quality of my decision-making						
g) HIS will reduce risk to patient safety						

24. **Please indicate your level of agreement or disagreement with each of the following statements below.**

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable
EMR functions and benefits						
EMRs improve quality of care and reduce errors						
EMRs improve quality of practice (i.e., work life)						
EMRs increase practice productivity (i.e., patients per day)						
Physicians will devote the time required for EMR Training						
EMRs induced hard work						
EMRs need spent time for training						

EMR benefits outweigh the costs	
EMRs issue	
Impact on cost	
Impact on security	
Patient acceptance	
Privacy	
Complexity	
Response time for patient	
Training needs	
Physicians resistance	

25. Functions of HIS perceived (choose all that applies)

Display of lab results	
Display of radiology reports	
Display of clinical notes and reports	
Display of height, weight and allergies	
Nuclear medicine	
Display of radiology images	
Entry/Display of diagnoses and medications	
Display of other ancillary clinical data	
Prescription alerts drug-drug, allergy and dose checking and formulary management	
Display of demographics	
Time trended clinical data display	
Structured documentation (Templates)	
Physician order entry (tests and medication orders)	
Prescription writing	
Workflow inbox for office and/or hospital results	
Decision support (guidelines, expert logic, reminders/alerts)	
Preventative health reminders	
Medical management reporting – notification by diagnoses	
Medical management reporting – disease management reporting	

26. Please indicate your level of agreement or disagreement with each of the following statements below.

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable
a) HIS is generally easy to use/ will be easy to use						
b) The effort required (i.e. number of clicks, screens, scrolling) to complete an action or access to information in HIS is/ will be acceptable						

c)   The response time from HIS is/ will be acceptable

d)   HIS is integrated with my workflow

e)   HIS adequately provides /will provide for the privacy and security of my patient's information

f)   HIS adequately provides /will provide for the privacy and security of my information

g)   I am aware of my privacy and security obligations with respect to HIS

h)   My patients can find out who has accessed their health information through HIS.

i)   Logging into HIS is/ will be acceptable

j)   The features in HIS enable/ will enable me to perform my work well

k)   HIS is/ will be reliable in its performance

27.   In general, when thinking about the quality of the information that will be provided by HIS, do you find the quality of the information to be:

Highly acceptable
Moderately acceptable
Neither acceptable nor unacceptable
Moderately unacceptable
Not at all acceptable
Not aware

28.   Please indicate your level of agreement or disagreement with each of the following statements below.

	Strongly Agree	Moderately Agree	Moderately Disagree	Strongly Disagree	Not Sure	Not Applicable

a)   The implementation process of HIS at this *Hospital if customizable to survey deployment setting*s acceptable

b)   Consultation with users during implementation of HIS is acceptable

c)   The current level of training for HIS is acceptable

d)   The level of on-going support provided for HIS is acceptable

e)   Workflow analysis and redesign if well integrated in the implementation process of HIS acceptable

29. What barriers exist in your use of HIS in clinical practice (Tick that apply)

□   Lack of Helpdesk support resources for HIS
□   Login takes too long sign in to use the HIS
□   Login is a complicated process (multiple logins) to access HIS
□   Lack of HIS's integration with other clinical systems
□   HIS does not align with clinical workflow
□   Too many other work demands

□   Lack of knowledge/confidence to use HIS
□   Mix of paper and electronic systems
□   Insufficient availability of computers or hardware equipment to access HIS
□   Functionalities in HIS do not meet my clinical practice needs

30.   How likely are you to recommend the system to other healthcare providers at other Hospitals or Centres?

☐   **Definitely**
☐   **Probably**
☐   **May or may not**
☐   **Probably Not**
☐   **Definitely not**

31. How do you forsee your role in future HIS implementation

I believe the computer systems will save the hospital money
I believe the cost of learning new computer systems is not wort the benefits
I would like to move to a paperless system as soon as possible
PAPER RECORDS ARE MORE USEFUL THAN PAPRLESS RECORDS

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

Thank you for your response

END OF DOCUMENT.