"To Assess the acceptance level of integrated HIS developed and deployed by H*i*SP,India at DDU Hospital,Shimla"

A dissertation submitted in partial fulfillment of the requirements

For the award of

Post-Graduate Diploma in Health and Hospital Management

By

Neha Gupta

PG/10/085

International Institute of Health Management Research

New Delhi -110075

April, 2012

HiSP INDIA

Society for Health Information Systems Programmes

(**Feb 1 – April 30, 2011**)

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April 26, 2012

To Whom It May Concern

This is to certify that Ms. Neha Gupta, a graduate student of the Post- Graduate Diploma in Health and Hospital Management, has worked under our guidance and supervision. She is submitting this dissertation titled "To Assess the acceptance level of Integrated HIS developed and deployed by HISP, India at DDU, Hospital, Shimla" 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.

(Sundeep Sahay)

Department of Informatics : Gaustadalléen 23,P.O. Box 1080, Blindern,No-0316 Oslo Norway
Head Office : 136/7 Begampur, Main Shivalik Road, Malviya Nagar, New Delhi-17 Ph: +91 11 46563892/94
Project Office-Shimla : Flat no 7, Sirtaj Manor, Old Torentian Cottages, Brokhost, Chotta Shimla, Shimla-2 Himachal Pradesh, Ph: +91 177 2620186

Certificate of Approval

The following dissertation titled " **To assess the acceptance level of integrated HIS developed and deployed by Hispindia at DDU Hospital, Shimla** "is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

	Name	Signature
_____	AVANISH KR SINSH	
	Prof. I. Bhattacharya	
_____	Prof.(Dr.) T. MUTHUKUMAR	3/5/12
_____	Prof Rani Unnayali	
	Dr. Anandhi Ramadoss	

HISP INDIA SOCIETY FOR HEALTH INFORMATION SYSTEMS PROGRAMMES

April 26, 2012

To Whom It May Concern

This is to inform, that Ms. Neha Gupta, student at International Institute of Health Management Research (IIHMR), New Delhi, has successfully completed internship with the Society for Health Information Systems Programmes, India (HISP India) working with various Indian states in setting-up e-Health systems, from February 2012 to April 2012. Her contributions have been in completing evaluation study for implementation of Hospital information System in Himachal Pradesh.

She came across as a good team member with potential of being an asset to the organisation her works. I wish her good luck.

(Sundeep Sahay)

(Prof. I. Bhattacharya)

Department of Informatics : Gaustadalléen 23,P.O. Box 1080, Blindern,No-0316 Oslo Norway
Head Office : 136/7 Begampur, Main Shivalik Road, Malviya Nagar, New Delhi-17 Ph: +91 11 46563892/94
Project Office-Shimla : Flat no 7, Sirtaj Manor, Old Torentian Cottages, Brokhost, Chotta Shimla, Shimla-2 Himachal Pradesh, Ph: +91 177 2620186

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Also, we would like to extend our sincere thanks to Ms. Arunima S Mukherjee, Project Lead Coordinator, HISP India for providing us opportunity to do our project on "Evaluation of hospital information system (HIS) in Deen Dayal Upadhayay Hospital, Shimla and also to Ms. Rashi Banta, Project Lead Coordinator, HISP India who guided us and gave us valuable suggestions regarding the project report.

Our special thanks to all our colleagues in developing the project and people who have willingly helped us out with their abilities. Last but not the least; the study would not have taken place without the help and participation of clinicians, administrators, paramedical staff and patients. We owe a lot to their generosity and nice gesture.

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1. EXECUTIVE SUMMARY

The greater need to cut down on healthcare costs, enhance clinical/administrative workflow of hospitals, and huge demand for faster, better and efficient healthcare delivery along with reduced medical errors, is fueling the healthcare IT market globally. Thus, the growing cognizance of IT's importance in healthcare has been instrumental in improving the efficiency of services offered at the hospitals as well as saving precious time, effort and money considerably in the long run. With rising adoption of healthcare IT, healthcare delivery models are expected to evolve from clinic centric to patient centric models such as preventive healthcare, remote patient monitoring, telemedicine, and home healthcare.

The World healthcare IT market estimated to reach $162.2 billion in 2015, growing at a Compounded Annual Growth Rate (CAGR) of 10.2%. However, as per the Springboard Research, healthcare IT spending in India is expected to grow from $274.2 million in 2009 to $609.5 in 2013, growing at a Compounded Annual Growth Rate (CAGR) of 22 per cent from 2009-2013

Furthermore, by 2013, as stated in Express Healthcare, India's healthcare sector's total spend is projected to grow to nearly $40 billion. This throws up a lot of opportunities for IT players as more and more hospitals are adopting information technology apart from medical technology. Moreover, with new and upcoming applications such as telemedicine and e-prescriptions penetrating the healthcare vertical in India, IT investments on software would further increase with a focus on integrated billing and online availability of patient records across hospitals.

With increasing emphasis on the implementation of hospital information system (HIS) in the country, the market of instruments such as PACS will grow rapidly. However, the success of these factors will largely depend upon various factors including technology adoption and cost.

With the help of IT, patient care has improved drastically. In IT enabled hospitals, the bed turnaround ratio has increased by as much as 10%, which is a big advantage. Hence, the investment towards enabling IT gets recovered in a few months.

The biggest impact of good information technology systems will be on improving upon the inefficiencies in existing procedures inside Indian hospitals. India lags behind in terms of hospital infrastructure and manpower. The adoption of IT will help hospitals develop innovative and efficient healthcare infrastructure necessary for rural and urban population. IT solutions, which can help improve asset optimization, schedule doctors/clinicians, pharmacy orders, lab test orders etc. are needed on priority. The growth in healthcare IT sector will also help hospitals in enhancing the efficiency of their administrative functions thus leading to reduced patient waiting time and increased success rate in treatment.

The primary objective of the project "Evaluation of Hospital Information System (HIS) in Deen Dayal Updahya (DDU) Hospital, Shimla" is to analyze the impact of the implemented system at the hospital by knowing the user satisfaction of the stakeholders. Also, the secondary objective is to attain feedback onto the implemented system and to improvise on to drawbacks of the same.

The stakeholders identified consisted of the Administrators, Users of the System like the Data Operators for Registration and Billing, Main Store Manager, Doctors(Medicine, Surgery, Gynecology, Dental, Pediatrics, ENT, Eye, Ortho departments), Pharmacist/ JAS, Radiology Technician, Laboratory Technician, Nursing Staff (matron, staff nurse and ward sisters)and the Patients of DDU Hospital, Shimla selected by Convenience Sampling method. The total sample size was 100; consisting of the following stakeholders:

Stakeholders	**Number**
Administrator	1
Operators for Registration and Billing	3
Main Store Manager	2
Doctors	23
Pharmacist/ JAS	3
Radiology Department	2
Laboratory Department	6
Nursing Staff	40
Patients	200
Total Sample Size	**280**

The study also suggest that the use of the HIS application still remain underutilized due to limited staff and lack of interest for using the system.

2. ABBREVIATIONS USED

- **DDU :** Deen Dayal Updahya Hospital
- **DHIS**: District Health Information System
- **FGDs** : Focus Group Discussions
- **HIS** : Hospital Information System
- **HISP** : Society for Health Information Systems Programmes
- **JAS :** Jan Aushadi Store
- **OPD** : Out - Patient Department
- **IPD** : In - Patient Department
- **OSS** : Open Source Software
- **SOP :** Standard Operating Procedures

3. ORGANIZATION PROFILE

3.1 SOCIETY FOR HEALTH INFORMATION SYSTEMS PROGRAMMES (HISP), SHIMLA, HIMACHAL PRADESH

HISP India is a not for profit NGO specializing since more than a decade in designing and implementing solutions in health informatics for the public health sector in India, and also recently in Bangladesh and Sri Lanka.

With a strong commitment to free and open source technologies, we work with a global perspective of the Health Information Systems Programmes (HISP) network, coordinated by the University Of Oslo, Norway, and are active in more than 20 countries in Africa and Asia.

HISTORY

In 1999, an informal group of idealists, interested in making a difference in the Indian public health system, got together to start a project in a primary health centre in the remote villages of Kuppam, Chittoor district in Andhra Pradesh. These efforts were supported by the University of Oslo, Norway, and had initial partnerships with IIM Bangalore and ASCI Hyderabad. During the first five years, we remained focused on Andhra Pradesh and carried out implementations of the first version of the DHIS software application. From 2005, we started to work in the State of Kerala first in one facility and by 2008 all the facilities were reporting data in the DHIS2. The DHIS2, which is a global standard today, for facility reporting, took birth in a clinic in Kerala in 2006. The achievements in Kerala prompted the state of Gujarat first, and then Jharkhand and Madhya Pradesh to initiate DHIS2 implementations. This led to collaboration in 2008 at the national level with National Health Systems Resource Centre (NHSRC) to provide technical support on DHIS2 nationally. About 25 states took up DHIS2 in 2008. Today, HISP has gained international recognition, and has also been invited to provide technical support in Bangladesh, Sri Lanka, Rwanda, and Philippines. We expect our international operations to grow in the future. In the Indian front, we hope to provide more specialized and integrated services to states around health architectures.

VISION AND MISSION

VISION

To strengthen the development and use of integrated health information systems within a public health inspired framework in India and the South Asian region.

MISSION

To enable networks of collaborative action with like-minded actors who aspire to the ideology of open source software, open standards and decentralized decision-making to create complementary strengths in providing integrated and public health friendly health information systems.

GEOGRAPHICAL COVERAGE

With a 30 person team, we are proud to have a strong national and global coverage of work. In India, we have worked in at least 90% of our states, and currently have presence in about 20 states. Internationally, HISP India has worked in Bangladesh and Sri Lanka and on an individual basis our experts have contributed to Global HISP activities in various countries including Vietnam, Tanzania, Zanzibar, Ethiopia, Mozambique, South Africa, and those in West Africa.

3.2 DEEN DAYAL UPADHAYA (DDU) HOSPITAL, SHIMLA, HIMACHAL PRADESH

Deen Dayal Upadyay Hospital (DDU) is the selected pilot hospital for the project, and is located near the Shimla town centre. The official numbers states that it holds about 300 beds, but in reality there are a maximum 200 beds. DDU is an old heritage hospital and was opened in 1885. The 125 year old buildings are in a very bad condition, as there are strict rules and guidelines for repairing heritage buildings. It is built entirely of wood, and during the rainy season there are lots of leaks, causing bad conditions and posing a risk to computers and other electronic equipment. There are also a lot of monkeys in the area, vandalizing the buildings and power- and network cables. Nevertheless, due to its location and the lack of other public hospitals nearby, it is a much visited hospital. There is an average of about 1200 out- patient (OPD) visits per day.

Figure 1.DDU Hospital, Shimla

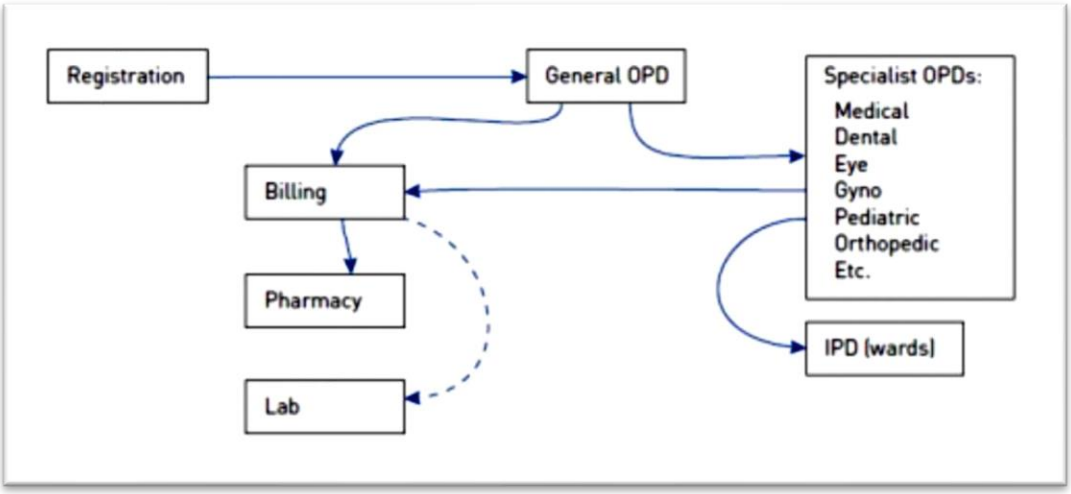

Figure 2. Patient Flow at DDU Hospital

4. INTRODUCTION

4.1 HOSPITAL INFORMATION SYSTEM (HIS)

The Government of Himachal Pradesh has identified quality health services and the efficiency of Government managed hospitals as key contributors for building trust and confidence for the general hospitals in the hearts of the citizen of the state.In order to be able to take prompt decisions at appropriate times required a holistic view of the functioning of all district level hospitals at the state headquarter level which mandated hospital information system deployment across the hospital processes. The Hospital Information System (HIS) has been envisaged to not only help the administrators to have better monitoring and control of the functioning of hospitals across the state using decision support indicators but also assist the doctors and medical staff to improve health services with readily reference patient data, work flow enabled less-paper process and parameterized alarms and triggers during patient treatment cycle.

Health Information System (HIS) is a system that integrates data collection, processing, reporting, and use of information necessary for improving health service effectiveness and efficiency through better management at all levels of health services [Lippeveld et al., 2000]. It is not a specific type of application, but a collection of tools, systems, users, routines, etc. that together seek to improve health services.

Most health information systems consist of many different systems. Some with specialized purposes, others more overlapping and aiming to combine functions and objectives. Standardization and interconnectivity between the subsystems can often be crucial for improving health services. The figure below shows how different HIS can be classified and linked based on their areas of usage:

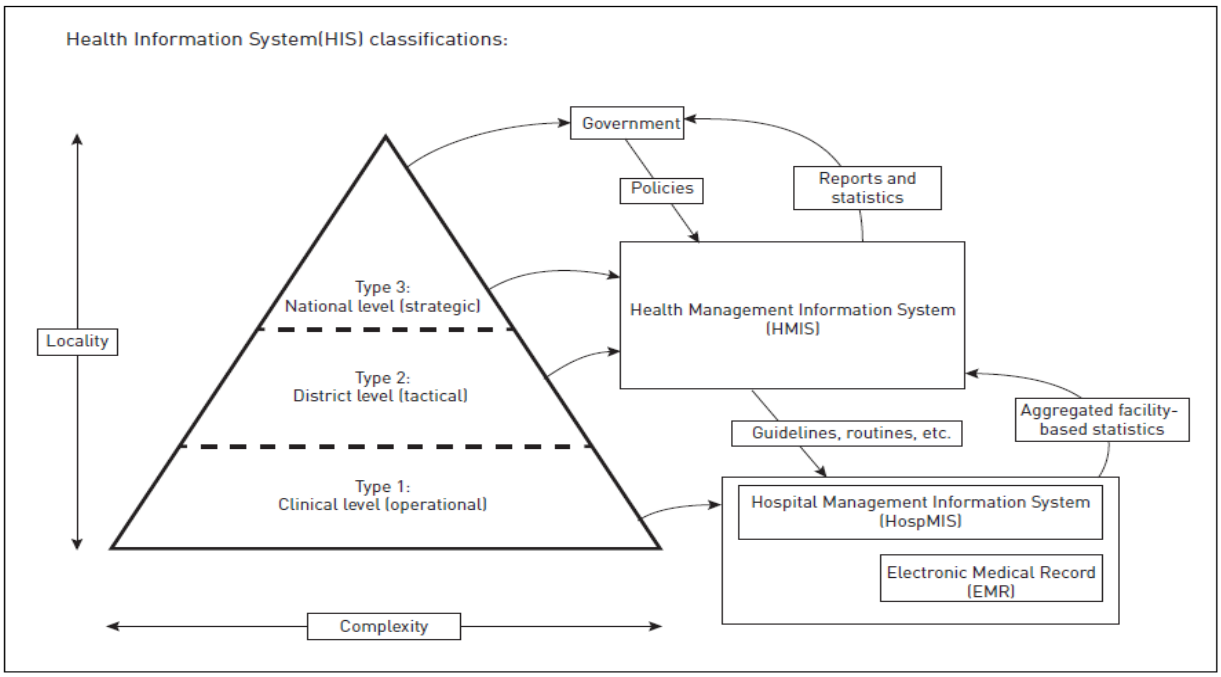

Figure 3. HIS Classification

Even though ICT-initiatives in the health sector and the idea of HIS for improving the overall quality of health services has been around since the start of the IT-era, it is still a field with large potential, also for the most developed countries of the world. Most of the present HIS has been changed into departments of hospital information management in order to take up responsibilities to function more effectively and efficiently in this regard. The Hospital Information managers must have the necessary skills to facilitate and manage this transition and bridge the gap in the changing patterns switch over to 21st century.

Current Healthcare IT Priorities in Indian Healthcare Sector

- Implementing technology to reduce medical errors/increase patient safety
- Integrating systems in a multi-vendor environment
- Standardize the healthcare delivery processes
- Health information management
- Implementing an electronic medical record or its components
- Training personnel to use existing and newly installed systems

Challenges faced by the Healthcare sector of India

- Low reach / inaccessibility as well as insufficiency (where available) of quality care to the most economically backward areas
- Lack of Standards Operating Procedures (SOPs)
- Lack of IT expertise and reluctance of medical, nursing and other staff to adapt
- Fear of Technology failure (paper systems appear more reliable)
- Integrating IT into the healthcare system
- Poor support from vendors
- Lack of other infrastructure support
- Presence of specialist doctors is restricted to the metro and class-A cities
- High focus / risk of under-utilization of capacity (beds, doctors, nurses)
- Lack of a one-point complete patient record
- High Cost / Low Productivity due to bottom-up re-creation of diagnosis /analysis for every instance

The Internet has ushered in many changes in the software industry, and one of the most prominent of these is the Open Source movement. What used to be a closed market controlled by large, monolithic vendors like Microsoft and IBM, has flourished into a web of companies and individuals exchanging ideas and collaborating together to create free and open software. Despite much skepticism, this method of development has proven to not only be viable, but to produce high quality software which today powers everything from phones to mission-critical computer clusters.

The widespread distribution of HIS in healthcare institutions requires professional evaluation to assess the practical usefulness of these applications. Hospital management information systems provide means for interdepartmental communication, bringing together information on laboratory and radiological test data, pharmacy orders, medical history and other patient data in a way that is easily accessible and usable by caregivers. The information system can aid in patient care by providing to the staff timely information needed to make decisions, diagnoses, and interventions. Information systems also aid in hospital and agency management by bringing together information on utilization of facilities, results of treatment, financial records, inventory control, case mix, and other information that helps administrators determine the costs, effectiveness and quality of care. Thus, the implementation of IT helps in maximizing returns on every penny spent.

Impact of Hospital Information System on the Indian healthcare sector

- Improvement in the quality of care
- Patient safety and satisfaction
- Standardize the delivery process and SOPs
- Helps in reduction of medical errors
- Management of health related information

- Safety and Efficiency of healthcare delivery
- Adoption of new technology – Cost effective
- Helps data to be portable
- Delivering timely information to care providers
- Integrating facilities and share information between facilities
- Medicare cutbacks/managed care fees reduction
- Bridge India’s rural-urban users equally

4.2 OpenMRS

In the project we had the opportunity to evaluate the Hospital Information System (HIS) implemented at DDU Hospital, Shimla. The system is based on an American made open-source Electronic Medical Record (EMR) system called OpenMRS. OpenMRS represents a change in the classical OSS direction, away from the low-level server application, and towards a field that has previously been dominated by a few large multi-national companies. Health informatics is an area that, with a few exceptions, has seen very little traction from the open-source world, despite a rising demand from the third world.

OpenMRS is a software platform and a reference application which enables design of a customized medical records system with no programming knowledge (although medical and systems analysis knowledge is required). It is a common platform upon which medical informatics efforts in developing countries can be built. The system is based on a conceptual database structure which is not dependent on the actual types of medical information required to be collected or on particular data collection forms and so can be customized for different uses.

It is based on the principle that information should be stored in a way which makes it easy to summarize and analyze, i.e., minimal use of free text and maximum use of coded information. At its core is a *concept dictionary* which stores all diagnosis, tests, procedures, drugs and other general questions and potential answers. It is a client-server application, which means it is designed to work in an environment where many client computers access the same information on a server.

☑ Features Of OpenMRS

- **Central concept dictionary:** Definitions of all data (both questions and answers) are defined in a centralized dictionary, allowing for robust, coded data
- **Security:** User authentication
- **Privilege-based access:** User roles and permission system
- **Patient repository:** Creation and maintenance of patient data, including demographics, clinical observations, encounter data, orders, etc.
- **Multiple identifiers per patient:** A single patient may have multiple medical record numbers
- **Data entry:** With the FormEntry module, clients with InfoPath (included in Microsoft Office 2003 and later) can design and enter data using flexible, electronic forms. With the HTML FormEntry module, forms can be created with customized HTML and run directly within the web application.
- **Data export:** Data can be exported into a spreadsheet format for use in other tools (Excel, Access, etc.)
- **Standards support:** HL7 engine for data import

- **Modular architecture:** An OpenMRS Module can extend and add any type of functionality to the existing API and webapp.
- **Patient workflows:** An embedded patient workflow service allows patient to be put into programs (studies, treatment programs, etc.) and tracked through various states.
- **Cohort management:** The cohort builder allows you to create groups of patients for data exports, reporting, etc.
- **Relationships:** Relationships between any two people (patients, relatives, caretakers, etc.)
- **Patient merging:** Merging duplicate patients
- **Localization / internationalization:** Multiple language support and the possibility to extend to other languages with full UTF-8 support.
- **Support for complex data:** Radiology images, sound files, etc. can be stored as "complex" observations
- **Reporting tools**: Flexible reporting tools
- **Person attributes:** The attributes of a person can be extended to meet local needs

4.3 RATIONALE OF THE STUDY

It has been 1.5 years that the HIS is in place at DDU Hospital, considering it as a pilot project the need was felt to evaluate the system efficiency under various parameters. The chief criterions under consideration are system acceptance and satisfaction amongst end users and patients. This will help in assessing effectiveness of HIS along with the current shortcomings in the deployed system. As NRHM funded HISP project is in the process of implementing the HIS in 19 government hospitals of Himachal Pradesh, the results of this study will be useful for improving the existing system.

The HIS project was conceptualized by the department of health & family welfare to ensure the quality health care by IT application in such a manner so has to provide of standard clinical & diagnostic protocol tools , hospital management tools and integration of management information at the state level so as to ensure online review & monitoring.. This is aimed at management of vital patient records, analysis of the critical health related data so as to provide an updated planning& policy tool towards provision of quality heath services. The Hospital Information System (HIS) integrates all departments in the hospital where every department can be viewed as an information-processing agency. The hospital Information system revealed that the system at DDU Hospital then, required up-gradation to meet the requirements of the managers and the clinicians. The management at DDU felt that HIS assists in decision making, and medical audit. It is also felt that the existing HIS resulted in longer time for OPD consultation and delay in investigation results.

The present HIS was developed by Society for Health Information System Programme India (HISP India) as a pilot project funded by grants from NRHM. The HIS has been made operational at the hospital since September, 2010.

Thus, the "Evaluations of HMIS in DDU Hospital, Shimla (HP)" has been undertaken focusing on the end users i.e., Hospital administrators, Users of the System working with the software and Patients.

4.4 OBJECTIVES OF THE PROJECT

- Technological glitches (if any) in DDU Hospital after implementation of HIS
- Impact of eliminating paper based records on the Study Population / Stakeholders
- User satisfaction towards HMIS by the Study Population / Stakeholders

REVIEW OF LITERATURE

Hospital Information System (HIS) is comprehensive and integrated system designed to store, manipulate, and retrieve information of the administrative and clinical aspects.1 The HIS supports various hospital activities to develop and promote comprehensive healthcare facilities in order to satisfy the functional requirements of the users (Centre of Development for Advanced Computing, 2011). It also acts as a decision support systems for the higher authorities and promotes the management of hospital finances. Hospitals are extremely complex institutions with large departments and units coordinate care for patients. Hospitals are becoming more reliant on the ability of hospital information system (HIS) to assist in the diagnosis, management and education for better and improved services and practices. However in this literature, there are two approaches evaluated for success of HIS application. The first of these approaches is the analysis of critical factors important to the successful HIS which offer specific guidelines or formulas for implementation. The second approach, the socio technical approach, is critical of offering specific formulas for success and treats such approaches as attempting to place healthcare systems within the standardized, predictable context of information technology systems. The socio technical approach does not offer a formula for success, but instead strives to successfully implement HIS.

Hospital Information Systems (HIS) have lagged business and industrial information systems in the use of information technology and in the application of quality standards to customer satisfaction. It is interesting to note that both education and health care lag manufacturing & service in attention to quality (health care having the lowest scores). In particular, health care scored 30% or less in percent of score for "Information and Analysis, "Strategic Planning" and "Process Management." All three areas directly impact on or are impacted by quality of information systems. These results reinforce the need to develop measurement tools to assess, understand and improve the quality of Information Systems and, more specifically, the quality of Hospital Information Systems. Quality HIS are needed to sustain high quality health service delivery that meets the needs of the people it serves. Hospitals are extremely complex institutions with large departments and units coordinate care for patients. Hospitals are becoming more reliant on the ability of hospital information system (HIS) to assist in the diagnosis, management and education for better and improved services and practices. As a result, there has been widespread agreement and comprehension that IT has the potential to improve the quality and reduce the cost.

In health organization such as hospitals, implementation of HIS inevitable due to many mediating and dominating factors such as organization, people and technology. HIS may subsequently improve the quality of care delivery and reduce costs. However, adoption of HIS among users needs evaluations to ensure its quality, reliability, maintainability and sustainability for its existence and span of system lifecycles. The problems arise when users reluctant and having difficulties to use the system. Consequently, the HIS may be under utilized by the users. More empirical investigations are being required to identify problem and weaknesses of HISbetter understanding of the requirements for different types of HIS users.

The socio technical approach does not offer a formula for success, but instead strive successfully implement HIS.

Success factor for HIS Development:

There exist some contributing factors that determine the success or failure of development and implementation of HIS. Review of literature shows some of success factors as listed at Table 1

People characteristics, Education & training, and User involvement both at system requirements. Definition and project implementation
Outsourcing, vendor Commitment, including Vendor support
System's Evaluation
Software and Hardware and Data accuracy (Technical issues)
Organizational Environment.
Cultural impact

TABLE 1. CRITICAL SUCCESS FACTOR HIS DEVELOPMENT[2]

Success factors for HIS Implementation:

i. Training and technical support

HIS is not implemented simply because it have been acquired or installed[4], nor should the implementation be the overarching goal[5]. Such healthcare information technology cannot work without dedicated healthcare professionals who had the opportunity to receive education and training necessary to use the HIS. Furthermore, follow-up training and on-site support are good steps to ensure that user, having different computer skill, become comfortable with the software and use it successfully. Historically, focusing exclusively on technology involved in implementing HIS has lead to failure. As noted by Lorenzi and Riley:

"Technical challenges still exist; they always will...[however] too many technologically good applications have failed because of sabotage by users who like the old ways in which things were done"

Data entry within difficult-to-use HIS is a major barrier to successful implementation due to some healthcare settings finds it too difficult to allocate necessary time[6].

ii. Technology

Technology facilitates but does not in itself bring about change. The healthcare professional, is critical factor in achieving a successful HIS. Those using the HIS must be dedicated in making it work, and be strong leaders within their practice to aid the transition from paper based medical records to electronic[7].

Also, in regards to technology, some physicians have noted the need for a paper back-up system to their medical records because they did not place their trust in the computer's ability to safely store their data[8].

iii. Usability

Introducing HIS into a clinical setting involves a certain degree of redesigning the way the office works. Time, training and or monetary investments are also necessary for providers and staff to adequately learn how to use the new system[9]. Hersh considers the initial time necessary to proficiently learn and use a HIS is sometimes the main obstacle

to their successful implementation; regardless of the savings in time, reduction in errors, and improved patient care that can result. Provider belief that there is no need for improvement in quality of care offered can enhance resistance[10].

As noted by Slack, providers will use computer applications and HIS if there is significant benefit to their practice in the sense of time savings, increased convenience in locating patient data, and quick analysis of specific patient data. While the initial investment in time and energy may seem substantial to healthcare professionals, the improved patient care resulting from HIS is primary among motivational factors.

iv. Leadership

Strong leadership within the clinical setting in support of the HIS is crucial in successful implementation. These leaders work with providers and staff to gain their support, will learn the system him/herself, and will help explain the HIS to ease any apprehensions[11]. Overall, the leader in support of the HIS understands the impact that this new healthcare information technology has and may increasingly have on healthcare delivery, while also understanding how to manage this impact.

Organizational structure change

While HIS change the ways in which medical records are recorded and stored, they can also have a significant impact on the organizational structure of a healthcare setting. In fact, the organizational nature of HIS implementation is in some cases more significant than its technical components. HIS can change the working relationships between staff, physicians, and other healthcare professionals3; with potential for a positive effect on the ways in which healthcare staff interact with one another, provide health care, maintain organization, and carry out their daily work routines. The impact on the organizational structure, then, must be understood prior to implementation in order for the HIS to be a success.[12]

The users must be the driving force behind changes that take place within the clinical setting to ensure they are not threatened by them. There is a critical relationship, then, between organizational and technological changes[13].

Socio technical approach

The socio technical approach to successfully implementing HIS within the clinical setting emphasizes that healthcare systems themselves must be the initial focal point. The installation of the HIS is only one step in the process of becoming a successful electronic registry. This approach stresses that the design of the HIS must be formed around the unique needs of the clinical setting[14].

There is no standard set of technological and/or organizational problems to be solved. Each setting poses unique difficulties in implementation, and elements determining success and failure are relative to each site. There is not a formula for successful implementation. Success, as seen by the socio technical approach, results from a thoughtful, well-planned combination of traditional office procedures and the new HIS elements. This is best accomplished in stages, at the pace appropriate for the each site, which allows the users to become accustomed to this change in the office environment. Viewed from the socio technical approach, HIS integration is treated as a process, or a journey, that is determined by the specific needs, problems, goals, and overall uniqueness of each setting. The socio technical approach, then, gives attention to the social, or human, variables that have a significant impact on the success of HIS. Berg, notes that

sites respond differently to the introduction of HIS due to differences in clinical leadership, practice environment and finances. In general, Berg holds that there are no prescriptions for success, only "insights." This is an integrated approach demonstrates that technical and social considerations are intimately linked.

As such, the socio technical approach mandates that the HIS be focused on the Health professionals using the registry. Users should be involved with the design of the HIS, which will in turn provide them with a better understanding of how the HIS works and how to use it to its fullest potential. This level of user involvement will help foster increased, long-term support for the HIS among its users. Importantly however, the data collection components of the HIS must not become impractical in light of user input. In other words, the users must be reminded that a simple HIS, or one which contains data collection components pertinent to the improvement of patient care and evaluation of quality improvement efforts, is a quality HIS.
In the socio technical approach, the HIS compliments existing strengths and abilities within the clinical setting, and does not attempt a high-tech replacement. Any transformation in healthcare delivery occurs in conjunction with the existing skills, methods and positive approaches to patient care already present[15].

Bailey and Pearson's measured user satisfaction for HIS. They founded that the role of user satisfaction has not been as prominent as in general IS research. In health care context, only about 4% of the studies used user satisfaction affect measure, whereas in IS research the fraction is 20%. Hence, although user information satisfaction (UIS) is seen as providing insights into the usefulness of the system as perceived by users, in health care it is not very widely used as a surrogate measure for systems effectiveness. Instead, more direct measures about the impacts on patients' health are used. Surprisingly, user satisfaction measures have not been used in the evaluation of supporting and auxiliary type of information system either. Such systems are used in making appointments, and in managing documentation, financial transactions and personnel information. They support patient's welfare indirectly.

In 1994, IMIA yearbook review paper, Hammond described how hospital information systems have developed since the 1970s, and how their functionality has evolved. In 1995, the observations, conclusions and recommendations of the Durham IMIA Working Group 10 HIS working conference were published. These publications outlined the shift towards clinically oriented and patient centered approaches, advocating health information systems without boundaries and seamless linkages connecting all individuals contributing to patient care. As a consequence, the scope and definition of "Hospital information system" was seen as extending towards "health information system".

The HIMSS 2000 survey has shown a high interest in clinical computing and in web technology. Survey participants were asked to select the top five healthcare applications they considered most important over the next two years. Tabulation of the survey results (number of representatives of healthcare providers surveyed = 858) showed the following application categories as the most important:

– Clinical information systems 71%
– Web-based applications 70%
– Clinical data repository 65%

The trend towards clinical computing and a patient centered computer-based record can be seen worldwide. As predicted, the hospital information system of earlier decades with its mainly administrative functionality has become much more focused on the clinical perspective and the Patient record, while it has become more open in a technological as well as an organizational sense. It is now understood that data, not systems, is what that counts.

Mbananga, Madale and Becke (2002) discussed the main objectives of HIS with reference to the facilities provided by the systems through improved delivery of services across the department, improved hospital management, and improved quality of patient care. Felt-Lisk (2006) conducted a survey with the senior healthcare executives. He stated that the fundamental objective of HIS is to improve the quality of healthcare services by providing more timely clinical information, diagnosis and treatment.

Research conducted by TechNavio reveals that the Hospital Information Systems market in India is expected to grow at a CAGR of 15 percent. Technavio's report, focusing on India, indicates that the market is currently being driven by the rapidly developing Healthcare industry in India. Several large hospitals in India have announced extensive expansion plans for the near future. This has been as a result of growing healthcare needs of the growing population. With the introduction of these new hospitals, hospital information systems are expected to be implemented to streamline workflow, boosting the market in India, reports a TechNavio analyst. In spite of the demand for hospital information services in India, the high capital cost is hindering the growth of this market. However, the increasing purchasing power of end-users in India is expected to boost the market. Moreover, the Hospital Information Systems market in India is witnessing a gradual move to cloud computing.

TechNavio's survey, Hospital Information System Market in the US 2011, has been prepared based on an in-depth analysis of the market with inputs from industry experts. TechNavio today launched its Hospital Information System Market in the US - Survey report based on an in-depth study conducted among 100 laboratory directors, medical technologists, clinical system analysts, hospital operation managers, and other healthcare providers working in various healthcare organizations in the US. The survey discusses the gap between the interest and the adoption of HIS in healthcare organizations in the US. Commenting on the report, an analyst from TechNavio's Healthcare team said, the latest trend witnessed by the HIS market in the US is medical device manufacturers are collaborating with IT companies. Various medical device vendors with their core competencies are collaborating with IT companies to design and develop improved and innovated products in the HIS market in the US.

Making use of both the critical factor approaches (focusing on usability, leadership, organizational structure and changes, technology, and training and technical support) and the socio technical approach, which is critical of focusing on specific factors of success and opts instead to uniquely examine each situation, may provide enhanced changes for successful HIS implementation. Thus considering the viewpoint of all the authors, it can be inferred that the main objective of HIS is to promote quality patient care through clinical and administrative decision support systems. These objectives can be achieved only through proper HIS implementation.

Hypothesis of the study:

1. "Real time" availability of patient data for disease surveillance and patient tracking.
2. Improved patient care by easy accessibility of patient information.
3. Reduced waiting time.
4. Standardisation of patient administration and management across hospital.

Improved decision making with the integrated information system

METHODOLOGY

Type of study: Descriptive/cross sectional study

Study population (Stakeholders Identified): 1. Administrators

2. Users of the System:

i. Data Operators for Registration and Billing
ii. Main Store Manager
iii. Doctors(Medicine, Surgery, Gynecology, Dental, Pediatrics, ENT, Eye, Ortho Departments)
iv. Pharmacist
v. Radiology Technician
vi. Laboratory Technician
vii. Nursing Staff (matron, staff nurse and ward sisters

3. Patients

- **Study site:** Deen Dayal Upadhyay (DDU) Hospital, Shimla (HP)

- **Tools for the Study:**

✓ **Questionnaires** for Administrators, Doctors, Nursing Staff, Laboratory Technicians, Radiology Technician.

✓ **FGDs** for Nursing Staff, Laboratory and Radiology Technicians and Patients.

✓ **Interviews** for Data Operators of Registration and Billing, JAS, Inventory and Patients.

- **Data Collection Methods**

Our project study is based on qualitative collection methods namely observation, interviews, questionnaires and focus group discussions. Furthermore, a short account of each of the methods and the description of how we specifically collected the various data.

1. **Observations –** We interacted with the various stakeholders and patients on a daily basis for analyzing the implemented system and its impact on the hospital.

2. **Questionnaires –** A small questionnaire session for the stakeholders was conducted. The collected data was aiding us in forming a clearer picture about the impact of the implemented system at DDU, and their assumptions and opinions about certain issues or phenomena related to the system.

3. **Interviews** – We conducted a semi-structured interview based on the questionnaires formulated which helped us in gaining much qualitative data through informal conversations that can be regarded as unstructured interviews with other Stakeholders. A lot of our information was gathered through these informal conversations, as it was easier for study population to discuss things more freely and in depth. We took notes whenever these occasions occurred.

4. **FGDs** – Focus Group Discussions (FGDs) were organized involving four to six participants from the study population because the FGDs helps in indicating the range of a people's beliefs, ideas, or opinions. A lot of useful information was generated through the FDGs as the participants were able to talk freely and spontaneously about a certain issue. The FGDs normally lasted for 15 – 20mins. Furthermore, the participants were guided through the formulated questionnaires during the FDGs to achieve the purpose of the discussion for collecting the required information on a study. The main purpose of conducting these was to improve the application or service by clarifying people's attitudes and needs and also to identify the issues for quantitative findings.

OBSERVATIONS

4.1. Outcomes of the Analysis

Valid	Missing	Total	Availability of Real Time Information			Total
N = 15 (62.5%)	N = 8 (34.8%)	N = 23 (100%) (Clinicians)	Always	Most of Time	Sometimes	
Access to Patient Data Across Various Departments	To an Effective Level		0	2	0	2
	To a Satisfactory Level		1	8	2	11
	Not at all		0	0	2	2
Total			1	10	4	15

Table 2. Cross tabulation of Access to patient data across various departments against the Availability of Real Time Information

Total N = 16 (Paramedical Staff)		Satisfied with the Reports generated by HIS			Total
		Yes	To some extent	No	
Satisfied in Time Taken for Compilation of Reports	Yes	5	0	3	8
	No	4	3	1	8
Total		9	3	4	16

Table 3. Cross tabulation of the level Satisfaction in Time Taken for Compilation of Reports against the level of Satisfaction with the Reports generated by HIS

4.2.Study Findings and Discussions

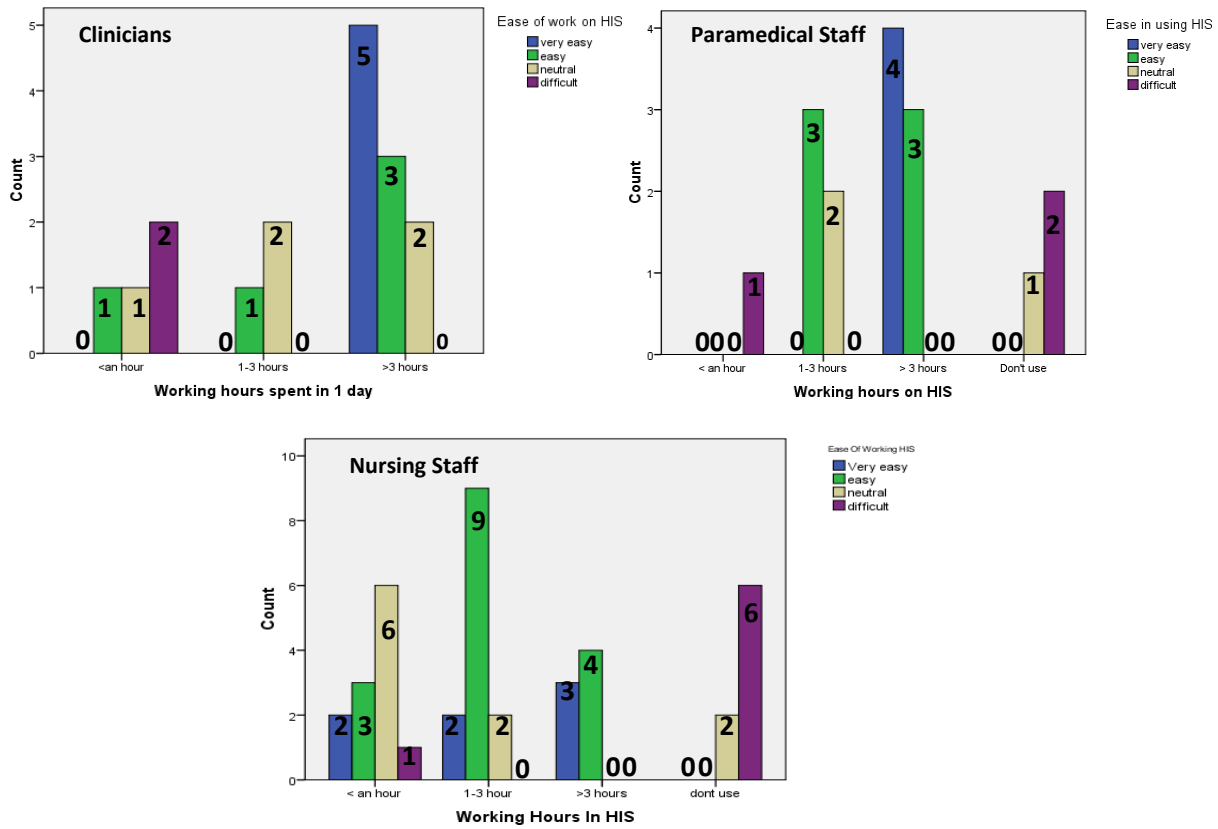

Figure 4. Cross tabulation of Working Hours against Ease of Working on HIS for Clinicians, Nursing Staff and Paramedical Staff

17 (73.9%) out of 23 Clinicians, 40 (100%) of the Nursing staff, 16 (100%) of the Paramedical Staff responded that they work between 1 – 3 hours per day on the HIS application therefore had ease in using the application.

Also, it has been observed that due to heavy patient inflow and limited time for clinicians, they are bound to use the application as well as attend the patient at the same time. Hence, maintenance of electronic records suffers. Even some of clinicians were not interested in filling up the evaluation questionnaire because they themselves do not use the HIS application.

A positive feedback was received on interviewing JAS, registration and billing as they were satisfied with the time taken and efficiency of system even at rush hours.

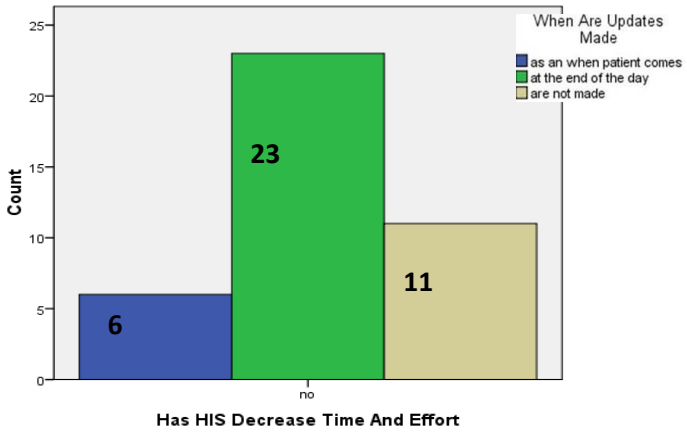

Figure 5. Cross tabulation of Decrease in Time and effort against the Time of Updating the HIS records for the Nursing Staff

It was observed that HIS application has not decreased time and effort as 23out of 40 nurses use to make updates at the end of the day and 11 nurses did not maintained any electronic patient records.

Furthermore, in the IPD departments, staff nurses pointed out that they have to come on weekends to update the records as a result lack of interest and commitment seen towards the application.

Also, the hospital staff has to maintain both the registers as well as electronic records as they are not confident about the electronic records generated by the HIS application.

As pointed out by some clinicians it is an extra burden for them as they are forced to use the system and make necessary updates at the end of the day.

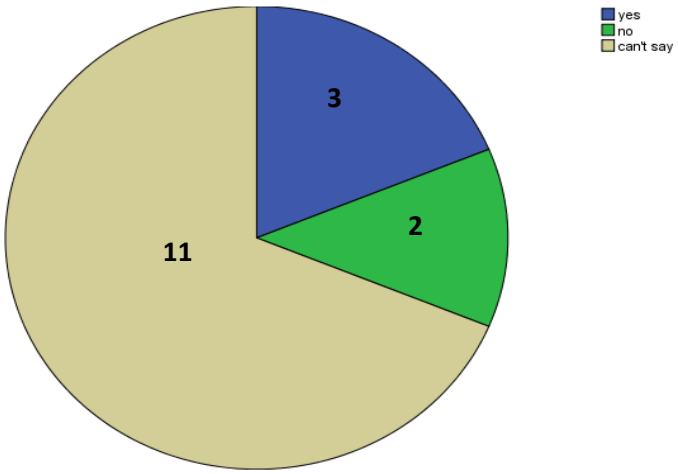

Figure 6. Flexibility of the HIS application to change over time

11(68.8%) out of 16 of paramedical staff does not know if application can change over time while 3 (18.8%) are aware about the application flexibility.

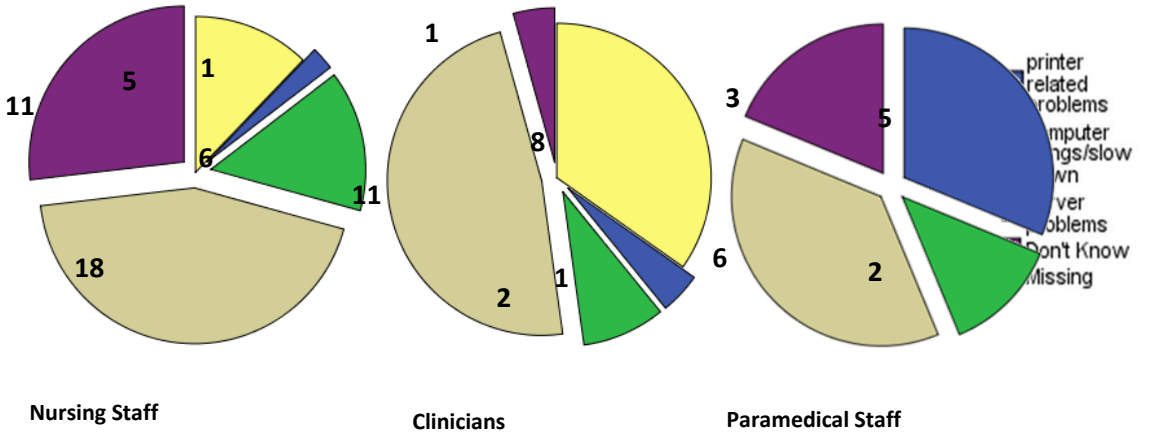

Figure 7. Technical Inconsistencies

50% of nurses and 47.8% of the Clinicians complained about server issues and internal errors, while only 37.5% of the paramedical staff had the same issue along with 31.2% of the printer related problems.

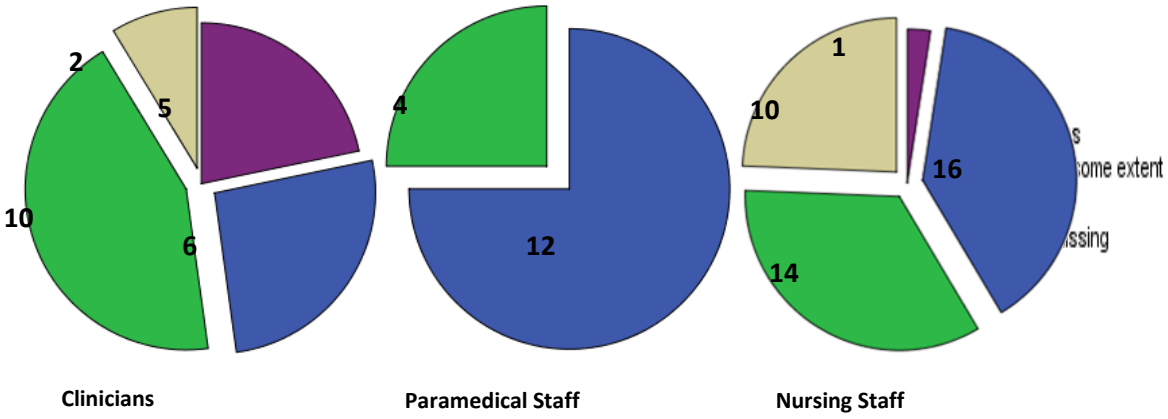

Figure 8. Satisfaction level with the HIS Team

75% of the Paramedical Staff, 39% of the Nursing Staff and 26% of the Clinicians were satisfied with the training and support provided by the HIS Team.
Some of staff in IPD departments (male/female surgical and orthopedics ward) pointed out that they were busy attending the patients and also due to transfers they did not receive the HIS training.

As the Senior MS DDU, pointed out that staff and nurses of the hospital were still not confident about the utility and efficiency of HIS application. Hence, the use of system has yet not reached its desired level.

Earlier RSBY and BPL patients use to go directly to the laboratory after consultation. But after the implementation of HIS, patients again have to get themselves registered to billing before going to the laboratory. As a result, sometimes patient undergoes unnecessary botheration.

As per hospital administration, the records of BPL and RSBY patients are now easy to maintain with the help of HIS application.

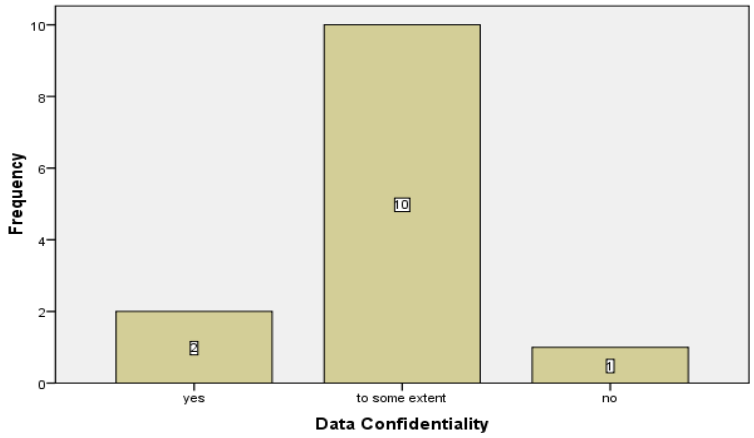

Figure 10. Data Confidentiality provided by the HIS application

Doctors are aware of data confidentiality in HIS application to some extent and even thought that its of no use to them instead it's the matter of concern for the Hospital Administrator.

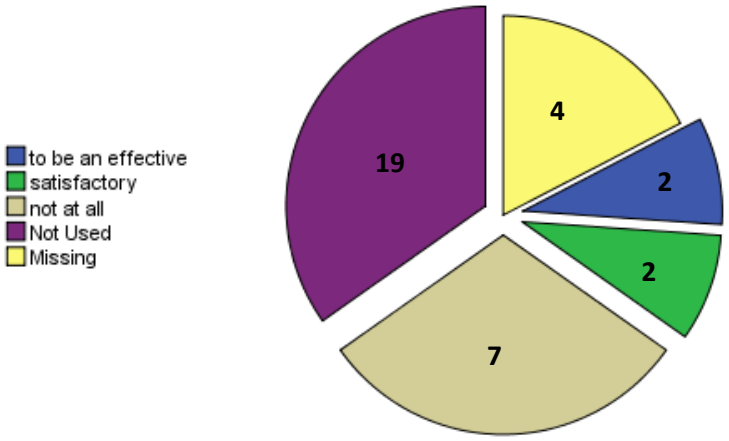

Figure 9. Accessibility of Patient data across various Departments

No effective referral system between clinicians was observed; patient had to come back to registration and billing department in order to go back to other department.

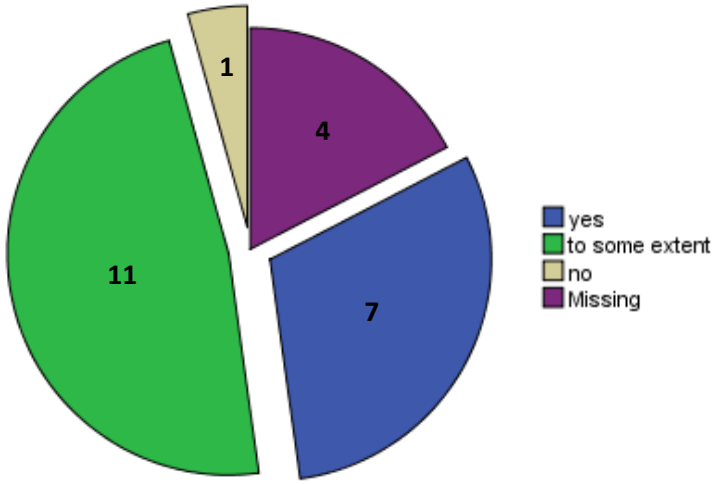

Figure 11. Clinicians response towards the compliance of the HIS application with the workflow of the OPD Departments

47.8% of the clinicians were satisfied to some extent with the compliance of the HIS application with the workflow of the OPD department but complaint that diagnosis and procedures were not adequate as per requirements and needed regular updating.

Most of the patients are not aware of any such application.

When asked in laboratory, patients said that there were delays in receiving the laboratory reports due printer issues.

Huge wastage of papers was seen in form of patient slips in the laboratory.

Limited staff at DDU is also one of the reason for under utilization of the HIS application.

The patients are satisfied with the application because now the patients get a single printed report irrespective of earlier where they use to have different reports for different tests.

Long waiting hours were observed at the OPDs.

Very few patients, especially from Medicine, Dental and Surgery OPDs were aware of some kind of application being used by the clinicians.

As per some patients, such HIS applications will not be successful as long as there is patient favoritism in Government hospitals.

There was no change seen in the discharge procedures and timings for the IPD patients, as the same hand written discharge slips are given to them.

5. LIMITATIONS OF THE STUDY

1. The sample was taken from single hospital; therefore a generalized inference could not be obtained for the study.
2. The sample population for study was taken on conveniences basis.
3. The Patients were not aware of the HIS application, therefore had lesser interest in participating for the interviews and FGDs.
4. Also, the sample size for the Hospital stakeholders was limited.
5. The HIS application is not fully functional in most of the IPD/OPD departments of the hospital.

Work plan:

The activity table for the overall project is as follows:

ACTIVITY	TIMETAKEN
Defining the problem	25th Feb-15th March 2012
Literature survey	20th March -28th March2012
Methodology Adopted	29th March -4th April 2012
Data Collection	4th April -20th April 2012
Compilation and Analysis	20th April - 24th April 2012
Documentation	20th April -29th April 2012

RECOMMENDATIONS

❖ CLINICIANS

Change management required. It was seen that clinicians were highly de - motivated. In order to have success of any IT projects end-users must be motivated, thus different ways to motivate clinicians must be used by the administration, like :

a) Biggest hindrance was data entry as clinicians had lack of time thus another person as data operator could be recruited to complete all the records.
b) Also training and follow-up training should be done regularly.
c) On-site support is also good step to ensure that end-users having different computer skill are using this application.

❖ NURSES

Change management is also required for the nurses. It was seen that as clinicians were not very keen to use HIS application. This further led to lack of interest by the nurses for using the HIS application albeit they were provided with thorough training.

Those departments where HIS system was functional, it was seen that the nurses were bounded to maintain both paper based. This further led to de - motivation for nurses. Thus highly motivated clinicians and management is required in order to encourage nurses to work on the application.

There seem to be lot of confusion for BPL and RSBY patients in the inventory and registration and billing departments. Also, they have to undergo unnecessary long procedures with regards to laboratory reports. Thus, we propose if possible there should be separate module for BPL as well as RSBY patients.

Also, in spite of provision of referral system in the application it was seen that clinicians were not using this application leading to unnecessary inconvenience for patients as a result management should promote proper and complete usage of this application.

Proper logistics support should be provided to all the departments of the hospital.

Regular updating of diagnosis and lab procedures is recommended.

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Annexure

11.1 QUESTIONNAIRE FOR THE ADMINISTRATORS

1. Name: ……(Optional)
2. Working Unit / Department: …..……...……...…..……
3. Work Profile: ……..……..…..……....

4. Since how long have you been working at DDU Hospital?

( ) Less than 7 Months ( ) 7 – 12 Months

( ) 1 – 3 Years ( ) More than 3 Years

5. How many hours do you spend on the Hospital Information System (HIS) application per day?

( ) Less than an Hour ( ) 1 – 3 Hours

( ) More than 3 Hours

6. Please mention the ease in using the interface of the HIS system?

( ) Very Easy ( ) Easy ( ) Neutral

( ) Difficult ( ) Very Difficult

If Difficult, please elaborate……..……..……

7. How effective has the HIS been in delegating the hospital functions?

( ) Very Effective ( ) Effective ( ) Moderately Effective

( ) Less Effective ( ) Not Effective

8. Does the system save time?

( ) Yes ( ) No ( ) Don't know

If No, please specify……..……...……

9. Has the HIS proved helpful in reducing the Patient's waiting time?

( ) To a larger extent ( ) To an optimal level ( ) To some extent ( ) No effect

10. Has HIS helped in improving patient care?

( ) Very much Improved ( ) Improved a bit ( ) Satisfactorily Improved ( ) Not Improved ( ) Can't say

11. Has the system improved the access to patient data across various departments of the hospital?

( ) Improved Drastically ( ) Slight Improvement ( ) No Improvement

12. How comfortable are you in retrieving the data by means of a report?

( ) Comfortable ( ) Not Comfortable

If Not, please specify……..……..…….

13. How often does the system provide real time information?

( ) Almost Always ( ) Most of the time ( ) Sometimes ( ) Never

14. How accurate is the patient discharge information?

( ) Much Accurate ( ) Accurate ( ) Not Accurate ( ) Can't say

15. Does the implemented HIS provides Data Security?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……..……

16. Has the implementation of HIS helped in reduction of errors?

( ) Yes ( ) No

Kindly Elaborate……..……

17. How has the data captured through HIS helped in decision-making?

( ) Yes ( ) No

18. Are you satisfied with the training and support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……..……..……

19. Are you satisfied with the documentation and troubleshooting support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……..……..……

20. Do you feel to have refresher training, if Yes then, for which Department(s)?

( ) Yes ( ) No

Name of the Department(s)……

21. What are the technical inconsistencies that you have faced (if any) after the HIS implementation?

[1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree]

	1	**2**	**3**	**4**	**5**
a) Time taken in opening the Homepage	[ ]	[ ]	[ ]	[ ]	[ ]
b) Login related problems	[ ]	[ ]	[ ]	[ ]	[ ]
c) Printer related problems	[ ]	[ ]	[ ]	[ ]	[ ]
d) Computer hangs / Slows down	[ ]	[ ]	[ ]	[ ]	[ ]
e) Server / Power related problems	[ ]	[ ]	[ ]	[ ]	[ ]

f) Others (please specify)……..

……...

22. What is your overall rating of the Hospital Information System implemented at DDU Hospital on a scale of 1 - 10?

Rate out of 10: /10

23. If there are / you have any kind of suggestions for the betterment of the working of HIS, kindly list them below

……
……
……
……
……

11.2 QUESTIONNAIRE FOR THE CLINICIANS/DOCTORS

1. Name: …… (Optional)
2. Working Unit / Department: ……
3. Work Profile/Designation: ……

4. Since how long have you been working at DDU Hospital?

( ) Less than 7 Months ( ) 7 – 12 Months

( ) 1 – 3 Years ( ) More than 3 Years

5. How many hours do you spend on the Hospital Information System (HIS) application per day?

( ) Less than an Hour ( ) 1 – 3 Hours ( ) More than 3 Hours

6. Please mention the ease in using the interface of the HIS system?

( ) Very Easy ( ) Easy ( ) Neutral ( ) Difficult ( ) Very Difficult

If Difficult, please elaborate……

7. Does the implemented HIS provide Data Confidentiality?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……

8. Are the procedures and diagnosis in compliance with your requirements?

( ) Yes ( ) To some extent ( ) No

If No, please elaborate……..

9. Does the system comply with the original workflow of OPD?

( ) Yes ( ) To some extent ( ) No

If No, please specify…….

10. Are you easily able to search a patient in queue and system?

( ) Very easy ( ) Easy ( ) Moderate
( ) Difficult ( ) Very difficult

11. Are you able to search the records of an old patient along with previous investigation reports and clinical summaries?

( ) Always ( ) Most of the time ( ) Sometimes ( ) Never

12. Are you satisfied with the patient records being generated by the HIS system?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……

13. How often does the system provide real time information?

( ) Almost Always ( ) Most of the time ( ) Sometimes ( ) Never

14. Has the system improved access to patient data across various departments of the hospital?

( ) To an effective level ( ) To a satisfactory level ( ) Not at all

15. Has the implementation of HIS helped in reduction of errors?

( ) Yes ( ) No

Kindly elaborate…….

16. Are you satisfied with the reports that are generated the HIS system?

( ) Yes ( ) To some extent ( ) No

If No, please specify …….

17. Are you satisfied with the training and support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify …….

18. Are you satisfied with the documentation and troubleshooting support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify …….

19. Do you require refresher training?

( ) Yes ( ) No

20. What are the technical inconsistencies that you have faced (if any) after the HIS implementation?[1 - **Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree]**

	1	**2**	**3**	**4**	**5**
a) Time taken in opening the Homepage	[ ]	[ ]	[ ]	[ ]	[ ]
b) Login related problems	[ ]	[ ]	[ ]	[ ]	[ ]
c) Printer related problems	[ ]	[ ]	[ ]	[ ]	[ ]
d) Computer hangs / slows down	[ ]	[ ]	[ ]	[ ]	[ ]
e) Server / Power related problems	[ ]	[ ]	[ ]	[ ]	[ ]

f) Others (please specify)

…….

21. What is your overall rating of the Hospital Information System implemented at DDU Hospital on a scale of 1 - 10?

Rate out of 10: /10

22. If there are / you have any kind of suggestions for the betterment of the working of HIS, kindly list them below

……
……
……
…….

11.3 QUESTIONNAIRE FOR THE NURSING STAFF

1. Name: ……..…… (Optional)
2. Working Unit / Department: …..……..……
3. Work Profile/ Designation: …….....

4. How long have you been working at DDU Hospital?

( ) Less than 7 Months ( ) 7 – 12 Months

( ) 1 – 3 Years ( ) More than 3 Years

5. How many hours do you spend on the Hospital Information System (HIS) application per day?

( ) Less than an Hour ( ) 1 – 3 Hours

( ) More than 3 Hours

6. Please mention the ease in using the interface of the HIS system?

( ) Very Easy ( ) Easy ( ) Neutral

( ) Difficult ( ) Very Difficult

If Difficult, please elaborate……..……

7. Has the Hospital information system (HIS) decreased your time and effort?

( ) Yes ( ) No

If no, please specify…….……

8. Do you still fill up IPD registers – Admission and discharge registers?

( ) Yes ( ) No

9. Are the procedures and diagnosis in compliance with your requirements?

( ) Yes ( ) To some extent ( ) No

If No, please specify…….

10. Does the HIS application comply with original workflow of IPD?

( ) Yes ( ) To some extent ( ) No

If no, please elaborate……..

11. Are you easily able to search a patient in the queue and retrieve records in the system?

( ) Very easy ( ) Easy ( ) Moderate

( ) Difficult ( ) Very difficult

12. Does your physical record of On-Bed patient match with your electronic record?

( ) Yes ( ) Sometimes ( ) No

13. Do you raise electronic indents?

( ) Yes ( ) No

14. How often do you issue items/drugs to Account/Patient in sub-stores to exhaust consumables?

( ) Often ( ) Sometime ( ) Rarely

15. Are you satisfied with the reports being generated by the HIS system?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……

16. How often does the system provide real time information?

( ) Almost Always ( ) Most of the time ( ) Sometimes ( ) Never

17. Has the system improved access to patient data across various departments of the hospital?

( ) To an effective level ( ) to a satisfactory level ( ) Not at all

18. When do you make updates?

( ) As an when patient happens ( ) At the end of the day

19. Has the implementation of HIS helped in reduction of errors?

( ) Yes ( ) No

Kindly Elaborate……..……..

20. Does the application encompasses basic need of IPD module

……
……

21. Are you satisfied with the training and support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……..……

22. Are you satisfied with the documentation and troubleshooting support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……..…….……

23. Do you require refresher training?

( ) Yes ( ) No

24 What are the technical inconsistencies that you have faced (if any) after the HIS implementation?

[1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree]

1 2 3 4 5

a)	Time taken in opening the Homepage	[ ]	[ ]	[ ]	[ ]	[ ]
b)	Login related problems	[ ]	[ ]	[ ]	[ ]	[ ]
c)	Printer related problems	[ ]	[ ]	[ ]	[ ]	[ ]
d)	Computer hangs / Slows down	[ ]	[ ]	[ ]	[ ]	[ ]
e)	Server / Power related problems	[ ]	[ ]	[ ]	[ ]	[ ]
f)	Others (please specify)…..…….....….					
	……					

25 What is your overall rating of the Hospital Information System implemented at DDU Hospital on a scale of 1 - 10?

Rate out of 10: /10

26 If there are / you have any kind of suggestions for the betterment of the working of HIS, kindly list them below

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……
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11.4 QUESTIONNAIRE FOR THE LABORATORY/ RADIOLOGY

1. Name: ……..…… (Optional)
2. Working Unit / Department: …..……..……
3. Work Profile: …..……..……....

4. Since how long have you been working at DDU Hospital?

( ) Less than 7 Months ( ) 7 – 12 Months

( ) 1 – 3 Years ( ) More than 3 Years

5. How many hours do you spend on hospital information system (HIS) application per day?

( ) Less than an Hour ( ) 1 – 3 Hours

( ) More than 3 Hours

6. Please mention the ease in using user interface of the HIS system?

( ) Very easy ( ) Easy ( ) Neutral

( ) Difficult ( ) Very Difficult

If difficult, please specify……

7. Has the implementation of HIS increased your efficiency?

( ) Yes ( ) No

Please elaborate…….……..

8. Has data access been easier than the paper based system?

( ) Yes ( ) No

If No, please specify ……..……..

9. Are you comfortable with the time taken in compiling reports in the HIS System?

( ) Yes ( ) No

If No, please specify ……..

10. Do you use Sample Ids generated by system?

( ) always ( ) most of time ( ) sometimes ( ) never

11. Are you satisfied with the outputs (ex: lab results, patients results etc) that are generated by the HIS system?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……

12. Are the test ranges and units in compliance with the DDU Laboratory?

( ) Yes ( ) To some extent ( ) NO

If any change required please specify…….

13. Does the Laboratory module of the HIS System encompasses all the needs of the laboratory?

( ) Yes ( ) To some extent ( ) No

If no, please elaborate……..……..

14. Are you able to access previous records of the patients?

( ) Almost Always ( ) Most of the time ( ) Sometimes ( ) Never

15. Has HIS Implementation reduced redundancy and duplication?

( ) Yes ( ) To some extent ( ) No

If no, please specify.....

16. Do you raise and accept electronic indents?

( ) Yes ( ) No

17. Do you make expenses by issuing to account at the end of month before raising a fresh indent?

( ) Yes ( ) No

18. Does your electronic balance match your physical stock balance?

( ) Yes ( ) No

19. Does the system comply with original workflow of laboratory?

( ) Yes ( ) No

If no, please elaborate…….……

20. Does the application have flexibility to change over time?

( ) Yes ( ) No ( ) can't say

21. Is there anything left out in application?

……
……
……

22. Are you satisfied with the training and support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……

23. Are you satisfied with the documentation and troubleshooting support provided by the HIS Team?

( ) Yes ( ) To some extent ( ) No

If No, please specify ……..……..

24. Do you require refresher training?

( ) Yes ( ) No

25. What are the technical inconsistencies that you have faced (if any) after the HIS implementation? [1 - **Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree]**

	1	**2**	**3**	**4**	**5**
a) Time taken in opening the Homepage	[ ]	[ ]	[ ]	[ ]	[ ]
b) Login related problems	[ ]	[ ]	[ ]	[ ]	[ ]
c) Printer related problems	[ ]	[ ]	[ ]	[ ]	[ ]
d) Computer hangs / Slows down	[ ]	[ ]	[ ]	[ ]	[ ]
e) Server / Power related problems	[ ]	[ ]	[ ]	[ ]	[ ]

f) Others (please specify)……...……
……...

26. What is your overall rating of the Hospital information system (HIS) implemented at DDU Hospital on a scale of 1-10?

Rate out of 10: /10

27. If there are / you have any kind of suggestions for the betterment of the working of HIS, kindly list them below

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……

11.5 QUESTIONS OF FGD FOR THE NURSING STAFF

1. How user friendly is the system?
2. Has the application decreased your time and effort?
3. Do you still fill up Admission and discharge registers?
4. How often do you use the system, comment on your usage?
5. When do you make updates?
6. Are you able to find all the Procedures and Diagnosis and are the spellings correct?
7. Does it comply with the original workflow of OPD/IPD?
8. How often do you Issue to Account/Patient in sub stores to exhaust consumables, do you raise electronic indents?
9. Are you satisfied with the training and support provided by the HIS Team?
10. What are the technical inconsistencies that you have faced (if any) after the HIS implementation?
11. Do you require refresher training?
12. Comment on the Scope of Improvement.

11.6 QUESTIONS OF FGD FOR THE LABORATORY/ RADIOLOGY DEPARTMENTS

1. How user friendly is the system?
2. Has the application decreased your time and effort?
3. How often do you use the system, comment on your usage?
4. Are you able to find all the Procedures and Diagnosis and are the spellings correct?
5. Does it comply to the original work flow of Laboratory/Radiology Department?
6. Are the test ranges in compliance to the Hospital?
7. Do you still maintain the lab registers?
8. Has the application reduced Redundancy and Duplication?
9. Are you satisfied with the outputs (ex: lab results, patients results etc) that are generated by the HIS system?
10. Are you satisfied with the training and support provided by the HIS Team?
11. What are the technical inconsistencies that you have faced (if any) after the HIS implementation?
12. Do you require refresher training?
13. Comment on the Scope of Improvement.

11.7 QUESTIONS OF FGD FOR THE PATIENTS (OPD/IPD)

1. How often do you come to the hospital?
2. In billing did you find any process improvement?
3. Do you know the slip is generated by system?
4. Is the system helpful in generating a compiled laboratory reports?
5. Is there some change in the admission and discharge procedures?
6. Are you satisfied with the time and attention given to you by the clinician while using the system?
7. Is there any kind of decrease in your waiting time?
8. Comment on the Scope of Improvement.

Thank You!!