User Perception regarding Impact of Implementation of Hospital Information System on Hospital functioning

A dissertation submitted in partial fulfillment of the requirements for the award of

Post Graduate Diploma in Health and Hospital Management

by

Pulkit Kathuria

International Institute of Health Management Research

New Delhi

May, 2013

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NATIONAL HEART INSTITUTE

Transplanting Health & Happiness

NABH ACCREDITED

Certificate of Internship Completion

TO WHOM IT MAY CONCERN

This is to certify that **Mr. Pulkit Kathuria** has successfully completed his 3 months internship in **National Heart Institute (NHI)**, covering the period January 03, 2013 to April 03, 2013. During his internship he has worked on his Dissertation **"Evaluation of Hospital Functioning on Implementation of Hospital Information System."** under the guidance of me and my team at National Heart Institute, New Delhi-110065.

National Heart Institute is a 104 bedded Cardiac Care Super Specialty Accredited Hospital in South Delhi

His dissertation is a symbol of hard work and it is a useful document.

On behalf of NHI we wish him good luck in his future endeavours.

Wg.Cdr.B Jena

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FEEDBACK FORM

Name of the Student: Mr. Pulkit Kathuria.

Dissertation Organisation: National Heart Institute, Delhi

Area of Dissertation: Quality, Topic :- Evaluation of HIS

Attendance: V. Good. (97.8%)

Objectives achieved: Updation of Quality Manuals.
feed back form analysis.
Indepth knowledge of various depts of hospital.
Pre & Post HIS evaluation.

Deliverables:
Evaluation of user/employee perception regarding implementation of HIS, points for improvement in systems

Strengths: persistent hard worker.
Team worker.

Suggestions for Improvement: Better time Management and a focused approach would help.

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

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Place: Delhi

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Certificate of Approval

The following dissertation titled "**User Perception regarding Impact of Implementation of Hospital Information System on Hospital functioning**" 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

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Certificate from Dissertation Advisory Committee

This is to certify that **Mr Pulkit Kathuria**, 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 **"Evaluation of Hospital Functioning on Implementation of Hospital Information System"** in partial fulfillment of the requirements for the award of the Post- Graduate Diploma in Health and Hospital Management.

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

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ABSTRACT

In previous years healthcare industry has experienced numerous changes in terms of information system and resultant products. Today Hospital Information System is used by number of healthcare organizations. It has proved to be effective and efficient tool for healthcare providers. HIS provides information at right time, right place and right place for effective decision place.

However to implement HIS successfully, regular training is absolute necessary to adequately learn how to use the system and increase acceptability among the users. The study was carried out to gain end user perception regarding impact of implementation of HIS on Hospital functioning. Since lot of expenditure is involved in implementation, therefore it was necessary to evaluate its effectiveness.

A structured questionnaire was made consisting of mainly four different parameters namely, Organization Workflow, User Perception, Patient Care Delivery and HIS support system. The data was collected from various end users in the organization. The survey response rate was 51.14%, results showed that the users agreed to most of the statements indicating that HIS improved their efficiency. However it was observed that with statements such as discharge process and slow down of the system, agreement level was low.

Hence overall it can be concluded that HIS proved to be an effective tool at National Heart Institute.

Key Words- Hospital Information System, User Perception, Stakeholders, Patient Care Delivery and HIS Support System

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LIST OF ABBREVIATIONS

3-D – 3 Dimensional

AICD-Automatic Implantable Cardioverter Defibrillators

AIHF- All India Heart Foundation

CGHS- Central Government Health Scheme

CT-Computed Tomography

ECHO-Electro Cardiogram

HIS- Hospital Information System

MRI- Magnetic Resonance Imaging

NHI- National Heart Institute

NCT-National Capital Territory

OPD-Out Patient Department

PTCA-Percutaneous Transluminal Coronary Angioplasty

TPA- Third Party Administrator

WHO- World Health Organization

UNICEF- United Nations Children's Fund

PART-1 INTERNSHIP REPORT

Introduction to National Heart Institute

The journey of a thousand miles begins with one small step and that was taken in 1981 when National Heart Institute (NHI) opened its portals as the Nation's First Dedicated Cardiac Care Institute and the First Private Sector Cardiac Catheterization Laboratory outside the developed world at that time. National Heart Institute (NHI), brain child of doyen of Cardiology in India, Dr. S. Padmavati, was established in 1981 under the aegis of the All India Heart Foundation (AIHF), research and treatment of heart ailments. Inaugurated by the late Prime Minister, Mrs. Indira Gandhi, NHI is a landmark super specialty health destination in India. This 104 – bedded tertiary care hospital renders some of the sophisticated and most advanced state of art specialized medical services at affordable cost. NHI was established with the aim of providing State-of-art Modern Cardiac Care Technology to the financially poor section of the society. It was planned to be a self sufficient, stand alone facility and as a result it was decided that people with paying capacity should also be taken up and the surplus generated from them be used for the treatment of the poor.

Towards the goal of transplanting health and happiness, NHI is staffed by a team of committed and value driven medical professionals, whose endeavor is to provide the ultimate in modern-day medical care for we believe in 'Together we care ... as no one has ever done before'.

The NHI is the Research & Referral tertiary care Heart Hospital of the AIHF, which acts as a center for diagnosis and treatment of heart ailments and allied diseases and is equipped with state of the art equipments. Surgical services include all kinds of closed and open Heart Surgeries like Coronary Artery Bypass Surgery, off pump bypass surgery (beating heart surgery), valve repair & replacement surgeries, aortic / carotid surgeries, congenital heart surgeries including blue babies and minimally invasive (Key hole) surgeries. It has modern Cath lab facilities where procedures like Angiographies, Angioplasties, Stenting of the Coronary arteries, valvotomies correction of birth heart defects and closure of holes of the heart, Electrophysiological studies, Radio Frequency ablation, Rotablation, Intra-vascular ultrasound, pacemaker and internal defibrillator implantation are carried out. Highly qualified staff, trained in India & abroad, with wide experience in Cardiology & Cardiac Surgery service these areas.

Apart from indoor treatment, the Institute also provides all-inclusive medical check-up, i.e. Executive health check-ups, at nominal rates with a view to ensuring good physical conditioning and health of all individuals. Cardiac patients with other ailments are also admitted to this hospital, as specialists for diseases other than heart are available round the clock for consultation and treatment.

The Institute has been known for open heart surgeries, coronary artery bypass surgery, angiography and angioplasties and other specialized cardiac treatment by the Central Govt. Health Scheme (CGHS), Employees State Insurance (ESI), Employee Contributory Health Scheme (ECHS), besides the Governments of Himachal Pradesh, Haryana, Madhya Pradesh, Mizoram and Govt of NCT of Delhi. Ministry of Defence, Office of the Director General of Armed Forces Medical Services and Directorate General of Medical Services Naval Headquarters have recognised NHI for treatment of their employees and their families. 122 Public sector bodies, almost all the TPAs and International Organisations like World Health Organization (WHO) & UNICEF are also empanelled with the NHI.

To maintain its culture of service to the humanity, NHI carries out regular Community outreach programmes (heart camps) and also ‘Executive Health Checkups’ and ‘Employment Checkups’ to detect cardiac problems early and take corrective action.

NHI is recognized by National Boards for post doctoral training and runs an active teaching and training programme in the specialties of Cardiology & Cardiovascular & Thoracic Surgery. It also carries out research in all aspects of Cardiology & Cardiac Surgery.

NHI is recognized as a Collaborative Centre of WHO in Preventive Cardiology since 1983. It is an affiliate of the World Hypertension League and Heart Beat International.

NHI lays extraordinary emphasis on "Lifestyle Disorders" and caters to outdoor consultation, education and counseling on Diabetes, obesity, cholesterol related diseases, thyroid disorders, alcohol and smoking. Indoor care for Diabetes & Lifestyle disorders are taken care of. The hospital has a department of Pulmonology and Sleep Medicine which is equipped with sophisticated machines and is staffed by devoted Pulmonologists, Thoracic Surgeons and Physiotherapists.

10% indoor beds are dedicated for poor patients having monthly income of Rs.4000/- and less and the hospital regularly grants free treatment to such patients and lots many at subsidized rates. The hospital also runs free OPDs for two hours on all working days.

In collaboration with Heartbeat International, the hospital provides free Cardiac Pacemakers for needy patients.

A premier cardiac care centre with par excellence services to the humanity for over three decades, NHI prides itself in-:

- Diagnosis and treatment of cardiac ailments with round O' clock Cardiac and Medical Emergencies and Non Invasive Labs

- Adult and Paediatric Surgeries- entire spectrum of Cardiac and Vascular ailments
- Internal Medicine
- Diabetology and Lifestyle disorders
- Nephrology and Dialysis
- Outpatient Department Services – 8 am to 8 pm
- Radiology Services
- Nuclear Medicine
- Laboratory Services – Biochemistry, Hematology and Microbiology
- Transfusion Medicine
- Physiotherapy and Cardiac Rehabilitation Programme
- Dietetics and Nutrition
- Cardiac and Critical Care Ambulance
- Outdoor 24 x 7 Pharmacy

Centers of Excellence

Cardiology

The Department provides intensive cardiac care, diagnosis & treatment of cardiac ailments. It has latest technologies for cardiac catheterization and angiography, Angioplasty, Valvuloplasty, Pacemaker and Defibrillator implantation, 3 D ECHO, Holter, Stress Testing, Electrophysiological Studies, etc. The hospital's warm ambience dedicated & well qualified doctors, cheerful & pleasing support staff, modern outpatient facility and dedicated inpatient care ensures that the patient is in the best hands at National Heart Institute.

Interventional Cardiology

Interventional cardiology is a branch of the medical specialty of cardiology that deals specifically with the catheter based treatment of structural heart diseases.

A large number of procedures can be performed on the heart by catheterization. This most commonly involves the insertion of a sheath into the femoral artery (in practice, any large peripheral artery or vein) and cannulating the heart under X-ray visualization (fluoroscopy, a real-time x-ray).

Procedures Performed by Specialists in Interventional Cardiology

- Angioplasty (PTCA, Percutaneous Transluminal Coronary Angioplasty) - for coronary atherosclerosis
- Valvuloplasty - dilation of narrowed cardiac valves (usually mitral, aortic or pulmonary)
- Procedures for congenital heart disease - insertion of occluders for ventricular or atrial septal defects, occlusion of patent ductus arteriosus, angioplasty of great vessels etc.
- Emergency angioplasty and stenting of occluded coronary vessels in the setting of acute heart attacks (Primary PTCA)
- Coronary Thrombectomy - a procedure performed to remove thrombus (blood clot) from blood vessels.
- Carotid angioplasty
- Insertion of temporary and permanent pacemaker including dual chamber pacing
- Insertion of AICD (Internal Defibrillator)
- Radio frequency ablation for irregular rhythms of the heart.

Invasive procedures of the heart to treat arrhythmias are performed by specialists in clinical cardiac electrophysiology.

Non- Invasive Cardiology:

- 3 D Echocardiography & Doppler Studies
- Foetal Echocardiography
- Transoesophageal Echocardiography
- Peripheral and Carotid Doppler Studies
- Stress Echocardiography
- 24 Hour Holter Monitoring
- Treadmill Stress Test
- Ambulatory Blood Pressure Monitoring
- Nuclear Cardiology (in Collaboration)
- Cardiac CT & MRI (In Collaboration)

NHI LOGO

NHI VISION

"To create long term relationships by caring as no one has done ever before"

NHI MISSION

"To provide superior, compassionate and innovative cardiac care to prevent and treat disease maintaining highest standards in safety and quality"

A SHORT REFLECTION OF DISSERTATION AT NATIONAL HEART INSTITUTE

As a part of my dissertation, I was interning at National Heart Institute, New Delhi from eight weeks starting from January 3rd – Till date. With the exposure and my training at the hospital, following are my Job Responsibilities, Task performed as management trainee and Reflective learning's in the Quality Department during the dissertation period.

Job Responsibilities

1. Assisting the Quality Assurance and operations Executive
2. Promoting the quality drive throught the organization.
3. Assisting in documentation of SOP's / Quality Policies and Manuals / Minutes of meetings for different departments
4. Making PowerPoint presentations in preparation and holding of Training classes.
5. Helping in collection of data of quality indicators and making the reports for the same.
6. Assist in different coordinating different committee meetings and when scheduled.
7. Assist in various audits and thereafter documentation and analysis.
8. Any other patient care and operation/quality aspects so assigned.

Tasks Performed as Management Trainee-:

1. Scrutinizing patient feedback forms fortnightly and information captured thereby. Circulation of gray areas and notifying to the concerned heads/in charges.

2. Coordinating with quality cell with regards to capturing quality indicators pertaining to patient satisfaction.

3. Monthly audits/ stock Checks of general store, pharmacy and various sub stores. Thereafter documenting the surplus/deficient items found and doing analysis.

4. Looking after staff discipline- personal tidiness and turnout etc.

5. Round of patient care (ICCUs/Wards) and related areas (patient kitchen) on daily basis and making note of observations with regards to floor discipline, discrepancies and other aspects / issues which needed improvement.

6. Updating quality manuals with respect to mid assessment of NABH held in the month of February, 2013.

7. Closing of minor observations pointed in the NABH audit by collecting the various documents and evidence needed for the same.

8. Conducting fire mock drills on regular basis for security/housekeeping and other concerned staff (new and old).

9. Verifying attendance for the housekeeping and security staff (outsourced) on monthly basis.

10. Verifying monthly dietary bills of the patient (outsourced department).

11. Monitoring discharge and opd waiting timings with coordination to respective departments.

Reflective Learning's:

1. Understanding the general working of various hospital departments.
2. Insight into NABH audit and pre assessment audits by the other external agencies
3. Man power management in terms of Housekeeping and security staff.
4. Coordination regarding various quality initiatives within the hospital
5. Documentation related to NABH and other related documents.
6. Timeliness, patient focused approach.
7. Reviewing of all the quality manuals and procedures.
8. Regular training of nurses and other staff (housekeeping, security, dietary) related to fire safety, biomedical waste management, emergency codes etc.
9. Recording of each and every event (sentinel/adverse, patient fall, disaster/emergency).
10. Adhering to Quality Management process.
11. Taking action when a non-conformance is detected.
12. Developing Team spirit, leadership and motivation among the staff.

PART-II – DISSERTATION

Introduction

Information is critical in making healthcare related decisions. New technologies show great promise in providing ways to develop and deliver changes in healthcare behaviors. Previously computer use was predominantly in research laboratories, government agencies and big companies. Today computers in connection with health data are new way to manage diseases. Hospitals, healthcare organizations, health departments and small health care facilities are using Hospital Information Systems to access health related information.[2] (Vibha Kumar's "Impact of Health Information Systems on Organizational Health Communication and Behaviour, April 2009, Volume No:2). Healthcare has become a very essential part of our society and it is necessary for healthcare providers to do their jobs in an efficient and effective manner. Each day hundreds of thousands of patients enter healthcare facilities challenging the management to run the show smoothly. The employees have to manage and integrate clinical, financial and operational information that grows with the practice. Formerly, this data was organized manually, which was time consuming and failed to deliver the desired level of efficiency. Most professionally run hospitals and clinics now rely on Hospital Information Systems (HIS) that help them manage all their medical and administrative information.

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.[3] [Fishman Eric (January, 2013), Hospital Information System, EMR Consultant ™, A division of EHR Scope, LLC, Retrieved from http://www.emrconsultant.com/education/hospital-information-systems]. It can be also defined as mechanized document and information system in hospitals[4]. Hospital Information System is vital to decision making and plays a crucial role in success of the organization. HIS was first introduced in 1960's and since then, continuously new innovations are being done in it to improve hospital efficiency and patient care. The HIS should be user friendly and proper training should be imparted to the users to achieve maximum benefits from it. However when organization implement new HIS there is often a period of decreased performance and or/quality.[5] (Ramsay et. al 2000; Edmonson et al. 2003). This period of decreased performance may be attributed to multiplicity of influences such as learning phase phenomena.

The HIS provides an effective solution to hospitals that plan to reduce the costs of administrative and clinical transactions, and at the same time provide following advantages-

1. It helps hospital administrators by fundamentally enhancing operational control and streamlining operations.

2. It facilitates improved response to demands of patient care because it automates the process of collecting, gathering and recovering patient information

3. Furthermore, the HIS provides a variety of direct benefits such as easier patient record management, reduced paperwork, quick information flow between various departments, reliable and timely information, reduced wastage, and reduced registration time for patients.[6] (Quintegra Solutions "Hospital Management and Information System", November 2006, Page No:15)

Rationale of the Study

The Research Proposal is for reviewing benefits of Hospital Information System (HIS) Implementation in National Heart Institute (NHI).

So far evaluations have been undertaken, focusing mainly on financial aspects but major aspect has been neglected, and that is "The End User". **And moreover there is no such study in the Indian Context.**

HIS was implemented in National Heart Institute to improve health system management in general, beyond the patient care. Since lot of expenditure is involved in implementation, therefore it is necessary to assess that whether the HIS has met its objectives or not and this evaluation process can help us in it.

Since its been only 6 months, that HIS was implemented and no studies have been conducted till now, therefore the main purpose of this study is to evaluate the end user perception regarding HIS.

Therefore, the evaluation will help to assess how far the HIS has been successful in improving the overall functioning of the hospital.

Review of Literature

It is broadly acknowledged that the use of HIS in the healthcare industry offers great potential for improving the quality of services provided, the efficiency and effectiveness of personnel,

and also reducing organizational expenses.[7] (Vassilios P. Aggelidis, Prodromos D. Chatzoglou, (2008) "Methods for evaluating hospital information systems: a literature review", EuroMed Journal of Business, Vol. 3 Issue 1).

The extensive distribution of Hospital Information Systems (HIS) in healthcare institutions requires professional evaluation to assess the realistic usefulness of these applications. So far, evaluations of HIS have been undertaken focusing mainly on financial aspects or considering the patients interests. A major aspect has been neglected: The end users! Nurses, physicians and other healthcare employees, working with the software, spend a lot of time each day by filling in forms, reviewing medical inspection results and handling an amount of information for administration needs.[8] (Kai-Christoph Hamborg and Brigitte Vehse (2004). Questionnaire Based Usability Evaluation of Hospital Information Systems, Electronic Journal of Information Systems Evaluation Volume 7 Issue 1, Pg-21-30)

1. In example 1, A report was prepared University of Osnabruck and University of Heidelberg, Germany by Kai-Christoph Hamborg, Brigitte Vehse titled “Questionnaire Based Usability Evaluation of Hospital Information Systems”. An Isometrics questionnaire was presented to assess the usability of Hospital Information System. A total of 182 participants took part in the study and both online and paper and pencil version formats were used. There was significant contrast between Physicians, Medical secretaries and the nursing staff feedback. Physicians rated the systems, “Suitability for the task”, “Self-descriptiveness”, “Controllability” and “Suitability for learning” worse than “Nursing Staff I” and “Medical Secretaries”. Error tolerance was rated significantly better by nursing staff compared to “Physicians”.

   There are different explanations for this finding. First, by definition of the “user types”, “Physicians” were using other functions than “Medical Secretaries” do. It can be assumed that the functions used by secretaries were of higher ergonomic quality. Especially the MS Word plug-in might have influenced the comparatively good rating of the medical secretaries.

   Secondly, different ratings might depend on the specific software experience of the identified “user-types”. Results of demographic data show that there are more novices than expert software users among doctors. In contrast, nursing staff comprises of more experts than novices. A large proportion of nursing staff (43. 8 %) was working with the software for up to 62 months whereas a large part of the doctors (46,8 %) have been using the software for only

up to 12 months. The low experience of the physicians may be due to the fact that the university hospital is a teaching hospital with a high turnover of physicians dependent on a training scheme.

Overall, IsoMetrics was proven to be a reliable technique for software evaluation in the field of hospital information systems supporting usability screenings in large organisations

2. In a second example, According to the Medical Research Council of South Africa, a report was prepared titled "Evaluation of Hospital Information System in The Northern Province in South Africa" by Nolwazi Mbananga, Rhulani Madale, and Piet Becker.[9] The basic aim of the study was to assess how the HIS had met its objectives and to provide lessons that can be learned from this evaluation process. An evaluation framework was designed through a series of multidisciplinary workshops that included all relevant stakeholders. The framework contained qualitative and quantitative components that provided both formative and summative elements of the evaluation.

   The evaluation was designed as a Randomized Control Trial (RCT).

   Twenty four hospitals were selected and divided into two groups of twelve hospitals each; an experimental and a control group. The 'control hospitals' were to receive the information system after the 'experimental hospitals', thereby providing a period across which to compare the two. The study was conducted over sixth months of HIS implementation. Data were collected before as baseline and for sixth months after implementation. The major outcome variables that were used in HIS evaluation were- a) Median Time Outpatients spend at hospital, b). Length of Stay, c) Bed Occupancy, d) Number of drug prescriptions per patient, e) Improved Revenue Collection, e) Cost Per Patient Per Day (CPPPD), and f) Number of Referrals.

   The quantitative findings of the study revealed that there were no changes observed in the median time spent by patients in OPD in both implemented and non implemented hospitals. Moreover it was found that HIS improved the workflow of OPD clerks, there was a rise in the revenue collected in those hospitals where HIS was implemented when compared with those which were not implemented, There was considerable variability in the cost per patient per day in and between implemented and non implemented hospitals and The variability in bed occupancy rate was observed in quantitative data during the six months period of the study in both implemented and non implemented hospitals.

3. In example 3, an international article was published *by* Hesamaddin Kamalzadeh Takhti, Dr. Azizah, Abdul Rahman, Samireh Abedini, and Sedigheh Abedini titled "Impact of Hospital Information Systems on patient care: Nurses' perceptions, March 2013.[10] A cross sectional survey research design was applied to collect the data from the nurses in the sample. The survey response rate was found to be 82%. The majority of the nurses (87.9%) showed positive response about HIS implementation. Moreover HIS qualities of timeliness and reliability contributed to complete and accurate information about patients in nursing practice**.**
Therefore evaluation of Hospital Information Systems is essential as they are increasingly used in clinical routine and may even influence patient outcome.

4. In example 4, an article was published by Sima Ajami and Zohreh Mohammadi-Bertiani titled "Training and its Impact on Hospital Information System (HIS) Success", 2012.[11] This study was unsystematic review study. The aim of this study was to express the importance of users training to use successful HIS. The study was divided into three phases: literature collection, assessing, and selection. Researchers identified studies which denoted the importance of users training on the users' satisfaction and positive attitude of users and also successful of the HIS implementation. It was reported that training is one of the key factors to achieve success as non trained users fear to lose their employment and resist the change. Therefore one of the solutions to decrease barriers is; first, to train users to make more familiar with the function and benefits of it, second, to involve more users in the implementation and facilitate the HIS needs. Moreover appropriate techniques; training and high-quality training materials are required for successful system implementation and usage.

Aims and Objectives

General Objective

To evaluate the impact of Hospital Information System on Hospital operations and explore areas for improvement

Specific Objectives

1. To evaluate end user perception regarding use of Hospital Information System.
2. To give the necessary recommendations.

METHODOLOGY

Type of the Study: Descriptive Cross sectional Study using convenient sampling.

Study Population- Users of the system-

a) Nursing Staff b) Laboratory Staff c) Store Incharge and Store assistant d) Pharmacy Department e) Operations and Quality f) Dietary Staff g) E.D.P h) Others (Dialysis, Physiotherapy, Nuclear Medicine, Blood Bank, Library)

Study Tool – Questionnaire for the Nursing and Administration Staff

Sample Size- The questionnaire was distributed to 97 staff members out of whom only 50 of them responded completely. This excludes incomplete responses i.e. 6 in number. Lowest response rate was from the nursing staff which might be due to their busy schedule of the patients.

Duration of Study- 2 Months (March-April, 2013)

Study Site – National Heart Institute, East of Kailash, New Delhi

Data Collection Method – A small questionnaire was framed for the relevant population which was intended to capture user perception/opinions of users about various issues and recommendations for improvement**.**

STUDY FINDINGS

1. Demographic Data

Table No: 1- Demographic Profile of Users

Demographic Profile	**Number in Total** (50)
Gender	
Male	18(36.00%)
Female	32(64.00%)
Age	
20-30	32(64.00%)
31-40	8(16.00%)
41-50	9(18%)
51-60	1(2%)

The study of demographic statistics can help to study that who were the major end users of HIS and to which age category did they belong. The table shows that out of the total users surveyed 64% were females and the rest were 32.00% users were males. Moreover maximum number of respondents (64%) belonged to the age group of 20-30 years and minimum respondents (2.00%) belonged to above 50 years of age group. (Table No:1)

2. Departments

HIS users in healthcare arena consist of many different user groups (physicians, nurses, administrators, managers, researchers etc.)[12.] From the below table it can be concluded that maximum stakeholders were from the Laboratory, Physiotherapy, EDP, Nuclear Medicine and General Stores. While departments such as Dietary, Dialysis, Pharmacy, Blood bank, Operations/Quality and Library had equal number of users. The questionnaires were distributed to 97 stakeholders. However out of 97 only 50 of them responded completely accounting to response rate of 51.14 %. The lowest response rate was from the nursing staff (27 out of 60) which might be due to their busy schedule with the patients followed by laboratory department. (Table No: 2)

Table No: 2- Characteristics of stakeholders

Department	Total Users	Total number of questionnaire distributed	Number of respondents who responded
Nursing	70	60	27
Laboratory	20	20	8
Pharmacy	1	1	1
General store	2	2	2
Operations & Quality	2	1	1
EDP	3	3	2
Physiotherapy	4	4	3
Nuclear Medicine	2	2	2
Blood Bank	1	1	1
Dialysis	2	2	1
Dietary	2	1	1
Library	1	1	1
	110	97	50

3. **Work Experience**

Table No: 3- Total Work Experience

Work Experience	Number of Respondents
0-1 years	5
1-3 years	8
3-5 years	13
Above 5 years	24

With experience, learning's get enhanced. Majority (24) of the respondents in NHI were having experience more than 5 years followed by staff who were experienced between 3-5 years of work experience while least were with 0-1 years of experience. (Table No: 3).

4. Work Experience at NHI

Experience is significant part in assessing the satisfaction regarding HIS. Out of 50 respondents, there were equal numbers of stakeholder having experience of 1-3 years and above 5 years. Followed by people with experience of 0-1 yrs (Table No: 4).

Table No: 4- Work Experience at NHI

Work Experience at NHI	Number of Respondents
0-1 year	12
1-3 years	15
3-5 years	8
Above 5 years	15

5. Qualification

Table No: 5- Qualification of Stakeholders

Educational Qualification	Number of Respondents
Graduate	39
Post Graduate	8
Doctorate	3

Qualification may/may not affect in overall satisfaction regarding HIS. From the Table No: 5 it can be concluded that majority of the respondents were graduate in their fields followed by Post- Graduate and Doctorates.

6. Have you ever worked on HIS before joining NHI?

Table No: 6- Previous Exposure to HIS

Previous Exposure to HIS	Number of Respondents
YES	20
NO	30

Whether a particular user has previous experience of HIS or not affects his/her overall working on HIS as it might affect acceptability of Information Technology among them.. From the total

users surveyed (Table No: 6), 20 of them were first time users of HIS while others had previous experience of working on HIS.

Study Findings Related to Questionnaire Parameters

7. Organizational Workflow of the System

Table No: 7- Agreement level on Organizational Workflow

STATEMENTS / VALUE	IT is helpful in clinical practice	HIS has helped in scheduling appointments effectively	HIS has reduced duplication of work	HIS has reduced number of manual errors	HIS has provided easier access to data	Consumables TAT has decreased with HIS
MEAN	4.32	3.5	4.08	3.78	4.3	4.06
STANDARD DEVIATION	0.47	1.57	0.67	0.89	0.61	0.68
COFFICIENT OF VARIATION	10.91	44.81	16.30	23.47	14.29	16.81

The implementation of computerized workflow systems to support the collection and giving out of patient information has been an area of focus in healthcare for many years[13]. Implementation of a HIS will always impact the workflow in the hospital. Moreover it is a challenging and complex task to shift from manual based workflow to computer-based workflow. Here workflow represents a change in which work is completed. The degree of impact will depend on the scope and complexity of the HIS itself. The major benefit is that the processes become relatively well defined and streamlined. Other benefits include effective appointment scheduling, reduction in duplication of work and manual errors, quicker access to data and decreased turnaround time of consumables. From Table No: 7, it can be inferred that from workflow point of view majority of the stakeholders agree with parameter organization workflow. Maximum agreement can be observed with the statements-IT is helpful in clinical practice and with Easier access to data with mean score of 4.32+/- 0.47 and 4.08 +/- 0.67

respectively. The lowest mean score (3.5 +/- 1.57) was in the case of statement of scheduling of appointments which is above neutral level.

8. User perception

Table No: 8- Agreement level on User Perception of Stakeholders

STATEMENTS / VALUE	HIS has made my job tough	HIS saves time	HIS has reduced my efficiency	HIS has increased mental stress	Working on HIS is easier than manual work	HIS has reduced my documentation work
MEAN	3.28	4	3.16	3.26	3.98	3.52
STANDARD DEVIATION	1.05	0.70	0.98	0.90	0.84	0.89
COFFICIENT OF VARIATION	32.03	17.50	30.90	27.58	21.23	25.18

It is very important to know that how newly implemented HIS has changed their user perception. Stakeholders may express optimistic, impartial or negative views towards HIS Users of clinical information system are in fact considered as clients of system, services, and its information [14]. If HIS does not identify the expectations of users, it will be neglected by them; even they consider the system as a disturber [15]. From the table it can be observed that most respondents agreed to assertion that HIS saves time and Working on HIS is easier than manual work with mean score of (4.0 +/- 0.70 and 3.98 +/-0.84) respectively. Lowest level of agreement was in case of change in efficiency and increasing mental stress with HIS with mean score near to neutral level.

9. Patient Care Delivery

HIS is designed to support healthcare providers in accessing and working with variety of patient information [16] (Gruber, Cummings, Leblanc, & Smith, 2009) and promoting health care quality through coordinated information sharing[17] (Beuscart-Ze´phir, Anceaux, Crinquette, & Renard, 2001). Additional benefits include lesser registration time for patients thereby reducing overall waiting time. Besides it automates the process of collecting, combining and retrieving the patient information. When similar question was asked, mixed responses were observed from the stakeholders. All the statements except change in discharge process were having mean score between 3.3-3.62 indicating a near neutral response. While there was a difference in view of the assertion regarding whether HIS discharge process slow or not, the mean score was 2.26 +/- 1.74 which is near to agreement level. (Table No: 9)

Table No: 9- Agreement level on Patient Care Delivery

STATEMENTS / VALUE	Better patient care is possible with HIS	Interdepartmental Communication with regards to patient data improved with HIS	Interdepartmental Coordination has improved with HIS	HIS has made registration/ admission of patient easier	Retrieving old reports Became less time consuming	HIS made discharge process slow
MEAN	3.32	3.62	3.64	3.3	3.5	2.26
STANDARD DEVIATION	1.36	1.18	1.03	1.67	1.43	1.74
COFFICIENT OF VARIATION	41.02	32.49	28.17	50.58	40.92	76.80

9. HIS Support System

A number of Hospital Information Systems (HIS) fail, because users are inadequately trained. Training and round the clock support and sufficient training materials are necessary for

providers and staff to adequately learn how to use the new system and adapt them these changes. Unfortunately, often with inadequate training, the system usually does operate, but does not fulfill the original expectations [11]. From Table No:10 it can be observed that for statements regarding Training, support by HIS team and overall view about the HIS implemented at NHI, a mean score between 3.66-4.04 with standard deviation ranging from (+/- 0.67 - +/- 0.82) was observed indicating agreement response.

Whereas for negative problems such as login related, server down and slow down of the system a mean score of 2.22-2.94 with standard deviation (+/- 0.97 - +/- 1.04) indicating a varied response of near agreement level to near proximity neutral level . Hence on the whole maximum disagreement was with the statement slow down of the system.

Table No: 10- Agreement level on HIS Support System

STATEMENTS / VALUE	Training provided by HIS team has helped to perform better	HIS team always provide necessary support	Login is always a problem	Server down is always a problem	Slow down of system is always a problem	HIS implemented at NHI is best solution for HIS
MEAN	4.04	3.88	2.94	2.82	2.22	3.66
STANDARD DEVIATION	0.67	0.72	1.04	1.00	0.97	0.85
COFFICIENT OF VARIATION	16.56	18.51	35.31	35.60	43.92	23.16

OTHER SIGNIFICANT FINDINGS

Table No: 11- Age Wise User Perception

Age	Organizational Work Flow Average Score	User Perception Average Score	Patient Care Delivery Average Score	HIS Support System Average Score
20-30 Yrs.	4.11	3.52	3.43	3.33
31-40 Yrs.	3.83	3.42	3.33	3.25
41-50 Yrs.	3.78	3.67	2.63	3.41
Above 50 Yrs	4	3.83	3.67	3.24

From Table No: 11, it can be interpreted that in all the age groups, highest level of agreement was observed with Organizational Work Flow with an average mean score ranging from 3.78-4.11 indicating near agreement level. While lower level of agreement was observed with factor-HIS Support system except in age group of 41-50 years where lowest concordance was with parameter of patient care delivery with mean score of 2.63 respectively.

Table No: 12- Gender Wise User Perception

Gender	Organizational Work Flow Average Score	User Perception Average Score	Patient Care Delivery Average Score	HIS Support System Average Score
Males	4.12	3.53	3.36	3.44
Females	3.94	3.54	3.22	3.27

It can be observed (Table No: 12) that mean score was highest both in case of males and females with criteria- Organizational Work Flow (4.12) and minimum in case of Patient Care Delivery (3.36).

Table No: 13- User Perception with Previous exposure to HIS

Previous Worked With HIS	Organizational Work Flow Average Score	User Perception Average Score	Patient Care Delivery Average Score	HIS Support System Average Score
Yes	4.04	3.62	3.53	3.31
No	3.98	3.48	3.11	3.35

From Table No: 13, it can be interpreted that both the respondents who have worked/not worked previously on HIS agreed with parameter Organizational Work Flow with average score of 4.04 and 3.98 respectively followed by least agreement in case of HIS Support system.

On the other hand respondents who were not exposed to HIS before disagreed to the fact that, it has improved the Patient Care Delivery.

Table No: 14- User Perception with Experience

Experience	Organizational Work Flow Average Score	User Perception Average Score	Patient Care Delivery Average Score	HIS Support System Average Score
0-1 Yrs.	4.13	3.70	3.67	3.46
1-3 Yrs.	3.85	3.38	2.88	3.29
3-5 Yrs.	4.12	3.37	3.67	3.18
Above 5 yrs	3.97	3.64	3.11	3.41

From the Table No: 14, it can be deduced that in all age groups maximum agreement was observed with parameter- Organizational Work Flow. The lowest agreement was observed in Patient Care Delivery with average score of 2.88 among respondents with 1-3 Yrs. of experience.

Common Suggestions Given by the Users

Apart from the general questions, respondents were asked for suggestions to improve HIS. Various suggestions were listed by the stakeholders but most common of them are put together in the below table. The most common was slow down of the system, followed by recommendation for availability of patient diagnosis and diet in HIS.(Table No:15)

Table No: 15- Suggestion by the Users

Sl. No:	SUGGESTIONS	FREQUENCY
1	Slow down of the system	8
2	Patient Diagnosis should be available in the system	5
3	Gate Pass/ Return Option is case of drug/consumable is case of drugs/consumable should be there in HIS	2
4	ECHS/EWS/CGHS rate list is not updated.	2
5	We have only two system in ICCU-I so entry is always a problem, so allow more system in ICCU-I	2
6	If errors occur at the time of entry, then please give solution/authorization to delete the error by Incharge/TL/staff nurse.	2
7	There should be an option for indent of medicines in HIS which saves time	2
8	Information like diet, medicine etc should be added in HIS	1
9	Drugs Name should include both trade name and generic name	1
10	Wrong entry items/out dated items are shown which creates problems	1

Conclusion

The study was conducted to gain the end user perception of the stakeholders after the implementation of HIS at National Heart Institute with respect to different parameters such as patient care delivery, organizational workflow, user perception and support given by HIS team. Since considerable amount of time and money is spent to develop and implement information systems within an organization, therefore it was necessary to evaluate to what extent it has been successful in improving the functioning of the Hospital. There are many factors which determine success or failure of HIS implementation. According to the literature, HIS implementation can truly be considered as a "success" when a significant number of users have moved from an initial adoption to using the IS on a continued basis[18].

The study was conducted in National Heart Institute over a period of time and sample size was 50. The results from this cross sectional descriptive study seem to support the key findings reported in literature. It can be concluded HIS implementation has resulted in many benefits

1. Number of manual errors and duplication of work – major benefit of HIS decreased by a considerable amount since HIS facilitates by automating various task and reducing replication of work.
2. Majority of the stakeholders agreed that data access became trouble-free as just with a simple click; range of information can be accessed related to patients and other necessary data.
3. Turnaround time of consumables decreased thereby saving time – a significant benefit of HIS.
4. Mixed responses were observed regarding various criteria such as reduction in efficiency, toughness of job and change in mental stress with HIS. A near to neutral responses was observed for all the above three statements.
5. Majority of respondents agreed to the fact that appointment scheduling became effective thereby improving patient care.
6. Improvement in interdepartmental communication and coordination was observed.
7. Registration, the principal activity overall HIS became streamlined.
8. Agreement level for retrieval of reports was above neutral level.
9. Training, an indispensable part of HIS was successful and helped staff to perform better.
10. Stakeholders agreed to the fact that HIS team always provided necessary support.

11. Near to non aligned responses were observed in case of statements – Login related problems and problem of server down.
12. However respondents agreed that slow-down of the system is a problem; hence management must look into this matter.
13. Overall "PANACEA" is rated as best solution for HIS by majority of respondents.
14. Moreover agreement level was maximum for the parameter of organizational work flow and least for patient care delivery.

Recommendations-

1. System speed was observed as a major problem faced by the end users which should be increased if possible which will help in increasing efficiency of the users.
2. Currently patient pharmacy indents are raised manually, they should be done through HIS which help in saving will paper as well as time.
3. Patient diagnosis including diet, medicines should be entered in HIS which will help in easy and efficient patient care thereby effective decision making.
4. There should be an alternate billing option of patient in case system is down for long hours.
5. Option for gate pass for returning goods to supplier in case of short expiry etc. should be introduced in HIS which will help in better accounting of drugs and consumables.
6. The drug name should be listed in HIS with both generic and brand names which will facilitate easier and faster billing to the patients.
7. More systems in ICCU/Bed Side monitors should be provided so that progress notes of patient and any other useful information can be added in HIS which will help to make the organization eco friendly.

Limitations of the Study

1. The study is subjected to the understanding, bias and prejudices of respondents.

2. Although participants were assured of confidentiality, it may still be possible that they either over or underreported their level of perception.

3. Low response rates: this was due to the fact that most of the respondents especially nurses who were major users of HIS, were busy with the patients and others were not willing to participate.

4. Small sample size: most of the respondents were busy with their daily work schedules, so very few of them respond to the survey. Also, it was important to take care of respondents being surveyed that it does not cause any discomfort to them. So, only those people were surveyed who felt no discomfort responded to the questionnaire.

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ANNEXURE-I

QUESTIONNARE TO STUDY IMPACT OF HOSPITAL INFORMATION SYSTEM ON NURSING AND ADMINISTRATION STAFF

About Study

I, Pulkit Kathuria, student of **International Institute of Health Management Research (IIHMR), New Delhi** is presently undergoing dissertation as a **Management Trainee** in the **Quality Department** at **National Heart Institute.** I am conducting a survey on **"How the hospital functioning has improved after the implementation of HIS and recommend areas for improvement"**.

This survey will help me in collating the data, further analyzing and suggesting the necessary changes required. Kindly fill in the survey form below and provide me with your valuable feedback.

Details of Respondent

Name (Optional): _____ Age/Gender: ___ /Male / Female

Department_____ Designation_____

Total Work Experience in Years_____ Working in NHI Since_____

Qualification: Graduate/ Post Graduate/ Doctorate

Have you ever worked on Hospital Information System (HIS) before Joining NHI?

Yes ☐ No ☐

Please rate the following statements about Hospital information system (HIS) on given levels of agreement: **Here SA: Strongly Agree, A: Agree, N: Neither Agree nor Disagree, D: Disagree, SD: Strongly Disagree**

Sr.	Statements	Level of Agreement				
	Organizational Work Flow					
1	Information Technology is helpful in clinical practice	SA	A	N	D	SD
2	HIS has helped in scheduling appointments more effectively	SA	A	N	D	SD
3	HIS has reduced duplication of work	SA	A	N	D	SD

4	HIS has reduced number of manual errors	SA	A	N	D	SD
5	HIS has provided easier access to Data	SA	A	N	D	SD
6	Disposables/Consumables such as stationary requisition turnaround time have decreased with HIS	SA	A	N	D	SD
	Users Perspective					
7	HIS has made my job tough	SA	A	N	D	SD
8	HIS saves time	SA	A	N	D	SD
9	HIS has reduced my efficiency	SA	A	N	D	SD
10	HIS has increased mental stress	SA	A	N	D	SD
11	Working on HIS is easier than manual work	SA	A	N	D	SD
12	HIS has reduced my documentation work	SA	A	N	D	SD
	Patient Care Delivery					
13	Better patient care is possible with HIS	SA	A	N	D	SD
14	Inter Departmental Communication with regards to patient data has improved	SA	A	N	D	SD
15	Inter Departmental coordination has been improved with HIS	SA	A	N	D	SD
16	HIS has made registration/admission of patient easier	SA	A	N	D	SD
17	Retrieving the old reports has become less time consuming.	SA	A	N	D	SD
18	HIS has made discharge process slow	SA	A	N	D	SD
	HIS Support System					
19	Training provided by HIS Team has helped to perform better	SA	A	N	D	SD
20	HIS Team always provide necessary support	SA	A	N	D	SD
21	Login is always a problem	SA	A	N	D	SD
22	Server down is always a problem	SA	A	N	D	SD
23	Slow down of the system is always a problem	SA	A	N	D	SD
24	HIS (PANACEA) implemented at NHI is best solution for HIS	SA	A	N	D	SD

25. Kindly give your minimum two valuable suggestions for improvement in HIS at NHI?

1._____

_____

_____

_____2._____

_____

_____

_____3_____