

Is Efficiency of Prevalent Health Care Information System Hampered due to Shortcomings: A Comparative Study of Public and Private Hospitals

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Abstract

Information technology adoption in healthcare industry is very slow alike other industries. The hospitals need to be developed as there are various problems, challenges and limitations. The shortcomings are to be identified and rectified by understanding the root cause. In medical care computerization is highly required and recommended however there is scarcity of perfect interface between IT intervention and health care workers. The health workers are not willing to move to technology either it is usage of computer or its training. Computers are lying unattended as adoption seems to be a complex work. It is a big task to spread the implementation and make health care workers to work differently. Evidently, it is perceived that Health care information system (HCIS) are not adaptive due to certain shortcomings like lack of infrastructure, weak or deficient internet networking, the departments are not interconnected, inexperienced and un trained health care team, software is not user friendly, work flows are not planned, inflexible HCIS functionality, implementation is not complete. Administration to strongly intervene for handling limitations and implement an effective system. This study is going to identify the shortcomings in prevalent HCIS.

Key Words: Healthcare Information System(HCIS), Shortcomings of HCIS, Limited IT Intervention, Complexity of System Management

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1. INTRODUCTION

Introduction of health care information system (HCIS) in hospitals will bring considerable change and improvement in timely, quality and customary patient care. On implementation it will help in efficient health care and administrative hospital management. There are numerous other benefits of implementation of HCIS like proper maintenance of medical records of patients, timely and accurate information of patients, infrastructure maintenance and control, drug inventory tracking, online appointment, e-training, telemedicine all can be provided effectively. However the hospitals are struggling due to lack of infrastructure, lack of resources, trained human resource, unwillingness of health care workers to use IT intervention. The hospitals either private or public have various shortcomings and due to this the services provided are not satisfactory. Therefore, it is the responsibility of health care workers that the shortcomings of IT interventions should be reported and competent authorities to take in consideration and tried to remove them in lesser time. Additionally whether the hospital is public or private in origin, irrespective of their specialty, size or vision must think to remove shortcomings and implement HCIS for better medical services. The purpose of the present study is to identify factors of the shortcomings which exist in current health care system (HCIS). Further, compare the public and private sector hospitals with regards to identified factors of shortcomings.

2. REVIEW OF LITERATURE

Many studies have been conducted to identified shortcomings in health care information system previously, this section discussed them in detail. Hospital Care Information System plays a vigorous part for a unified system. It supports in building integration among different information system. The implementation of HCIS will develop a proper maintenance system of medical records, administrative master data, will support in planning to use the system and will identify the need of training, develop a mechanism to trained the health care workers who will further play a vital role to support all department IT needs which will support in establishment of health care information system. In this study we have evaluated automation in hospitals department wise

and have a positive report that the department wise information system was implemented in the hospital. However it was a small hospital and has an ease in implementation with positive reports but implementing in wider hospitals may have huge challenges. in their study found that, the information sources and transition of health services are discussed health is a matter of both central and state. Present information system is insufficient in perspective of multidimensional health transition. A strong health information system is required for collecting health statistics which will help in maintaining evidence based planning, transparency and accountability. The policies for hospitals, unregistered practitioners, registered medical practitioner have to be defined as those are not proper. There is no proper maintenance of statistics related to death and birth. There is no significant coherent health care information system in nation for better medical amenities. acclaimed that the shortage of staff, untrained health care workers, unwillingness to adapt new system, staff shedding duties having irresponsible behaviour, low internet speed, long and uneven electricity cuts led to low or not feeding of medical data timely and accurately were the major problem in hospitals. Public health is unmanageable due to wide geographical area, big population, lack of transportation; inaccessibility and low budget for health, not as much of coordination have made health services down. These factors delayed the implementation of e-governance and e-health in India. The Ministry of Health and Family Welfare (MOHFW) and Govt. of India (GOI) on 21st Oct. 2008, launched Health Management Information System web portal to track and capture data from private and public medical institutions in rural and urban areas of the nation. There were challenges to compare and do data analysis due to lack of training in data analysis techniques. The techniques and trainings are to be scheduled to trained the health care workers as data analysis helps in making decision. Although, public hospitals developed system for providing training, technical support and supervision but still there might exist number of challenges like deficient infrastructure, manpower, high expenditure cost, unmanageable patient foot fall and low quality of services. The administrative and clinical systems standards to be maintained for the establishment of better health care services.

Establishment and implementation of effective management system will face challenges because of deficit staff and infrastructure, scarcity of communication resources, lack of training and trained man power, unwillingness of adaptation for new system, security of patient, feedback and evaluation from patient. The staff has to be timely upgraded for better and improved hospital services. In the study an integrated and wide-ranging domain of public healthcare has to be established in India. There are lack of developed E-health projects, very less awareness and low level of training of the domain. The public health infrastructure if compared and evaluated among different countries is found to be inadequate and feeble. The complete succession of the public health informatics includes number of steps from conceptualization to implementation and maintenance. Therefore removing shortcomings and handling challenges the health care domain to be focussed and developed in public and private hospitals. The data do not flow among health care entities in a cohesive or standardized way. The Entities within the health care information system face challenges while collecting language race and ethnicity data from health care workers, patients, respondents and employees. The use and adoption of IT in medical sector is very limited and slow in comparison to other sectors. In health care currently computerization is extending but is hindered and implementation is on a slow pace. The unwillingness of using IT interventions by the health care workers must be tackled initially as they are immune to different system. An interface is required between computers and medical care providers for adaption and training of the system. According to the hospitals are facing several challenges to implement and addressing the unwillingness for use of system by all stake holders. Further, Becker's Hospital Review, (2014) studied challenges like physician engagement, administrative engagement, infrastructure and sustainability of resources. And found that, if these shortcomings and limitations are removed then health care will automatically improve. Review of literature identified that, the existing studies have either studied infrastructure, patient care, patient satisfaction, health care worker's satisfaction, clinical practice and on specific disease. None of the studies have taken together all aspects to study and assess complete problems of HCIS. Alike

global scenario, in India very less studies have been conducted to compare the HCIS in public and private hospitals. A complete research work as a whole on shortcomings of HCIS was yet to be administered in Indian hospitals.

3. RESEARCH METHODOLOGY

3.1 Research Objectives

This study has the following objectives

1. To identify factors of shortcoming in existing healthcare information system (HCIS) of hospitals.
2. To compare Public and private hospital with regards to the factors of the shortcomings.

3.2 Methods

In order to identify the factors of shortcomings of existing health care information system (HCIS), a structured interview was conducted personally with the doctor's, health care workers(HCW) working in different capacity in hospital, in family and friends. On getting response a survey was prepared and given to these persons for providing response. A five-point Likert scale begin from 'Strongly disagree' (1) to 'Strongly agree' (5) was used to measure all variables in the questionnaire. To remove negative worded statements or variables a self reporting survey is used for collecting data, (Nunnally, 1967) (Spector, 1987). Personal interview was conducted with 50 HCW and 5 academicians for pilot run. They were asked to share their opinion about the appropriateness of each item (Diamantopoulos, Reynolds & Schlegelmilch, 1994). HCW's were consulted to know missing items, ambiguity in the wording or sentence in the instrument. Originally, the questionnaire having 24 items and after the pilot run, 3 items were merged with the remaining dimensions so as to avoid redundancy.

3.3 Population and Response Rate

Prior appointment was taken from the respondents to get their full involvement and participation. Respondent were made clear about the purpose of the study. In addition, to this if respondent not able to make out the meaning of questions then it was made clear to them at the time of interview. Personal interaction with the respondents facilitates procurement of related information. Face to face contact also motivated respondents to

share different experiences associated with shortcomings in existing health care information system (HCIS). A list of hospital was downloaded from Delhi government website (Delhi Govt., 2016) 3 public and 3 private large hospitals with their HCW's were taken to administer the survey. Finally, the sample of 600 HCW's consisted of 150 Doctors, 150 Nurses, 150 Administrative Staff, 120 Laboratory Technicians, 18 Pharmacists and 12 Dieticians was drawn from six hospitals. The

demographics of the sample is given in the Table 1. A total of 700 questionnaires were circulated among the HCW's, 650 responses were received, comprising a response rate of almost 93 per cent. After scrutinizing, 50 questionnaires were further found to be incomplete or having unanimous response so they were discarded. Finally, only 600 were found to be used in analysis with a response rate of approximately 85 per cent.

Table 1: Demographic Profile of Respondents

Demographic	Details	N (%)
Designation	Doctors	150 (25)
	Nurses	150 (25)
	Administrative	150 (25)
	Technician	120 (20)
	Dietician	12 (02)
	Pharmacist	18 (03)
Age	Below 25	57 (10)
	26-35	262 (43)
	36-45	143 (24)
	46 & above	138 (23)
Gender	Male	311 (52)
	Female	289 (48)
IT Proficiency	Very Low	06 (01)
	Low	100 (17)
	Medium	340 (57)
	High	135 (22)
	Very High	19 (03)

3.4 Statistical Tools

Exploratory factor analysis is a statistical method to reduce data, establishes relationship between measured variables and latent constructs and provides construct validity proof of self-reporting scales (Williams, Brown, & Onsmann, 2010). This study used factor analysis as it can provide statistical proof of how well patterns of opinions from respondents conform to the construct used in the study. Moreover, factor analysis is useful and often applied in health care sector for instrument development (Norman & Streiner, 2014). Cronbach Alpha was applied to check the reliability of the construct. For comparing the views of HCW's with regard to shortcoming in

prevalent HCIS an independent t-test was conducted.

4. RESULTS

4.1 Scale Reliability and Validity

Twenty-one statements (Table 2) of shortcomings due to limited IT implementation in existing HCIS were taken into consideration after interviewing HCW's and literature review. The data on these items was collected through a sample of 600 HCW's of three public and three private hospitals on a 5 point likert scale ranging from 5 strongly agree (SA), 4 agree (A), 3 undecided (UD), 2 disagree (DA) to 1 strongly disagree (SDA). Reliability of scale was checked by Cronbach's

Alpha statistics which came 0.953 (Ngobo,2004) which is acceptable but variable such as Q5, Q8, Q12, Q13, Q16 and Q17 were dropped because of having consistently low correlation across the board as well as low corrected item-total

correlation and squared multiple correlation .After getting reliable scale, exploratory factor analysis (EFA) was conducted to identify factors of shortcomings in existing HCIS.

Table 2: Items Selected For Analysing Shortcomings of HCIS

S.No.	Statement	Variable
Q1	Implementation of IT is limited	Limited IT Intervention
Q2	Existing computers are slow and outdated in configuration	Outdated Computers
Q3	Lack & non availability of Computers in most of the departments	Lack of Computers
Q4	The process of addition and up gradation of system is lengthy and complex	Complex System for Up gradation
Q5	Infrastructure & maintenance cost is high for system	High Infrastructure Cost
Q6	Available infrastructure for IT system implementation is not sufficient	Insufficient Infrastructure
Q7	The down time of Computer System is long and delayed	Delay in Computer Maintenance
Q8	Backup plan is insufficient to handle the load on break down of electricity or Computer System	Insufficient Backup plan
Q9	The system is annually maintained by vendor but maintenance and system breakdown vendor response is long and delayed	Delay in Vendor Response
Q10	OPD waiting time is long as there is no queue management	Long Waiting Time
Q11	Redundancy of data like medical record, investigation reports, medicines & other documents	Duplication of Documents
Q12	The manpower has to be trained periodically for the best use of resources	Manpower Training
Q13	Lack of training provision & program for HCW	Lack of Training Program
Q14	HCW has resistance to accept the system	Resistance to Accept System
Q15	HCW have low satisfaction level from prevalent HCIS	Low Satisfaction from HCIS
Q16	The system has large volume of data & needs proper handling	Large Volume of Data
Q17	The system provide inaccurate and insufficient information on retrieval	Insufficient Information
Q18	Information retrieval regarding bed availability, HCW, medicine reports, medical records etc.is difficult and complex	Complex Information Retrieval
Q19	Medical record tracking is inadequate	Inadequate Medical Record
Q20	Tracking of Patient is difficult as centralization of medical records is not maintained	Difficulty in Tracking Patient
Q21	Redundancy of data as centralization of medical data is not maintained	Redundancy of Medical Data

4.2 Factor Analysis

This study used Principal component analysis with Varimax rotation on remaining variables. The correlation between factors and factorial loads were significant. The Kaiser-Meyer-Olkin (KMO) is used to measure sampling adequacy which came out to be 0.944 with chi-square value of Bartlett's Test of Sphericity being significant (chi

sq=5662.832, p= 0.000) and therefore, acceptable. Further, factor analysis produced two components with Eigen values above 1 and total variance explained was 68.3%. However, there is a cross loading among Q14 and Q15 was found hence we dropped these two items for further analysis. The factor loadings for all the components have been shown in (Table 3).

Table3: Result of factor Analysis

	Factors	
	1	2
Q20	.860	
Q19	.838	
Q21	.765	
Q18	.728	
Q10	.673	
Q11	.673	
Q9	.608	
Q2		.833
Q1		.780
Q4		.754
Q6		.716
Q3		.682
Q7		.645

Factor one was named as Complexity in System Management having items such as Difficulty in Tracking Patient(Q20), Inadequate Medical Record (Q19), Redundancy of Medical Data (Q21), Complex Information Retrieval (Q18), Long Waiting Time(Q10), Duplication of Documents (Q11), and Delay in Vendor Response (Q9) all related to complexity in managing system. The other factor named as Limited IT Infrastructure consisting of variables like Outdated Computers(Q2), Limited Use IT Intervention (Q1), Complex System Up gradation(Q4), Insufficient Infrastructure (Q6), Lack of Computers (Q3) and Delay in Computer Maintenance (Q7) all were related to limited or

insufficient IT infrastructure in existing HCIS.

The most critical dimension in factor complexity in system management is difficulty in tracking patient with a factor loading of .860 followed by inadequate medical records having .838 factor loading. In factor limited IT infrastructure the important dimension is outdated computers followed by limited use of IT intervention with a factor loading of .833 and .780 respectively.

4.3 Comparative Analysis

In order to compare public and private hospitals with regard to factors of shortcoming the following hypothesis were formed.

H1: "There is no significant association

between complexity in system management and type of hospital”.

H2: “There is no significant relationship of shortcoming of limited IT infrastructure and type of hospital”.

An Independent samples t-test was conducted to

compare the current and preferred means of public and private hospitals for the two components of shortcomings due to limited IT implementation in existing HCIS defined by the scale, Complexity in system management and Limited IT infrastructure. The result of t-test was given in Table 4 and 5

Table 4: Group Statistics

Factor	Type of Hospital	N	Mean	Std. Deviation	Std. Error Mean
Complexity in System Management	Public	300	4.09	.558	.032
	Private	300	2.69	.785	.045
Limited IT Infrastructure	Public	300	4.28	.426	.025
	Private	300	2.97	.899	.052

Table 5: Mean Comparison of Hospitals on Factors of Shortcomings in Existing HCIS

Factor		Levene's Test for Equality of Variances		t-test for Equality of Means						
				F	Sig.	T	df	Sig. (2 tailed)	Mean Difference	Std. Error Difference
								Lower	Upper	
Complexity in System Management	EVA	43.672	.000	25.120	598	.000	1.398	.056	1.288	1.507
	EVNA			25.120	539.8	.000	1.398	.056	1.288	1.507
Limited IT Infrastructure	EVA	171.138	.000	22.799	598	.000	1.310	.057	1.197	1.423
	EVNA			22.799	426.852	.000	1.310	.057	1.197	1.423

*EVA= Equal variances assumed, EVNA= Equal variances Not assumed

On perusal of table 4 it was found that the value of Levene's Test for Equality of Variances is less than 0.05, which violates the assumption of equal variance, therefore the values of equal variance not assumed (EVNA) will be reported to explain the result of t-test. For the factor complexity of system management, significant difference is found in scores for public hospitals ($M= 4.09, SD= .558$) and private hospitals [$M=2.69, SD=.785; t$

(539.80) = 25.12, $p = 0.000$] to which is stated that since p value < 0.05 , we reject the null hypothesis (H1) that there is no significant association between complexity in system management and type of hospital. Similarly, for factor limited IT infrastructure, there is significant difference in scores for public hospitals ($M= 4.28, SD= .426$) and private hospitals [$M=2.97, SD=.899; t$ (426.85) = 22.799, $p = 0.000$] to which is stated

that since p value < 0.05, (Table 5) we reject the null hypothesis (H2) that there is no significant relationship of limited IT infrastructure and type of hospital.

There are a number of different effect size statistics, the most commonly used being Eta squared. ETA squared can range from 0 to 1 and represents the proportion of variance in the

dependent variable that is explained by the independent (group) variable. The value of ETA square was calculated using the information provided in the output .

The formula for ETA squared is, $ETA\ squared\ (R^2) = t^2 / t^2 + (N1 + N2 - 2)$ and ETA squared for both factor is given in the Table 6:

Table 6: ETA Squared of Both the Factors

Complexity of System Management	Limited IT Infrastructure
$(R^2) = (25.12)^2 / (25.12)^2 + (300+300-2)$ $= 631.0144 / 631.0144 + (598)$ $= 631.0144 / 1229.0144$ $= 0.5134$	$(R^2) = (22.799)^2 / (22.799)^2 + (300+300-2)$ $= 519.7944 / 519.7944 + (598)$ $= 519.7944 / 1117.7944$ $= 0.4650$

According to the guidelines given by for interpreting this value are: .01= small effect, .06= moderate effect, .14= large effect. As the Eta squared (R^2) value is 0.5134 for complexity in system management and 0.4650 (Table 5) for limited IT infrastructure which is greater than .14 shows larger difference between public and private hospital on account of shortcoming in existing HCIS factors .

5. DISCUSSION

Health care organizations such as public and private hospitals are complicated organization and health care workers require efficient and effective management. Being powerful information tool health care information system supports HCW's to make decisions. The purpose of this study was to explore shortcoming present in prevalent HCIS in hospitals. Results of present study revealed two factors and confirmed while studying shortcoming in IT implementation in current health care information system (HCIS). The first factor was complexity in system management which comprise of seven variables. All variables were related to managing complexity in system due to the use of IT. Second was limited IT infrastructure having six variables, all were showing insufficient IT infrastructure used in existing HCIS. Among

these two factors the variables identified as complex information retrieval, difficulty in patient tracking, redundancy and inadequate medical record, outdated computers and insufficient IT infrastructure are the major shortcomings due to limited IT implementation in the current HCIS. While comparing public and private hospitals with regards to shortcomings factors it was found that both hospitals had a significant difference. Not only they are different with regards to shortcoming but also had very large effect size. Private hospitals in comparison to public hospitals have lesser shortcomings as they have overcome and implemented HCIS fully or partially. The hospitals can slowly but gradually improve through experience of patient by measuring, patient satisfaction against services received during treatment. The result revealed that shortcoming due to limited IT implementation is very prominent in public hospitals as compared to private hospitals. This study is limited to complexity and infrastructure related problems so future researchers can study shortcoming related to knowledge transfer related problems or problems at human resource level. Moreover, this study is restricted to public and private hospitals, so in future researchers can study shortcoming in different ownership of hospitals.

6. CONCLUSION

Like other sectors, the healthcare sector has also been lagging behind in adopting information technology. Even today health care is evolving in use of IT in its day to day working. The pace of adoption of IT hampered to some degree because of technology itself. It has been observed that no ideal interface exists between Health care workers and IT interventions. Health care workers are usually on the way to transform, but IT interventions tend to tie them down. The reasons could be infrastructure, lack of knowledge or complexity in using it. With respect to the shortcoming in public sector hospitals, there is no readymade solution or shortcuts on the offer to improve their state of affairs. So, in near future, the speedy implementation of IT interventions in public hospitals but in phase manner with modular approach to reach at par with private hospitals is the crux of this study.

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