USABILITY OF HOSPITAL MANAGEMENT SYSTEM IN CLINICAL WORK PHYSICIAN'S PERSPECTIVE

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ABSTRACT

Objective: To assess effectiveness of hospital management system in clinical work in military hospitals: physicians' perspective.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: Military hospitals of Rawalpindi, from Apr 2013 to Jun 2014.

Material and Methods: Sample selected through convenient non probability sampling. Sixty-one (61) physicians in clinical work: 23 (38%) specialists and 38 (62%), Health Care Administrators (HCAs) were included in the study. Tools used were questionnaire, interviews, think aloud protocol, log book analysis and chart reviews.

Results: More than 50% of respondents agreed that hospital management system in clinical setting lacks appropriate attributes. System is not customized to the needs of each specialty and doesn't support the continuity of care. It does not support evidence based decision making since it lacks clinical decision support system. Majority of physicians expect their clinical HMS to provide better support for collecting statistics for research. Most respondents agreed that HMS often diverts attention away from the patients and physicians "worked around" the system due to number of cofounders like lack of time, increased number of patients. Chart review revealed majority did not add alerts.

Conclusion: This study has highlighted a significant number of usability issues which are on one hand lessening the effectiveness and efficiency of this system; while at the other hand leading to user frustration. These findings call for usability evaluations at all levels and the subsequent redesign of HMS application leading to a user-centered design which is effective in providing physicians with key functionalities which support physician's tasks and improve patient care.

Keywords: Effectiveness, Health management system, Military hospital.

INTRODUCTION

The usability of clinical HMS refers to the assessment of the ability of the system to have a positive impact on patient care by supporting physicians in achieving their goals with a pleasant user experience[1]. To support physicians, HMS needs to be compatible with physician's tasks. Dynamics of hospital working also warrants that the system should be effective in providing the physicians with key (context-matching) functionalities, be efficient (especially in terms of record-keeping and information retrieval), and have intuitive user interface. In addition, HMS should support information

exchange, communication and collaboration in clinical work and be interoperable and reliable. Since the clinical HMS is used in numerous environments, it should also adjust to various user needs and organizational settings.

A system or service is not itself usable or unusable, but it has attributes which determine the usability for a particular user, task, and environment. Therefore, usability is evaluated through the interaction of the system, the user and the task in a specified environment. A change in any of these components alters the entire interaction, and hence influences the usability of the tool.

HMS was established in Military Hospitals with a vision to provide quality and cost effective healthcare. It is the biggest information

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technology (IT) project of Pakistan Army, unparalleled in its scope and size in Pakistan and South East Asia with huge financial implications. The main beneficiaries are the soldiers and their families. The project was lauched/executed by AMC in collaboration with other techincal branches of Pakistan Army. AMC is providing health care facilities to its worthy clientele despite having limited resources and manpower constraints. One way of meeting this challenge is to utilize advancement in management technologies. HMS is one step towards this goal. Eventually it will create a complete paper free environment across 45 x hospitals and 12 x Armed Forces Medical Institutes in a phased program. At present only the outdoor module is operational and in patient module is in pipeline.

This window period at this juncture has provided an opportunity to evaluate the data about the experience of HMS and provide accurate and timely feedback for user oriented development of HMS for better health care outcomes. This has also been the motivation for this usability study.

MATERIAL AND METHODS

Descriptive study was conducted from April 2013 to June 2014 on 127 physicians using HMS in outpatient department in Military Hospitals of Rawalpindi through convenient non probability sampling. A self administered validated structured questionnaire was used to collect the data. It consisted of one summative question on electronic health record (EHR) rating on a scale of 4 (fail) to 10 (excellent) and 12 usability statements with 5 point likert scale (fig 1 & 2). Direct observation method was employed by videotaping the usability session by focusing on the computer's screen image. During this, the participants were encouraged to share their thoughts verbally as they progressed through the patient encounter "think aloud". For example, the user was asked to identify what information they are looking for before they initiate their search. We monitored what was entered into the program and we were able to view the

information retrieved. Then we recorded the degree of satisfaction with the information that they had obtained. That helped to define the participants' behavior in terms of both their intentions and their actions. To accomplish a valid study, a specific protocol was followed and multiple participants (typically 6 to 12) interacted with the system using the same set of scenarios. In this manner, we ascertained characteristics of the system that were functional, needed improvement, fitted user expectations, missed expectations, failed to function, or provided opportunities for development.

Interviews were conducted with the physicians, system administrators and hospital managers. A log book was placed with the system administrator to record daily HMS complaints to analyze the type of usability problems. Chart reviews were done in the control room to evaluate the safety features.

The assessment parameter was based on one of ISO 9241 specifications (effectiveness) and broken down into variables like accuracy and completeness of documentation, customization, continuity of care etc.

The data was entered in SPSS-19. The variables were expressed as percentages and frequency.

RESULTS

The response rate to our study was 61/70 (87%). Respondent demographics showed 35 (57%) women and 26 (43%) men and majority 42 (68%) less than 40 years of age. Specialists were 23 (38%) and health care administrators 38 (62%). Experience wise response showed most respondents were having 6 or less years of service. A summative question on comfort level with computers on a scale of 1-5 showed that majority 52 (85%) were proficient in using computers.

In this study 32 (52%) agreed that HMS working in Military Hospitals gives complete and accurate information provided complete

information is entered as pointed out in the interview.

Twenty eight (46%) agreed and 21 (34%) disagreed with the statement that HMS helps in decision making by provideing alerts and reminders for example about allergies, drug interaction and 12 (20%) had no idea about this functionality. Interview revealed that those who agreed were mostly Hospital Care Administrator

revealed that 80% of physicians did not add alerts.

Majority 48 (79%) agreed that system has checks and balances on prescribing medication to control costs and for judicious use of medication.

In this study 26 (43%) disagreed on customized HMS, and 13 (21%) agreed with the statement. Interviews revealed that initally no user feedback was taken on this but lately the

Table: Summary of findings of tools used for checking effectiveness of HMS.

Summary of Findings Effectiveness Questionnaire

Strenghts	Agree	Weakness	Agree
Complete and accurate information	52%	No Summary view	64%
Medication is in stock at the store	64%	Not a Tool for research	41%
Medication is in the formulary	79%	Not a Customized system	43%
		No (EBM) clinical care	52%
		No Continuity of care	57%
		Slight improvement in Health outcomes	33%
		No help in decision making	34%
		Takes attentions away from patients	75%
		Physician workaround	79%

Interview

Weakness	Comments
Lack of summary view	• Lot of scrolling and click to see patient history
Lack of Customized system	• No provision of coustomized examination or diagnosis • No user feedback was taken in implementation phase • Few commented feedback that feedback was taken from individuals who had no knowledge of HMS • Only gynecologists were relativley satisfied
Physician Workaround	• Paucity of time • Heavy OPD with no appointment system • No provision of transcriptionist, voice or hand writing devices
EB Clinical Care	• No CDSS
Health Outcomes	• Not deployed in full • No CDSS, Research and Pharmacy Module
Research Tools	• No statistical or research module

who had now access to investigations, medication list, and alerts so it facilitated them in disposal of patients. Twenty two (36%) who disagreed were mostly specialists with better knowledge of HMS. They disagreed because of lack of Clinical Decision Support System (CDSS) and automatic alerts for drug interactions. Chart review

feedback has been sought several times but so far no progress. Moreover, few physicians said that initial feedback was taken from physician's who had no knowledge of HMS applications. Only gynaecologists were relatively satisfied. Rest of specialities were dissatisfied. Think aloud protocol revealed HCA in filter clinics were

satisfied but Surgeons were dissatisfied because of no provision for displaying anatomical distribution of lesions and lack of customized diagnosis. Medical specialists demonstrated faults in system examination e.g. percussion of Cardio Vascular System (CVS) shows features used for percussion of Gastro Intestinal Tract (GIT). Central Nervous System (CNS) examination starts with cranial nerves instead of higher mental functions. Paedriaticians complained of no growth monitoring chart. Ear, Nose & Throat (ENT) specialists were unable to draw lesions. Command, Control, Computer, Communication & Intelligence (C4I) Directorate when contacted on this issue said that regular feedback has been sought from Medical Directorate.

Study results showed 25 (41%) respondents agreed with the statement that it improve health outcomes whereas 20 (33%) were not satisfied. In interview physicians suggested that system needed alot of upgradation like Picture Archiving and Communication Systems PACS, serial display of investigation for finding trends, Clinical Decision Support System (CDSS), research and pharmacy module etc for it to improve outcomes in true sense.

To assess doctor patient relationship statement 9 was asked. A strongly positive response i.e. 46 (75%) agreed meaning two of the three respondents perceived that the system unintentionally captures attention away from patients. Interview revealed that complete and detailed data entry requires multiple clicks and
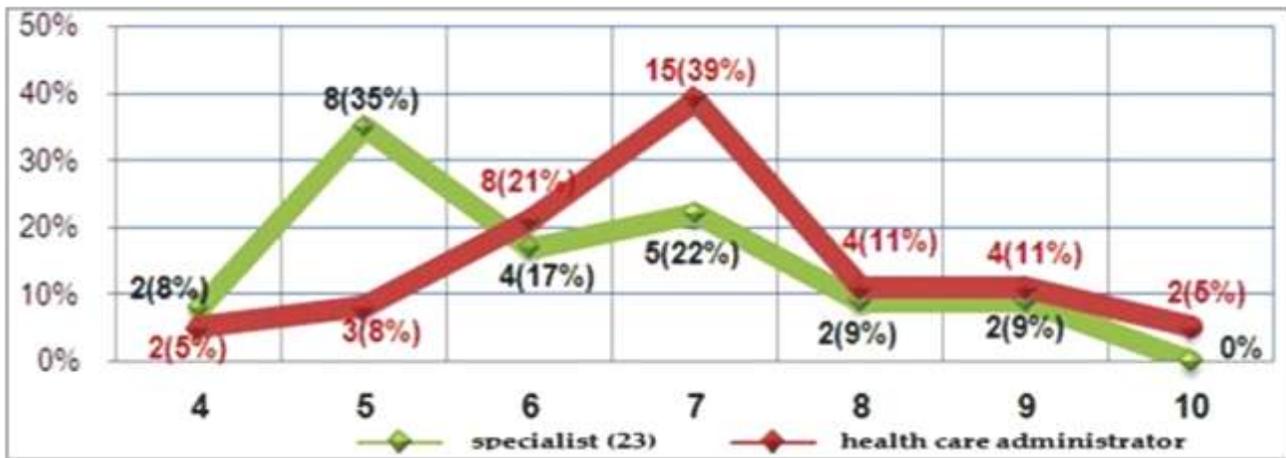

Figure-1: Electronic health record rating on a scale of 4-10. (4 is fail and 10 is excellent) Spec vs GDMO.

Thirty four (57%) respondents disagreed that system provides continuity of care. Interview revealed difficulties in accessing patient's information from other organizations however most were satisfied with the support HMS provides for collaboration between co-located physicians.

In this study majoriy 39 (64%) did not agree to having a summary view of patients. Think Aloud Protocol revealed that due to this physicians had to do multiple scrolling and click several tabs before they could see the previous history, investigations, diagnosis and treatment.

scrolls so physician may take a longer time in data entry.

Majority 79% agreed with the statement that physicians workaround the system. Interview revealed number of cofounders like lack of time, increased number of patients in OPD, lack of typing skills. Physicians suggested medical transcriptionists and voice capture devices or hand writing recognition devices for facilitation. Specialists also suggested to curtail number of patients to 35 and start an appointment system.

Twenty five (41%) disagreed with statement that it supports clinical research activities for

analysis of clinical performance, management efficiency or disease surveillance. Twenty nine (48%) had no idea of this functionality. Interviews with specialists revealed their frustration with HMS as they called it garbage in garbage out as they were unable to get any statistical data out of it thereby compromising the whole idea of HMS.

Questionnaire shows that 32 (52%) disagreed that it ensures clinician care follows recommended guidelines. In interview physcians suggested that medical directorate technical instructions on diseases can be utilized in ensuring that treatment follows recommended clinical guidelines.

Physicians' estimates of their EHR varied from 5 to 7 depending on the kind of facility

better grades than novice users and almost 90% of the respondents had more than one year of experience using the system.

DISCUSSION

Study indicated that out of eleven only on three attributes majority of respondents agreed. The system is effective in compiling complete and accurate information in a consistent manner. HCA felt that it helps in decision making as now they had access to Lab results, medication list and alerts but mostly specialists disagreed because of lack of clinical decision support system (CDSS).

HMS is ineffective because of lack of customization. Either accurate feedback from user who is knowledgable about HMS and its capabilities is not taken or HMS Cell in Medical Dte is not giving requisite information to C4I Dte.
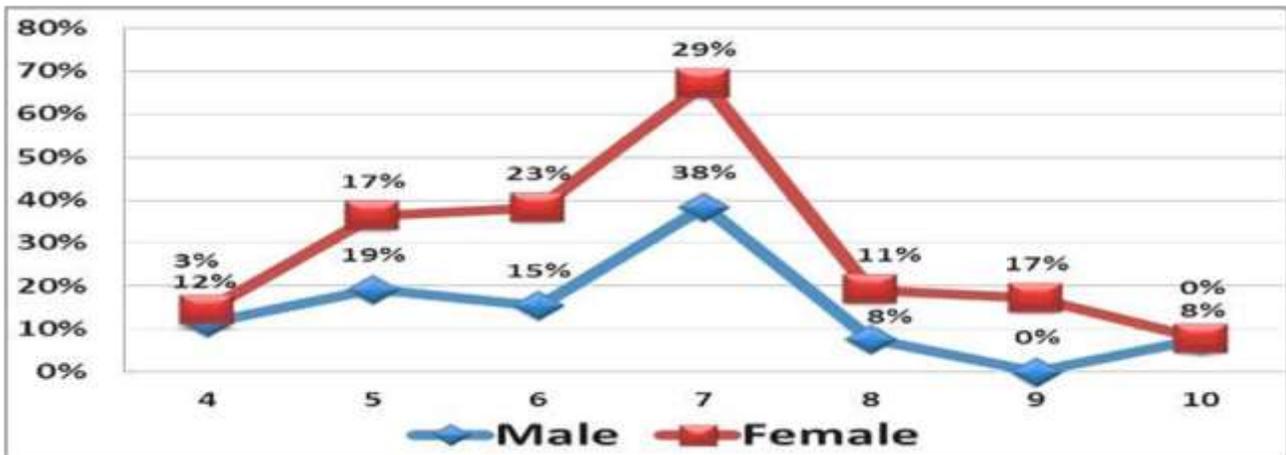

Figure-2: Electronic health record rating on a scale of 4-10. (4 is fail and 10 is excellent) Male vs Female.

where the physician is working and whether he/she is a HCA or a specialist. Again the analysis revealed that dissatisfaction with EHR was highest in the specialists (average 5) as compared to health care administrator (average 7).

Cross-tabulation between the respondents' demographics and overall EHR ratings revealed, females gave slightly better grades than men. Physicians over the age of 45 seemed to be more dissatisfied with the system than younger ones, especially when it came to grades of 9 or 10. Respondents with computer proficiency gave

The US department of veterans affairs recently published a study that suggested that EHRs should be more customized and tailored to clinicians' preferences and practices for enhanced usability[2].

Research reveal for physician, continuity is to have sufficient information about a patient to best apply their professional competence and the confidence that their care inputs will be recognized and pursued by other providers. For continuity to exist, care must be experienced as connected and coherent[3] but our study results show, HMS does not seem to sufficiently support

cross organizational information exchange or collaboration and neither it is interoperable. Therefore continuity of care is compromised.

Lack of summary view functionality has made the system ineffective. Summary view of patients if present helps physcian in making a quick assesment of patients condition, his medical history including medication history. Majority (41%) said it didn't ensure evidence based (EB) decision making since it lacked CDSS. Medical guidelines with direct medical knowledge at the point of care with an evidence-based nature and access to updated information help to improve the quality of treatment and outcomes, reduce unwanted errors and decrease economic costs[4]. Greenes and Lorenzi[5], Stead et al[6], and Shiffman et al[7], in separate researches, studied the effective ways of applying medical guidelines in clinical settings and stated that the guidelines provided features for timely and rapid access to information, through which physicians would be able to respond and make decisions quickly using appropriate and accurate information in real time[8]. Responses on the question of the systems' abilities to improve health outcomes were distributed almost evenly between agree, neutral and disagree opinions. Study also revealed that physicians expect their clinical HMS to provide better support for collecting statistics for research than they currently have because of lack of statistical module. Thus compromising the main objective of generating information to improve health care management decisions of all levels of health system. It seems that effectiveness of HMS is further reduced as majority accepted that they did not enter complete details of patient i.e. "worked around" the system due to paucity of time. Agency for healthcare research and quality (AHRQ) study reveal that Work around frequently arise because of flawed or poorly designed systems that actually increase the time necessary for user to complete a task[9].

The study revealed that considerable number of respondents did not know about certain functionalities of the system, like customization, improvement in health outcomes or whether it was an effective tool for research. This indicates that users have not been made aware of capabilities of system and lack of training, interest or ignorance of this aspect by administrators. It also means a lack of user input in terms of their requirements, and information needs which is first step in software designing. It is hoped that these findings will form the basis of more studies to further elucidate the causes of suboptimal performance of this software/ initiative.

CONCLUSION

This study has highlighted a significant number of usability issues which are on one hand lessening the effectiveness and efficiency of this system; while at the other hand leading to user frustration. These findings call for usability evaluations at all levels and the subsequent redesign of HMS application leading to a user-centered design which is effective in providing physicians with key functionalities which support physician's tasks and improve patient care.

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CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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