ORIGINAL ARTICLE

Physicians' perception about electronic medical record system in Makkah Region, Saudi Arabia

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ABSTRACT

Objectives: The study was done to determine the physicians' perception about electronic medical record system (EMRS) in the context of its productivity in order to improve its functionality and advantages. **Materials and Methods:** This cross-sectional survey was performed from July to August 2009 with structured questionnaire of 15 closed-ended questions with five points Likert scaling starting from strongly disagree to strongly agree as 1–5, reflecting the perception of physicians about EMRS. The physicians of the Makkah region working in six different hospitals were selected. "Positive" response means if percent of responses were rated 4 or 5 (agree/strongly agree), "neutral" if rated 3, and negative if rated 1 or 2 (strongly disagree/disagree). Descriptive data analysis techniques were used. **Results:** We selected 317 completed questionnaires. Majority of subjects were from King Fahd Hospital, Jeddah (83, 26.3%), residents (147, 46.4%), male (200,63.1%), expatriates (207, 65%), and age group 36–45 years (133, 42%) were dominant. The stem regarding importance of computers for practicing medicine and EMRS to improve quality of practice was appreciated by majority, that is, 77.7 and 71.2%, respectively. However, "It does not disrupt the workflow" (35.1%) and "EMRS is comfortable while entering the data instead of writing" (34.8%) were appreciated negatively. Consultants (53.9%), male (53.4%), expatriates (56.7%), physicians of King Abdul Aziz Hospital, Ta'if (56.9%), and age group of 46–55 years (53.8%) appreciated EMRS positively. Overall perception of EMRS was found positive by 52.8%. **Conclusion:** Majority appreciated the EMRS, but specific concerns about its usage easiness and workflow disturbance were opposed by them also.

Key words: Computer, cross-sectional survey, electronic medical record system, physicians

INTRODUCTION

Most of the Ministry of Health (MOH) hospitals in Saudi Arabia, adapted a separate local Health Information System that reflect the Saudi government efforts of implementing advanced information and communication technology in healthcare sectors.[1] General Directorate of Health Affairs, Makkah region is considered as the largest health region directorate of MOH in Saudi Arabia managing 36 hospitals all over the four cities (Makkah, Jeddah, Ta'if, and Qunfuthah).[2] At the time of study, nine out of 36 MOH governed hospitals had acquired electronic medical record system (EMRS), but six hospitals were using EMRS for an average of 5 years, that is, three in Jeddah used Oasis system; two in Makkah,

that is, Alnoor Specialist Hospital used Care Ware system; while Hera General Hospital used Arabian Computer Services system. One hospital in Ta'if district used iCare system. Each system has all the basic and specific EMRS key functions.

Saudi Arabia has prioritized the development of e-Health as well as the transition from paper-based health record to electronic health record. The Saudi government adopted the following mission for e-Health: "A safe quality healthcare system based on patient centric care guided by standards, enabled by e-Health".[3] The MOH allocated a total of 4 billion Saudi riyals towards e-Health programs for the 4-year period from 2008 to 2011. An e-Health plan integrates with the plans of the MOH.[4]

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Studies on EMRS uptake in Saudi Arabia have been found scarce, but EMRS use has been prioritized by the Saudi government, so it is important that its perception be measured by end users, especially the physicians. The primary objective of the study is to determine the physicians' perception about EMRS in the context of its productivity in MOH hospitals in Makkah region, Saudi Arabia, in order to improve its functionality and advantages.

MATERIALS AND METHODS

The physicians working in six government hospitals (MOH, Saudi Arabia) having EMRS since the duration of at least 1 year underwent a cross-sectional survey during July–August 2009. Hera General Hospital (H1), Makkah city, (317 beds); King Abdul Aziz Hospital (H2), Ta'if city, (691 beds); King Fahd Hospital (H3), Jeddah city, (840 beds); Maternity and Child Health Hospital (H4), Jeddah city, (390 beds); Alnoor Specialist Hospital (H5), Makkah city, (627 beds); and King Abdul Aziz Hospital (H6), Jeddah city, (559 beds) have been selected. Physicians who were in direct contact with patients comprised the study population.

Sample size (n) determination was done by following formula as 317 out of total study population (P) size, that is, 1,802, by keeping the margin of error (D) 5%, confidence level of 95%, response distribution (P) of 50% and response rate (RR) of 100%. Sample Size = $n/[1+ (n/\text{population})]$. In which $n = Z \times Z [P (1 - P)/(D \times D)]$. Where $Z = 1.96$ with confidence level of 95%. Sample from different settings were selected randomly by Neyman's pick proportionate allocation method. This allocation method was used to maximize the survey precision by identifying the best sample for the stratums (six hospitals). We sent the questionnaire to 453 subjects to keep the RR of 70% in order to have desired sample size for final analysis.

A structured questionnaire of one A4-sized paper has been prepared containing demographical queries including age groups, gender, nationality, job category, and place of employment. It also had 15 closed-ended questions/stems with five points Likert scaling starting from strongly disagree to strongly agree as 1–5, reflecting the perception of physicians about EMRS. General Directorate of Health Affairs, Makkah region experts in Medical IT verified the content and face validity of the questionnaire.

Questionnaire stability, that is, internal consistency was measured by Cronbach's alpha using kappa statistics through Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc, Chicago, IL, USA). The Cronbach's alpha and Guttman split-half was shown for each stem. Ten percent of selected

sample size was chosen and the subjects (physicians) were selected by randomization irrespective to their age, gender, nationality, and category from the identified settings. Out of the 10%, the RR was 79%. Test-retest reliability could not be measured because of impediments in arranging the subjects twice to fulfill the same questionnaire after a gap of certain time period.

In each enrolled hospital, a formal demonstration was given in order to explain the projects detail followed by questionnaire distribution to the selected subjects. Time of 2 weeks to answer the questionnaires was provided. The results were categorized as "positive" if percent of responses were rated 4 or 5 (agree/strongly agree), "neutral" if rated 3, and negative if rated 1 or 2 (strongly disagree/disagree). Average rate for each stem as well as for subjects stratified into categories, gender, nationality, working place, and age groups were measured.

Data analysis
Descriptive data analysis techniques, that is, count, percentage, and average calculations, were implemented by using Microsoft Excel 2007 on personal computer.

Ethical considerations
Research project had been approved by General Directorate of Health Affairs, Makkah Region and all the participants were made aware of all the potential and future prospects of this survey. All respondents were assured of strict confidentiality of their identity.

RESULTS

RR of 356 was found to have margin of error of 4.7% with 95% confidence level with total target population of 1,802. Only 317 surveys were selected based on the results of the sample size formula shown in the methods section. Majority of subjects were selected from H3 King Fahd Hospital, Jeddah (83, 26.3%) and H5 Alnoor Specialist Hospital, Makkah (77, 24.4%). Overall questionnaire stability, that is, Cronbach's alpha and Guttman split-half coefficient weremeasured to be 0.86 and 0.79, respectively. Physicians' residents (147, 46.4%), male (200,63.1%), expatriates (207, 65%), and age group 36–45 years (133,42%) were dominant [Tables 1-3].

Regarding the positive perception, two stems, that is, Q5 and Q7 were appreciated by the majority, that is, "Computers are important for practicing of medicine" (77.7%) with average rating (AR) of 4.1 and "EMRS improve quality of practice (work life)" (71.2%, AR = 3.8). However, negative response was also found for the stems, but the

Table 1: Study settings and sample size allocation

Settings	Population distribution				Sample distribution†			
	C*	S*	R*	Total	C	S	R	Total
	n (%)**	n (%)**	n (%)**	n	n	n	n	n
Alnoor Specialist Hospital, Makkah city H5	87 (23.5)	141 (23.8)	211 (24.9)	439	15	25	37	77
Hera General Hospital, Makkah city H1	32 (8.6)	66 (11.1)	154 (18.1)	252	6	12	27	44
King Abdul Aziz Hospital, Ta'if city H2	75 (20.2)	83 (14)	96 (11.3)	254	13	15	17	45
King Fahd Hospital, Jeddah city H3	101 (27.2)	160 (26.9)	212 (25)	473	18	28	37	83
Maternity and Child Health Hospital, Jeddah city H4	54 (14.6)	105 (17.7)	124 (14.6)	283	10	18	21	50
King Abdul Aziz Hospital, Jeddah city H6	22 (5.9)	36 (6.1)	43 (5.1)	101	4	6	8	18
Total	371 (20.5)	591 (32.7)	840 (46.7)	1,802	66	104	147	317

C: Consultants, S: Specialists, R: Residents. *Percentages have been measured from each column total, **Percentages have been measured from (n=1,802), †sample size has been allocated to each hospital by Neyman's pick proportionate allocation method, for example, 15=23.5×66÷100

Table 2: Subjects' demography (n=317)

Variables	n (%)
Physicians category	
Consultants	66 (28.8)
Specialists	104 (32.8)
Residents	147 (46.4)
Gender	
Male	200 (63.1)
Female	117 (36.9)
Nationality	
Saudi nationals	110 (35)
Expatriates	207 (65)
Age groups in years	
≤ 35	82 (26)
36-45	133 (42)
46-55	67 (21)
55-65	35 (11)

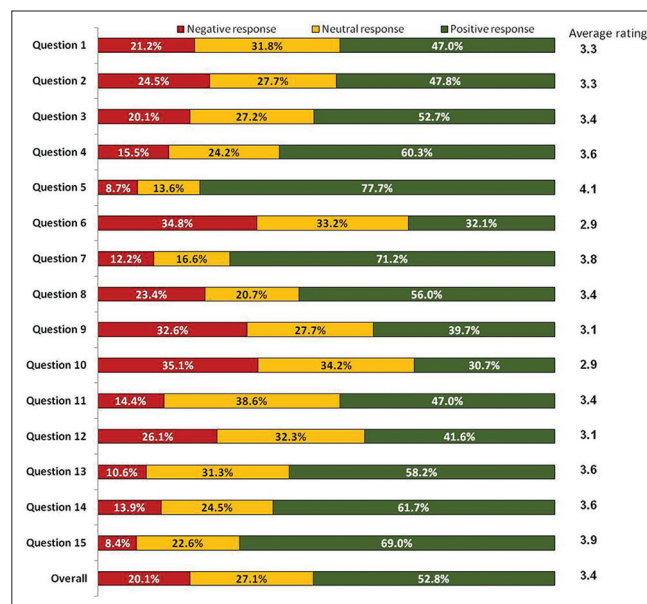**Figure 1:** Subjects response to questions about electronic medical response system

stem Q10 "It does not disrupt the workflow" was at the top of negative response (35.1%, AR = 2.9) followed by Q6 "EMRS is comfortable while entering the data instead of writing" (34.8%, AR = 2.9) [Figure 1].

Perception about EMRS was appreciated mostly by consultants (53.9%, AR = 3.5), male (53.4%, AR = 3.4), expatriates (56.7%, AR = 3.5), physicians of H2 King Abdul Aziz Hospital Ta'if (56.9%, AR = 3.5), and age group of 46–55 years (53.8%, AR = 3.4) [Figure 2].

Overall perception of EMRS was found positive by 52.8%, while 20.1% negatively responded.

DISCUSSION

In this study we found that nine (25%) out of total 36 hospitals under MOH in the Makkah region have implemented EMRS that makes the level of EMRS uptake higher than that of the eastern province (15.8%) found in a study with aims to determine the level and extent of usage of EMRS in government-related hospitals. We also found a difference in variety/types of EMRS in our study settings as compared to eastern province where all the study hospitals were using the same EMRS.[4]
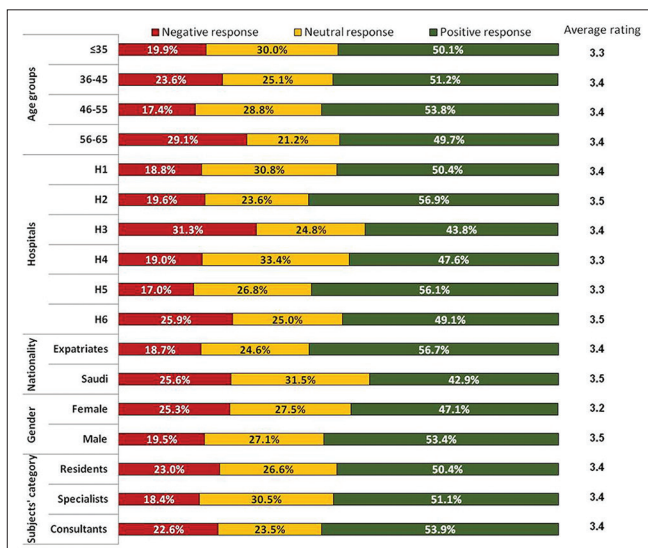
Our study findings can be compared to a number of studies like; a cross-sectional survey including physicians to evaluate the knowledge, attitude, and practice of physicians towards the EMRS was conducted in Oman in 2011. EMRS as an effective tool in improving quality, performance, and timeliness was rated by 15.6% of physicians, while 29.4% of respondents considered it poor in worth. The majority (67.4%) reported difficulty with their performance, while using the EMRS. The overall quality of work was perceived not to have changed mentioned by 41.2% of the respondents. The low satisfaction and underperformance was found to be associated with younger age and junior designation.[5]

Our survey stems reflected the physicians' point of view to the values and imperative benefits of EMRS in general. More than 50% of all physicians regardless the designation category, nationality, gender, age, and settings have given an overall positive perception about the EMRS. On the other hand, a tendency towards the facts that EMRS disrupts

Table 3: Electronic medical record system questionnaire stability testing

Serial no.	Questions/stems	Cronbach's alpha	Guttman split-half coefficient
Q1	I am generally satisfied with EMRS	0.81	0.76
Q2	EMRS is easy to use	0.86	0.81
Q3	EMRS gives information which helps you in better writing	0.81	0.81
Q4	EMRS increases the comprehensiveness of care which I provide	0.83	0.83
Q5	Computers are important for practicing of medicine	0.85	0.8
Q6	EMRS is comfortable while entering the data instead of writing	0.87	0.82
Q7	EMRS improve quality of practice (work life)	0.81	0.76
Q8	EMRS increase practice productivity (patients per day)	0.83	0.81
Q9	EMRS decrease the work load	0.87	0.81
Q10	It does not disrupt the workflow	0.89	0.83
Q11	Benefits of EMRS outweigh the inconveniences	0.91	0.85
Q12	EMRS does not reduce the communication among the users, i.e., healthcare providers	0.93	0.76
Q13	EMRS has a benefit of remote access usage and ordering	0.95	0.78
Q14	All the orders can be done in one place by using EMRS	0.89	0.72
Q15	Typed orders are clear to read leading to less error	0.86	0.81
Overall		0.86	0.79

EMRS: Electronic medical record system

Figure 2: Subjects' overall response to questions about electronic medical record system stratified into their category, gender, nationality, hospitals, and age groups. H1 = Hera General Hospital (Makkah), H2 = King Abdul Aziz Hospital (Ta'if), H3 = King Fahd Hospital (Jeddah), H4 = Maternity and Child Health Hospital (Jeddah), H5 = Alnoor Specialist Hospital (Makkah), H6 = King Abdul Aziz Hospital (Jeddah)

the workflow consistent with the survey conducted on nurses in Turkey.[6] It increases the work load, reduces the communication among users, and not comfortable while entering the data instead of writing had been seen. However,

females, Saudi, and older age (56–65 years) had weakness in understanding the values and benefits of EMRS in our study. Nurses' perceptions about the electronic health recordin Spain also werefound positive in the context of its continuity of care and exchange information on patient health data.[7]

According to Bleich and Slack[8] and Nour El Din[9] excited acceptance of EMR by physicians and nurses is because of its easiness to use, but it was concluded in the eastern province of Saudi Arabia that benefits of the EMR are not fully achieved because of underutility of many core functions that can be improved by the EMR training and improvement of its key identified aspects.

Study by Darr *et al.*, in 2003 suggested that the senior physicians had positive view about EMRS in the managerial role; however, junior physicians emphasized on its negative occupational effects on their work as found in our survey where perception of senior physicians were more positive. The nurses identified use of the EMR as good for quality care and administration of patient care.[10]

The study of Laerum *et al.*, in 2001 revealed a low level of use of EMRS by physicians because of a lack of available computers and physicians' literacy using the computer. There was no significance difference between EMRS in terms of respondents' age, sex, or place of employment.[11] Success of any information system depends upon the data quality and its completeness, end users computer literacy, and experience as well. User friendly EMRS is critical to facilitate the process.[12]

CONCLUSION

Survey outcomes show positive and negative impacts about EMRS at our settings. The study revealed that physicians are generally satisfied with EMRS, and they believe the system can improve quality of care for patients. EMRS is a good source of education and communication as well. Development of a good EMRS requires the fullest and sincere cooperation of all healthcare professionals; especially the medical staff, health information professionals, and information technologists. A future plan should address how to improve the system with continued upgrading. In addition, the cost associated with system upgrade and improvement must be addressed by the MOH.

Recommendations

A further comparative usability evaluation study about different EMRSs by the end users in different settings of Makkah region is highly recommended. It is also recommended to evaluate the current status of perception about the EMRS in relation to the past efforts done by

directorate general office in order to improve the perception as well as the comparison with the current study.

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