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*Original Article*

# Satisfaction of Primary Health Care Physicians Towards Electronic Health Information System (WAHED) in Al-Ahsa, Saudi Arabia 2022

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## Abstract

**Background**: The implementation and adoption of the health information systems (HIS) in hospitals has increased globally in the recent years. A physician's perception of such systems is a crucial determinant of their successful use. In this study, we aim to explore physician satisfaction levels with the electronic health information system and to identify the main factors affecting the satisfaction level of physicians.

**Methods**: A cross-sectional study was performed among the primary health care (PHC) physicians in Al-Ahsa region of Saudi Arabia. Data was collected via a survey which was distributed using Google Forms. Physicians' satisfaction levels towards HIS were explored using a validated 19-item questionnaire and analysed in different categories.

**Results**: A total of 215 primary health care physicians were included in the study. Reliability showed good internal consistency ($\alpha = 0.809$). The aggregated satisfaction ratings for HIS based on the responses showed some variations. A total of 4 (2%) of the respondents gave an overall rating of 'poor' to the system, and 26 (12%) of them rated it as 'fair', 97 (45%) of them rated it as 'good', 80 (37%) of them rated it as 'very good' and 8 (11%) of them found the system 'excellent'. Nationality (p=0.017), HIS training (p=0.001), and stress or burnout (p=0.001) were significant factors associated with physicians' satisfaction levels with the HIS.

**Conclusion**: Overall, physicians were moderately satisfied with the HIS, and that various aspects of the system require improvement. Continued evaluation of installed systems and feedback from users must guide future improvements in the technology. Further research is required to investigate the causes of the physician's stress/burnout, and non-trainee physician dissatisfaction, and improve the overall satisfaction among primary health care physicians.

**Keywords**: Health information system, HIS, PHC, physicians, satisfaction, WAHED

## Introduction

The Saudi Ministry of Health introduced the electronic health system in 1988 with the intention of improving health systems in this country (1). Globally, more hospitals are using Health Information Systems (HIS) to increase patient satisfaction, care quality, and hospital efficiency (2). These technologies introduced in the 1960s are being utilized in almost every country in the world at different rates based on each country's level of technological advancement (3). The majority of hospitals in Saudi Arabia's Eastern region have fully implemented most of the functionalities pertaining to the electronic clinical documentation of the HIS (4). Other categories of modern HIS functionality including decision support and barcoding have not been as widely implemented across the region yet. However, electronic health information system enables the computerization of all patient-related data, resulting in better and more effective health services (5). The primary goal of installing a health information system is to increase healthcare efficiency by ensuring that all patients receive the best care possible with a minimal amount of resources, including time (6). It can reduce prescription errors and improve adherence to clinical practice guidelines and the delivery of preventive health services, thereby, potentially improving health outcomes for patients (7). Electronic file systems in many countries have improved the accuracy and safety of patients' information.

Physician's perception of the HIS is a crucial determinant of the successful use of the HIS system. Despite the many advantages of the health information systems, their implementation does not necessarily mean increased efficiency. In addition, some studies have observed a rate of variation in the adoption of these systems and a low rate has been detected suspected to be resulting from financial and administrative factors, attitudes of health care providers, and technological knowledge (8, 9). The success of these systems has been linked with physician satisfaction with HIS, and their accommodation with the quality of these systems. However, users are often dissatisfied due to several issues they encounter while using HIS that results in delays in introducing these services to the patients (10). At times, practitioners experience reduced productivity due to a lack of technological skills, leaving them unsatisfied with the system. The success of electronic health records system is dependent on the clinicians' perception and acceptance of that system (11). Various studies globally have shown a controversial level of satisfaction with electronic health information systems among physicians. This study was conducted to fill this gap and estimate the level of satisfaction of PHC physicians towards the HIS, WAHED in the Al-Ahsa region. The goal of this study is to evaluate the factors determining the satisfaction level of physicians towards HIS.

## Methods

### *Patients and settings*

This was an online-based cross-sectional study conducted among the Primary Health Care (PHC) physicians in all four sectors of Al-Ahsa conducted between 20 April 2022 and 28 April 2022. The study included primary health care physicians including general practitioners and family medicine physicians (residents, specialists, and consultants) in Al-Ahsa city in the Eastern Region of Saudi Arabia. After recruiting participants, the survey was distributed through Google forms and was sent through social networking. The primary objective of this study was to investigate and measure the satisfaction of primary health care physicians towards the HIS and to evaluate the variables affecting the physician's satisfaction with the HIS. This study was conducted following the approval of the institutional review board of the Directorate of Health Affairs in the Ministry of Health, and participants were asked to agree to participate in the current study before completing the online questionnaire. We excluded PHC physicians from rural areas and dentists.

### *Study tool and data collection*

A bilingual (Arabic and English) questionnaire was used to collect the data. The questionnaire was transformed into an online Google form. The online questionnaire was comprised of three major parts and depended on the self-reporting of the participants. The first part was to collect socio-demographic information from the participants including age, gender, nationality, marital status, qualification, job designation, experience level, and working sectors. The next part was about the physician's bio-psychosocial characteristics and experiences with the HIS system. The third part included questions measuring the physicians' satisfaction with HIS, including the physicians' experiences, network, technical issues, quality, and user-interface design. We did a pilot study that included 28 participants for validation of the questionnaire. The questionnaire's


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internal consistency was analysed using Cronbach's alpha. All of the satisfaction-related questions were validated, with an estimated reliability value of 0.763 based on the reliability coefficient by Cronbach's alpha using pilot data. Participants were asked to indicate their level of agreement with the 19 satisfaction-related statements using a three-point Likert scale (agree, neutral, and disagree). Following data collection, all results were then briefly reviewed and coded by senior authors to ensure the comprehensibility of the results and ensure the statistical analysis step was appropriately interpreted. We compared all the satisfaction-related questionnaire parameters with the socio demographic characteristics of the participants aiming to identify any potential association with any of them.

### *Statistical analysis*

The data were entered into Microsoft Excel and cleaned for analysis. Variables were then imported into Statistical Package for Social Sciences (SPSS), version 26 for statistical analysis. Means and standard deviations were used to represent the quantitative data, while numbers and percentages were used to represent the qualitative data. Several comparison tests, including the Chi-square test, independent sample t-test, and one-way ANOVA, were used to assess the potential association between the different variables of this study. A p-value that is <0.05 indicates a significant association.

## Results

### *Respondents' demographic characteristics*

A total of 215 PHC physicians were included in the study. Among the respondents, the majority belonged to the age group of 25–30 (41%), and only 13% of the respondents were older than 41 years. The gender distribution was roughly the same; males made up 52% of the respondents, and most of the respondents were married (80%). Moreover, 87% were of Saudi nationality, and 33% were from the Eastern region. Nearly half of the respondents possessed fewer than five years of experience (53%), and 21% had more than 10 years of experience in healthcare. In terms of job designation, 33% of the respondents were general practitioners, while 31% were residents undergoing Saudi Board of Family Medicine residency training, 30% were family medicine specialists and 18 were family medicine consultants **(Table 1).**

**Table 1: Demographic characteristics of participants.**

| | Total (n = 215) Frequency (%) |
|---|---|
| **Age groups** | |
| 25 – 30 years | 88 (41) |
| 31 – 35 years | 62 (29) |
| 36 - 40 years | 36 (17) |
| **Gender** | |
| Female | 103 (48) |
| Male | 112 (52) |
| **Nationality** | |
| Non-Saudi | 27 (13) |
| Saudi | 188 (87) |
| **Marital status** | |
| Single | 31 (14) |
| Married | 173 (80) |
| Divorced | 7 (3) |
| Widow | 4 (2) |
| **Qualification** | |
| Board Certification | 96 (45) |
| Diploma | 13 (6) |
| Masters | 12 (6) |
| MBBS | 94 (44) |
| **Job designation** | |
| Family Medicine Consultant (Non-trainer) | 1 (0) |
| Family Medicine Consultant (Trainer at SBFM Academy) | 14 (7) |
| Family Medicine Resident (Under Training in SBFM) | 66 (31) |
| Family Medicine Specialist (Non-trainer) | 41 (19) |
| Family Medicine Specialist (Trainer at SBFM Academy) | 23 (11) |
| General Practitioner | 70 (33) |
| **Experience** | |
| 0 - 5 years | 115 (217) |
| 6 – 10 years | 53 (100) |
| More than 10 years | 47 (89) |
| **Sector** | |
| East | 71 (33) |
| Middle | 56 (26) |
| North | 46 (21) |
| South | 42 (20) |

*SBFM: Saudi Board of Family Medicine,*

### *Respondents' bio-psycho-social characteristics*

Most physicians worked during the morning shift (89%) only. A total of 82 (38%) of the respondents admitted to feeling stressed or burned out regularly. Many of the physicians (62%) attended to 21 – 30 patients daily on average while only 7 (3%) physicians in the survey study reported seeing over 40 patients per day on average **(Table 2).**


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**Table 2: Physician's bio-psychosocial characteristics and experiences with HIS system.**

| | Total (n = 215) Frequency (%) |
|---|---|
| **Work schedule** | |
| Coverages | 13 (6) |
| Morning only | 191 (89) |
| Shifts | 11 (5) |
| **Patients per day, average** | |
| Less than 20 | 29 (13) |
| 21 - 30 | 133 (62) |
| 31 - 40 | 46 (21) |
| More than 40 | 7 (3) |
| **Do you feel stressed or burned out?** | |
| Rarely | 9 (4) |
| Sometimes | 19 (9) |
| Often | 75 (35) |
| Usually | 82 (38) |
| Most of the time | 30 (14) |
| **HIS training** | |
| Yes | 113 (53) |
| No | 102 (47) |
| **Experience with HIS** | |
| Never | 17 (8) |
| Yes, currently | 158 (73) |
| Yes, previously | 40 (19) |
| **Length of HIS use** | |
| 0 - 6 months | 34 (16) |
| 6 - 12 months | 41 (19) |
| More than 12 months | 140 (65) |
| **Documentation time per patient, average** | |
| 5 - 10 minutes | 108 (50) |
| 11 - 15 minutes | 94 (44) |
| More than 16 minutes | 13 (6) |
| **Typing skills** | |
| Poor | 4 (2) |
| Fair | 21 (10) |
| Good | 109 (51) |
| Very good | 66 (31) |
| Excellent | 15 (7) |
| **Medical problems affecting your ability to use HIS** | |
| Yes | 23 (11) |
| No | 192 (89) |

### *Respondents' experience with HIS*

Regarding the survey reliability, the analysis of the satisfaction level statements showed good internal consistency ($\alpha = 0.809$) **(Table 3)**. Furthermore, 65% of the respondents reported to be using HIS in their medical practice for more than 12 months at least. Half of the physicians reported 5 – 10 minutes to be their average time for documentation per patient. It was 11- 15 minutes for 44% of physicians and more than 16 minutes for 6% of physicians respectively. Nearly half of the participants (51%) felt that their typing skills were good and 31% felt they had very good typing skills, while 7% of them perceived their typing skills as excellent. Of the total respondents, 23 (11%) reported having experienced a medical problem that adversely affected their ability to use HIS.

**Table 3: Cronbach's alpha results of questions measuring satisfaction level**

| | Number of items | Cronbach's alpha | Internal consistency |
|---|---|---|---|
| HIS satisfaction related questions | 19 | 0.809 | High |

### *Respondents' attitudes towards HIS*

#### *Overall experience with HIS*

Roughly half (48%) of the respondents found HIS easy to use, while only 11 (5%) of them found that HIS was difficult to use. A total of 149 of the participants agreed with the claim that HIS reduces paperwork. Most of the physicians (73%) stated HIS helped maintain patient confidentiality. Many physicians (46%) believed that HIS reduced communication with patients, and 14% disagreed with the idea. More than half (54%) of the respondents felt that HIS improved the quality of their clinical practice. Only 4% of respondents did not agree with the claim that HIS improved the quality of practice. 41% of the participants agreed that HIS increased their workload **(Table 4, Figure 1).**

#### *HIS quality and user-interface design*

Nearly half (51%) of the respondents found the user interface design easy to navigate, and 20% of the respondents reported being satisfied with the accuracy of data entered by the nursing staff, whereas 74 (34%) of the physicians were dissatisfied. Regarding the laboratory result documentation on HIS, 35% of the respondents reported being satisfied with the process while 30% of the physicians were dissatisfied. On the other hand, 28% respondents reported being satisfied


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with the prescription process. Regarding the medical refill process in HIS, only 59 (27%) respondents reported being satisfied with the process, while 84 (39%) of the physicians admitted to being dissatisfied with the process. Further, with respect to the electronic appointment system in HIS, nearly half (49%) of the respondents reported being satisfied with the process. Most of the physicians (70%) agreed that HIS facilitated documentation and review of patient data. With respect to patient history accessibility, 49% were satisfied with this aspect of HIS design, and 13% respondents reported being unsatisfied **(Table 4, Figure 1).**

**Table 4: HIS satisfaction measures related to physician's experiences, network and technical issues, quality, and user-interface design.**

| Statement | Agree | Disagree | Neutral | Mean ± SD | Direction |
|---|---|---|---|---|---|
| **I am satisfied with the quality of computer devices in my workplace** | 87 (40) | 36 (17) | 92 (43) | 2.24 ± 0.71 | Yes |
| **I am satisfied with the availability of technical support** | 39 (18) | 85 (40) | 91 (42) | 1.78 ± 0.73 | Natural |
| **I am satisfied with HIS connection stability** | 23 (11) | 130 (60) | 62 (29) | 1.49 ± 0.68 | No |
| **I find the system (HIS) easy to use** | 103 (48) | 11 (5) | 101 (47) | 2.42 ± 0.59 | Yes |
| **HIS interface is easy to use** | 109 (51) | 8 (4) | 98 (46) | 2.47 ± 0.58 | Yes |
| **HIS reduces paperwork** | 149 (69) | 12 (6) | 54 (25) | 2.63 ± 0.6 | Yes |
| **HIS facilitates documentation and reviewing of patient data** | 150 (70) | 12 (6) | 53 (25) | 2.63 ± 0.6 | Yes |
| **HIS keeps patient information confidential** | 157 (73) | 12 (6) | 46 (21) | 2.70 ± 0.56 | Yes |
| **HIS reduces communication with patients** | 98 (46) | 30 (14) | 87(40) | 2.32 ± 0.71 | Yes |
| **I am satisfied with the accuracy of data entered by the nursing staff** | 43 (20) | 74 (34) | 98 (46) | 1.82 ± 0.72 | Natural |
| **I am satisfied with accessibility to the history of patient's visits** | 106 (49) | 27 (13) | 82 (38) | 2.34 ± 0.71 | Yes |
| **I am satisfied with laboratory result documentation in HIS** | 76 (35) | 64 (30) | 75 (35) | 2.04 ± 0.81 | Natural |
| **I am satisfied with HIS ability in documenting and reviewing patients' medication list** | 78 (36) | 60 (28) | 77 (36) | 2.08 ± 0.8 | Natural |
| **I am satisfied with the prescription process in HIS** | 60 (28) | 77 (36) | 78 (36) | 1.90 ± 0.81 | Natural |
| **I am satisfied with medication refill process in HIS** | 59 (27) | 84 (39) | 72 (33) | 1.87 ± 0.81 | Natural |
| **I am satisfied with electronic appointment system** | 105 (49) | 38 (18) | 72 (33) | 2.33 ± 0.76 | Yes |
| **HIS increased my workload** | 88 (41) | 31 (14) | 96 (45) | 1.75 ± 0.7 | Natural |
| **HIS improves quality of my practice** | 117 (54) | 9 (4) | 89 (41) | 2.49 ± 0.59 | Yes |


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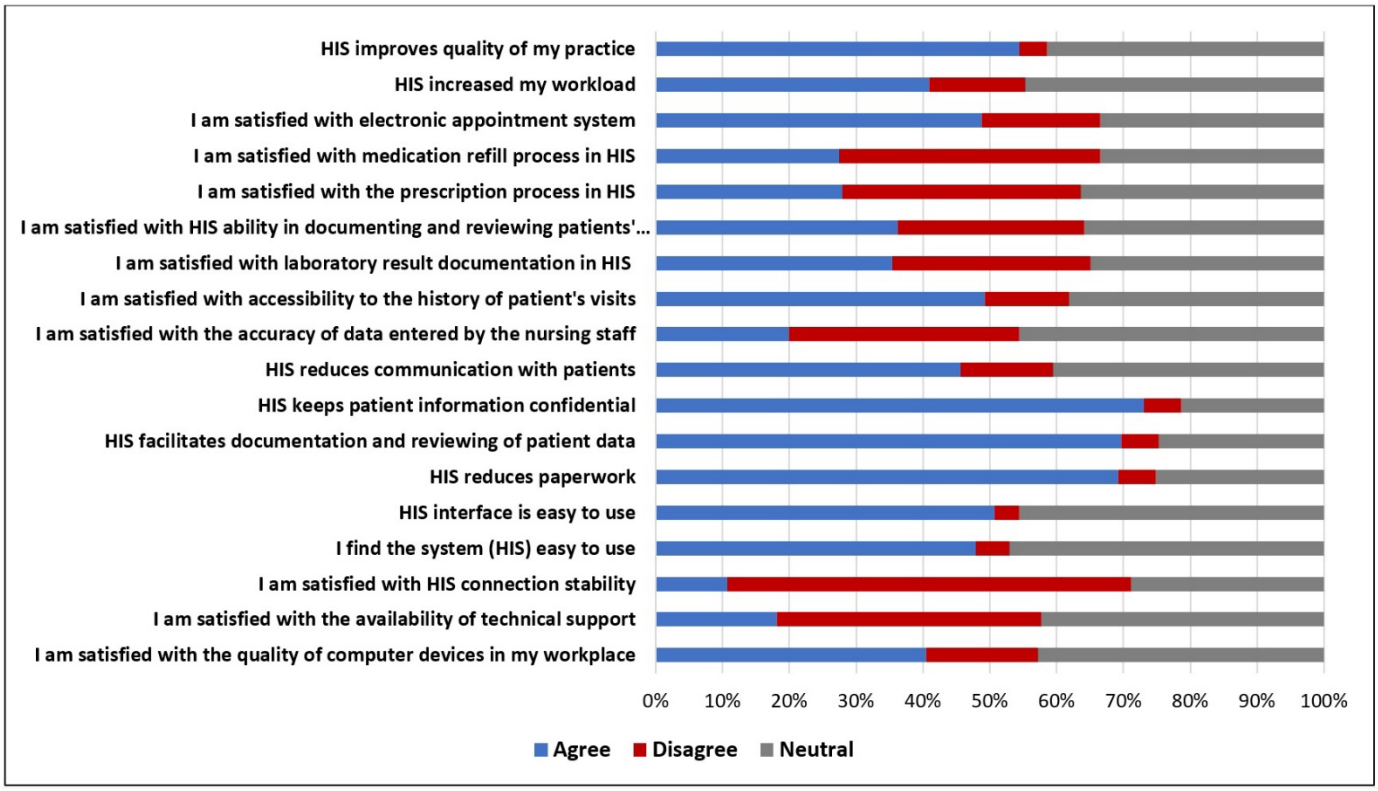


*Figure 1: HIS satisfaction measures related to physician's experiences, network and technical issues, quality, and user-interface design*

### *Network and technical issues*

A total of 40% of the respondents reported being satisfied with the quality of the computer devices at the primary health center, while 43% of the physicians had a neutral stance. Only 11% of the participants were satisfied in terms of the stability of the connection. The majority (60%) remained unsatisfied with the stability of the HIS connection **(Table 4, Figure 1).**

The aggregated satisfaction ratings for HIS based on the responses of the participants are as follows: 4 (2%) of the respondents gave an overall rating of 'poor' to HIS, and 26 (12%) of them rated it as 'fair', 97 (45%) of them rated it as 'good', and 80 (37%) of them rated it as 'very good', and lastly, 8 (11%) of them found HIS 'excellent' on the whole **(Table 5, Figure 2).**

**Table 5: Participant's overall satisfaction rating towards HIS**

| Rating | Frequency (%) |
|---|---|
| Excellent | 8 (4) |
| Very good | 80 (37) |
| Good | 97 (45) |
| Fair | 26 (12) |
| Poor | 4 (2) |


*Figure 2: Participant's overall satisfaction rating towards HIS*

### *Comparison among individual subgroups of demographic and psychosocial groups*

Using comparative statistical tests, it has been found that nationality ($p=0.017$), HIS training ($p=0.001$), and stress or burnout ($p=0.001$) were significantly associated with physicians' satisfaction levels with the HIS system. Non-Saudi patients had a significantly higher mean satisfaction level compared with non-Saudi patients. HIS-trained respondents were found to be more satisfied than their untrained counterparts. Physician stress and burnout seemed to demonstrate an inverse correlation with satisfaction levels **(Table 6).**


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**Table 6: Results of satisfaction level comparison among individual subgroups of demographic and psychosocial groups**

| | p-value |
|---|---|
| **Age groups** | 0.282 |
| **Gender** | 0.158 |
| **Nationality** | **0.017*** |
| **Marital status** | 0.382 |
| **Qualification** | 0.604 |
| **Job designation** | 0.723 |
| **Length of work experience** | 0.246 |
| **Sector** | 0.736 |
| **Work schedule** | 0.927 |
| **Patients per day, average** | 0.213 |
| **HIS training** | **0.001*** |
| **Length of HIS experience** | 0.93 |
| **Documentation time per patient, average** | 0.983 |
| **Typing skills** | 0.61 |
| **Medical problems affecting HIS usage** | 0.111 |
| **Stress or burnout** | **0.001*** |

** P-value < 0.05 is statistically significant*

## Discussion

This study assessed the PHC physician's satisfaction levels with HIS in Al-Ahsa, Saudi Arabia. The majority of the PHC physicians (n = 157; 73%) expressed that HIS was useful in protecting patient confidentiality. Today, in the context of health information, the needs of those providing, regulating, and paying for healthcare are often in conflict with the tenets of patient confidentiality and privacy. Studies report that there has been an ongoing debate among medical practitioners about the safety and feasibility of storing all patient information in a computerized form and making it accessible across institutions (12, 13). This is largely because the practitioners are subject to legal and ethical action for breaches of confidence. The positive perception of the respondents in our study regarding the ability of HIS to preserve patient confidentiality might be an important factor in driving their overall satisfaction with its implementation.

Further, more than half of the respondents agreed that the system facilitated the processes of patient data documentation and review (n = 150; 70), and reduced paperwork (n = 149; 69). A study conducted to determine the factors governing health information systems' efficiency found that clinicians considered a system to be efficient if it reduced their documentation time (14). This is important since the literature on health information technology reports an association of the electronic records related to detailed documentation with increased time pressure, and consecutive staff dissatisfaction (15).

Interestingly, an overwhelming proportion of the respondents (n = 130; 60) indicated being dissatisfied with the connection stability to HIS. According to Holden, interrupted connectivity was a major barrier to the implementation of an electronic health records system (16). The study reported that poor wireless connectivity from the lack of routers being spread across the outpatient clinics and operating rooms, led to limited accessibility, and slowed productivity, which impeded patient care (16). Therefore, it is incumbent on the PHC centers to ensure that their internet connection speed and bandwidth are sufficient to support HIS.

When asked about the availability of technical support on-site, only 18% (n = 39) of the physicians in our study reported being satisfied. Formal technical support has been found to be a major facilitator of a physician's use of electronic health record systems. According to Holden, that practitioners were most appreciative of one-on-one, on-demand technical support when encountering issues during actual care situations (16).

Our study found a statistically significant difference ($p=0.001$) in the satisfaction levels between physicians who had received prior training in HIS and those who had not. Formal training is suggested to be one of the most common barriers to the adoption of health information systems. While training physicians in the use of technology, it has been noted that educational efforts must ensure that the practitioners understand why the system is being implemented, and how they can utilize all relevant features (16). Early staff training beginning in the technology implementation phase is a determining factor in the problem-free integration of the system into clinical practice (17). In addition, there was a significant difference in the HIS satisfaction levels among the various levels of physician stress/burnout ($p=0.001$). This may indicate the presence of common


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factors that affect physicians' professional wellbeing and their contentment with the technology. Physician burnout is a widespread, multifaceted problem, well beyond the context of this report. Over the past years, it has been significantly linked with the rise of electronic health records systems due to the exhaustive data documentation and associated time-pressure during patient care (18).

In terms of overall satisfaction with HIS, the most frequent aggregated respondent rating was reported as 3/5 on a 5-point Likert scale (n = 97; 45). This is in line with a Brazilian study performed in 2012 about community health center physicians' satisfaction with the EMR system (19). From a total of 99 physicians who responded to the survey (89% response rate), 2 (2%) were satisfied, 50 (50.5%) were satisfied in part, and 47 (47.5%) were not satisfied (19). A Saudi Arabian study done by Alharthi et al. in 2014 about physicians' satisfaction toward EMRs in general governmental hospitals showed a low overall satisfaction level; 65% of the respondents expressed general dissatisfaction with the system (10). Furthermore, 61% wished to abandon the system and go back to paper records, and 90% asked for an alternate EMR. User perceptions and satisfaction with the system were also found to depend on the particular system being used (10). The overall satisfaction of the physicians was found to be significantly associated with the quality and performance of the system. However, despite their overall negative attitude towards the system, the physicians acknowledged that the technology would probably improve the quality of care. This is consistent with the findings of our study, in which 54% (n = 117) of respondents said HIS improved the quality of their practice. Nevertheless, 58% of the physicians were dissatisfied with the speed of the system, reporting that it took a long time to move between screens and that the system was slow to start up. Clinicians in other studies had similar concerns (10). An overwhelming majority of the physicians felt dissatisfied with the stability of the connection to the system.

#### *Strengths and weaknesses*

The participant selection approach involved all doctors working in PHCs who met the inclusion criteria of being physicians and working in urban PHCs. Selected PHC centers (52 centers) in the four PHC sectors in Al-Ahsa were included in the sample, and most of the targeted population responded to the questionnaire. These high responses assure the generalization of the results to the target population. One weakness of our study was the lack of exclusion of PHC physicians who were not experienced or trained in HIS.

#### *Implications and recommendations*

The finding that HIS-trained physicians in PHCs in Al-Ahsa have more satisfaction with HIS makes a case for more training initiatives for nontrained doctors, as their level of training could enhance their satisfaction with the system and also reduce health information system-related burnout. Further investigation is recommended to determine the cause of the nationality and stress/burnout related differences among physicians and their satisfaction levels toward HIS. Technical barriers to the successful implementation of HIS also need to be investigated in depth.

## Conclusion

In conclusion, physicians were moderately satisfied with the HIS, and that various aspects of the system require improvement. Continued evaluation of installed systems and feedback from users must guide future improvements in the technology. Despite the huge investment in health information systems and the push by the Ministry of Health for wide implementation of HIS, the results of this study indicate that the choice and implementation of HIS in Saudi PHCs still need work. Further research is required to investigate the causes of the physician's stress/burnout, and non-trainee physician dissatisfaction, and enhance HIS related satisfaction among primary health care physicians.

### Disclosure

#### *Statement*

The authors declare no conflict of interest.

#### *Funding*

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#### *Ethical consideration*

The investigators received approval from the Ethics Committee of King Fahad Hospital Hofuf (KFHH) with ethical number: 68-EP-2021.

#### *Data availability*

Data that support the findings of this study are embedded within the manuscript.

#### *Authors' contribution*

All authors contributed equally to the drafting, writing, sourcing, article screening and final proofreading of the manuscript.


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## References


1. Hasanain R, Vallmuur K, Clark M. Progress and challenges in the implementation of electronic medical records in Saudi Arabia: A systematic review. Health Informatics-An International Journal. 2014;3(2):1-14.

2. Cesnik B, Kidd MR. History of health informatics: a global perspective. Studies in health technology and informatics. 2010;151:3-.

3. Ben-Assuli O. Electronic health records, adoption, quality of care, legal and privacy issues and their implementation in emergency departments. Health policy. 2015;119(3):287-97.

4. Alsalman D, Alumran A, Alrayes S, Althumairi A, Almubarak Sa, Alrawiai S, et al. Implementation status of health information systems in hospitals in the eastern province of Saudi Arabia. Informatics in Medicine Unlocked. 2021;22:100499.

5. Al Jarullah A, El-Masri S. Proposal of an architecture for the national integration of Electronic Health Records: a semi-centralized approach. Quality of Life through Quality of Information: IOS Press; 2012. p. 917-21.

6. Sligo J, Gauld R, Roberts V, Villa L. A literature review for large-scale health information system project planning, implementation and evaluation. International journal of medical informatics. 2017;97:86-97.

7. Alotaibi YK, Federico F. The impact of health information technology on patient safety. Saudi medical journal. 2017;38(12):1173-80.

8. Robertson A, Cresswell K, Takian A, Petrakaki D, Crowe S, Cornford T, et al. Implementation and adoption of nationwide electronic health records in secondary care in England: qualitative analysis of interim results from a prospective national evaluation. Bmj. 2010;341.

9. Gagnon M-P, Desmartis M, Labrecque M, Car J, Pagliari C, Pluye P, et al. Systematic review of factors influencing the adoption of information and communication technologies by healthcare professionals. Journal of medical systems. 2012;36(1):241-77.

10. Alharthi H, Youssef A, Radwan S, Al-Muallim S, Zainab A-T. Physician satisfaction with electronic medical records in a major Saudi Government hospital. Journal of Taibah University Medical Sciences. 2014;9(3):213-8.

11. Al Alawi S, Al Dhaheri A, Al Baloushi D, Al Dhaheri M, Prinsloo EA. Physician user satisfaction with an electronic medical records system in primary healthcare centres in Al Ain: a qualitative study. BMJ Open. 2014;4(11):e005569.

12. Mandl KD, Markwell D, MacDonald R, Szolovits P, Kohane IS. Public standards and patients' control: how to keep electronic medical records accessible but private Medical information: access and privacy Doctrines for developing electronic medical records Desirable characteristics of electronic medical records Challenges and limitations for electronic medical records Conclusions Commentary: Open approaches to electronic patient records Commentary: A patient's viewpoint. Bmj. 2001;322(7281):283-7.

13. Markwell D. Commentary: Open approaches to electronic patient records. BMJ: British Medical Journal: International Edition. 2001;322(7281):286-.

14. Allan J, Englebright J. Patient-centered documentation: an effective and efficient use of clinical information systems. JONA: The Journal of Nursing Administration. 2000;30(2):90-5.

15. Abbey M, Chaboyer W, Mitchell M. Understanding the work of intensive care nurses: a time and motion study. Australian Critical Care. 2012;25(1):13-22.

16. Holden RJ. What stands in the way of technology-mediated patient safety improvements? A study of facilitators and barriers to physicians' use of electronic health records. Journal of patient safety. 2011;7(4):193.

17. Oxentenko AS, West CP, Popkave C, Weinberger SE, Kolars JC. Time spent on clinical documentation: a survey of internal medicine residents and program directors. Archives of internal medicine. 2010;170(4):377-80.

18. Robertson SL, Robinson MD, Reid A. Electronic health record effects on work-life balance and burnout within the I3 population collaborative. Journal of graduate medical education. 2017;9(4):479-84.

19. Holanda AA, do Carmo e Sá HL, Vieira APGF, Catrib AMF. Use and satisfaction with electronic health record by primary care physicians in a health district in Brazil. Journal of medical systems. 2012;36(5): 3141-9



http://dx.doi.org/10.52533/JOHS.2022.2906