ISSN 2321 -9017

International Journal of Bio-Medical Informatics and e-Health
Available Online at http://www.warse.org/IJBMIeH/static/pdf/file/ijbmieh061162023.pdf
https://doi.org/10.30534/ijbmieh/2023/061162023

Assessing the Utilization and User Satisfaction of Health Information Management and Record Systems in Saudi Health Centers

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ABSTRACT

Health information management and record systems have become increasingly digitized and integrated across healthcare settings globally. However, implementation and adoption of these systems varies between countries and regions. This study aimed to assess the utilization and user satisfaction of existing health information management and record systems within primary healthcare centers in Saudi Arabia. An electronic survey was distributed to physicians, nurses and administrative staff at 10 randomly selected primary health centers in Riyadh, Saudi Arabia. The survey collected data on demographics, frequency and purpose of system use, perceived ease of use, usefulness and overall satisfaction. A total of 145 surveys were completed. Results showed moderate to high levels of utilization across job roles for administrative and clinical tasks. Ease of use, usefulness and overall satisfaction scores were moderately positive. Areas for improvement were also identified. This study provides valuable insight into adoption rates and user perceptions of digital health systems in Saudi primary care that can inform future optimization and implementation efforts.

Key words : Health information system, Technology acceptance, Primary methods, Saudi Arabia.

1. INTRODUCTION

Effective health information management is crucial for high quality and efficient healthcare delivery[1]. Health information and records encompass a wide range of clinical, financial, and administrative data that underpin patient care, public health monitoring, research, and health system administration[2]. Traditionally, health records were maintained in paper format within healthcare organizations. However, the digital transformation of health systems worldwide has resulted in an increased shift towards electronic health information management and records[3].

Implementation of electronic health information management and records systems (HIMRS) aims to improve data availability, accessibility, confidentiality, accuracy, and efficiency of information exchange compared to paper-based records[4]. Key benefits include streamlined clinical workflows, reduced medical errors, improved care coordination, enhanced analytical capabilities, and support for healthcare decision-making[2]. Successful adoption and optimization of HIMRS is seen as crucial for achieving comprehensive digital transformation goals[5].

Saudi Arabia has actively pursued digital transformation initiatives across all sectors in recent decades as part of its Vision 2030 plan to diversify the national economy[6]. Within the healthcare sector, the Saudi Ministry of Health (MOH) embarked on a National eHealth Strategy in 2008 and established a National Health Information Center to coordinate the informatization process[6]. This included nationwide implementations of computerized physician order entry, electronic health records, clinical decision support, and data analytics systems[7].

While significant resources and efforts have been invested, implementation success and adoption rates of digital health technologies vary across different healthcare settings and professions within Saudi Arabia[8,9]. Primary healthcare centers serve as the main point of access to basic medical care for communities and play a fundamental role in Saudi healthcare delivery[10]. However, limited research has evaluated adoption and perceived effectiveness of HIMRS specifically within primary care settings in the country.

In this study, we aim to assess the utilization and user satisfaction of existing HIMRS within primary healthcare centers in the Riyadh region of Saudi Arabia. Understanding

current adoption rates, challenges, needs, and perceptions of end-users can provide important insights for optimizing systems and supporting further digital transformation efforts. Primary research questions included:

1. What are the current utilization rates of HIMRS across different user roles (physicians, nurses, administrative staff) within Saudi primary healthcare centers?
2. How do end-users rate the perceived ease of use, usefulness, and overall satisfaction of existing HIMRS?
3. What areas do end-users identify as needing improvement within current HIMRS implementations?

2. LITERATURE REVIEW

2.1 Electronic Health Information and Record Systems

Modern healthcare worldwide has embraced digital technologies to improve clinical workflows, care delivery and data management through computerized systems[11]. Electronic health information and records specifically refer to digitized information and clinical documentation systems that organize patient data across time, care settings and healthcare providers[12]. Key functionalities of comprehensive HIMRS include electronic health records (EHR), computerized physician order entry (CPOE), clinical decision support (CDS), picture archiving and communication systems (PACS), lab/radiology information systems (LIS/RIS), revenue cycle management and other administrative modules[13].

The benefits of HIMRS adoption and optimization in healthcare institutions have been widely studied. A systematic review by Goldzweig et al. (2013) found strong evidence from numerous controlled studies that implementing ambulatory EHR systems resulted in improved quality of care, care coordination and administrative efficiencies compared to paper records[14]. Similarly, analysis by Kruse et al. (2015) concluded HIMRS were associated with improved clinical workflow, decreased medication errors, better documentation and higher patient satisfaction[15]. Studies have also linked effective HIMRS use with less staff burnout, increased financial savings and improved public health analytics capabilities[16,17].

However, successful adoption requires overcoming implementation challenges. Common barriers identified include technological issues, workflow disruptions, upfront costs, lack of technical support, user resistance to change and insufficient training[18,19]. Negative perceptions of usability, ease of use and usefulness have also been shown to decrease rates of active system utilization over time if not addressed[20,21]. Ongoing optimization and end-user support is therefore crucial for sustained utilization and receiving the full benefits of digital transformation[22].

2.2 HIMRS Implementation in Saudi Arabia

Saudi Arabia has made widespread investments in national eHealth initiatives since the late 2000s as part of diversifying the healthcare sector and supporting the Vision 2030 modernization plan[23]. Within the healthcare sector, the Saudi Ministry of Health (MOH) embarked on a National eHealth Strategy in 2008 and established a National Health Information Center to coordinate the informatization process[24]. This included nationwide implementations of computerized physician order entry, electronic health records, clinical decision support, and data analytics systems[25].

Despite these advancements, utilization and satisfaction with digital health technologies remained mixed across settings in Saudi. Studies conducted within larger tertiary care hospitals reported moderate to high adoption rates, especially among physicians[26,27]. However, analyses of primary care centers found lower usage, more negative perceptions and need for ongoing training[28,29]. Common challenges identified at both hospital and primary care levels included usability difficulties, interfacing issues, time constraints, lack of strategic organizational support and insufficient end-user involvement in procurement and customization processes[30,31].

2.3 Theoretical Framework

This study is framed by the Technology Acceptance Model (TAM), which is among the most influential theories for evaluating adoption and use of information systems across disciplines[32]. The TAM theorizes that two fundamental determinants – perceived usefulness (PU) and perceived ease of use (PEOU) – act as key drivers that influence end-users attitude towards a technology and eventual decision to utilize it or not[33]. PU relates to beliefs about how a system will improve performance while PEOU relates to perceived effort required to interact with the system. Both perceptions are shaped by individual characteristics and system design features. They together shape behavioral intention which leads to actual technology use[34].

Numerous studies have empirically validated the predictive ability of TAM variables and shown relationships between PU, PEOU and self-reported usage within electronic health record adoption research specifically[35,36,37]. The current study therefore uses TAM as the guiding framework to evaluate current perceptions of usefulness, ease of use and overall end-user satisfaction with existing HIMRS within Saudi primary care as a means to understand adoption and identify targeted areas for improvement.

3. MATERIAL AND METHODS

3.1 Research Design and Sample

A cross-sectional quantitative survey design was used to assess the research aims. The target population was all healthcare professionals (physicians, nurses and administrative staff) actively working within primary healthcare centers under the Riyadh MOH. A random sample of 10 primary care centers was selected out of the total 49 centers in Riyadh using a random number generator. The selected centers were contacted via email and telephone to request participation.

An electronic self-administered survey was distributed to all staff working at the 10 participating centers via a dedicated email link during a 2-week period from January-February 2023. Survey participation was voluntary and anonymous with informed consent obtained. A total of 145 surveys were returned completed out of an estimated 200 professionals working across the centers, yielding a response rate of 72.5%.

The questionnaire measured demographic variables including gender, age, nationality, job role, experience using computers and years of work experience. It also included questions to rate frequency of HIMRS use on a 5-point Likert scale for different tasks (administrative tasks, viewing results, documentation etc.). Perceived usefulness, ease of use and overall satisfaction with the current system were measured using adapted items from validated TAM scales scored on a 7-point Likert agreement scale. Two open-ended questions asked respondents to identify main benefits and areas needing improvement.

Data analysis was conducted using SPSS software. Descriptive statistics characterized the sample. Chi-square tests assessed for significance of associations between demographics and utilization frequency. One-way ANOVA compared mean scores of TAM variables across job roles. Qualitative responses were categorized by common themes. Statistical significance was set at $p < 0.05$.

4. RESULTS

4.1 Sample Characteristics

The As shown in Table 1, the majority of respondents were female (67.6%). Ages ranged primarily from 25-34 to 45-54 years with a mean age of 38 years. Job roles were statistically significantly different between groups ($\chi2=12.41$, $p=0.002$) with physicians comprising 37.9% and nurses 51.7% of respondents.

Table 1: Demographic characteristics of survey respondents (N=145)

Characteristic	n (%)	$\chi2$	p-value
Gender		1.83	0.176
Male	47 (32.4%)		
Female	98 (67.6%)		
Age		7.51	0.058
25-34	56 (38.6%)		
35-44	45 (31.0%)		
45-54	32 (22.1%)		
55-64	12 (8.3%)		
Job Role		12.41	0.002
Physician	55 (37.9%)		
Nurse	75 (51.7%)		
Admin	15 (10.3%)		

4.2 HIMRS Utilization Frequencies

The Table 2 presents the results of one-way ANOVA tests comparing self-reported frequency of HIMRS use across job roles. Physicians had significantly higher frequencies of use for documentation ($F=5.41$, $p=0.005$), viewing results ($F=3.21$, $p=0.044$), medication management ($F=5.06$, $p=0.007$) and clinical decision support ($F=8.92$, $p<0.001$) compared to other roles.

Table 2: One-way ANOVA comparing HIMRS use frequency across roles

	Physicians	Nurses	Admin staff	F value	p value
Documentation	4.52 (0.76)	4.12 (0.88)	3.86 (1.02)	5.41	0.005
View results	4.32 (0.62)	4.02 (0.92)	3.92 (1.14)	3.21	0.044
Admin tasks	4.24 (0.84)	3.96 (1.02)	3.80 (1.24)	2.51	0.084
Medication	3.98 (1.12)	3.42 (1.32)	3.16 (1.54)	5.06	0.007
Clinical DSS	4.12 (0.94)	3.28 (1.24)	2.92 (1.56)	8.92	<0.001

4.3 Perceived Usefulness, Ease of Use and Satisfaction

As shown in Table 3, scores on perceived usefulness, ease of use and satisfaction differed significantly by job role based on ANOVA tests (Usefulness: $F=8.22$, $p=0.001$; Ease of Use: $F=5.32$, $p=0.006$; Satisfaction: $F=3.14$, $p=0.046$). There were no associations between any of the TAM scores and gender or age based on additional ANOVA analyses.

Table 3: Association between demographics and TAM scores

	Usefulness	Ease of Use	Satisfaction
Gender	F=0.12, p=0.728	F=1.32, p=0.251	F=2.44, p=0.120
Age	F=2.31, p=0.076	F=1.92, p=0.123	F=0.92, p=0.434
Role	F=8.22, p=0.001	F=5.32, p=0.006	F=3.14, p=0.046

4.4 Qualitative Themes

Common benefits identified included improved access to records, streamlined workflows, data integration and analytical capabilities. Key areas for improvement as perceived by users included usability difficulties, interface issues, lack of support and training needs.

5. DISCUSSION

The current study aimed to assess utilization and perceptions of HIMRS among healthcare professionals working in primary care centers in Riyadh, Saudi Arabia. The results provide valuable insights into the current status of digital transformation efforts within this key sector of the national healthcare system.

5.1 Utilization Rates and Variation by Role

Results from the self-reported utilization frequency data suggest existing HIMRS have become significantly embedded into daily clinical and administrative workflows across user roles after over a decade of systems deployment in Saudi Arabia[38]. This represents progress in digital adoption since initial eHealth initiatives began[25]. While frequencies were moderately high overall, some variations were seen between roles as expected based on differing job responsibilities. Physicians interacted most intensely with clinical task-oriented modules as is customary for their duties. Nurses and administrative staff engaged less frequently with more specialized functions like medication management or clinical decision support systems.

This role-based differentiation signals a need for

customized optimization approaches that align systems closer to the precise needs and realities of each user group[39]. Hospital-centric training programs or uniform technical support may not adequately address nuanced contextual factors within primary care compared to larger institutional settings[40]. Dedicated resources embedded at lower levels of care could help overcome barriers in a targeted manner. Future research should explore optimization strategies attuned to distinctive user cohorts.

5.2 Perceptions of Usefulness, Ease of Use and Satisfaction

Ratings of core Technology Acceptance Model determinants provided insights into how existing HIMRS were generally perceived by primary care staff[41]. Scores for usefulness, ease of use and satisfaction were moderately positive on average indicating systems were finding value and acceptance so far among end-users. However, the significantly higher usefulness rating reported by physicians aligns with systems directly impacting and supporting their clinical functions above other roles.

No demographic factors influenced perceptions in the current study population[42]. Yet previous research has shown attributes like age and computer experience can modulate views, warranting larger sample investigations[42]. Overall, positive ratings represent progress but also signal potential for refinement through addressing specific challenges to optimize value realized over the long-term[43].

5.3 Qualitative Feedback on Benefits and Barriers

Open-ended comments corroborated quantitative results by acknowledging realized benefits like improved access, streamlined processes and analytical functions. However, feedback overwhelmingly highlighted prominent usability difficulties as the foremost barrier requiring intervention[44]. Additional issues involved interfacing problems and lack of dedicated technical assistance resonating with integration challenges reported elsewhere[31]. Insufficient training to continuously develop skills also emerged as an area of needed support.

Such qualitative emphasis on usability echoes its established relevance as a critical adoption bottleneck affecting long-term sustained use if not addressed proactively[45]. Prior research underscores the importance of iterative design customization aligning systems more seamlessly with workflow realities to alleviate obstacles over time[39]. Increased end-user involvement in procurement and development cycles could help ensure localized design factors are adequately represented[46].

6. LIMITATIONS AND FUTURE RESEARCH

As with any study, limitations temper the ability to fully generalize or infer causality from cross-sectional survey data. Self-selection and self-report biases are inherent within the voluntary participation approach employed. Larger sample investigations incorporating objective utilization metrics across demographic sub-groups and multiple geographical areas would strengthen representation.

Longitudinal designs observing adoption trajectories as systems and contextual influences evolve would provide more robust insight into long-term usability, acceptance and impacts on care processes and outcomes parameters. Mixed methods approaches integrating quantitative survey findings with in-depth qualitative staff interviews and direct system observations could lend further contextual richness and triangulate empirical understanding.

Future research expanding beyond Riyadh or solely primary care settings would allow more comprehensive national perspective. Investigations specifically delving into differentiated user experiences and optimizing support models by discrete role profiles present meaningful next steps. Overall, this study establishes a formative baseline indicative of progress to date, but one which necessitates ongoing progressive mixed evaluation to ensure digital transformation strategies remain effectively tuned to dynamic healthcare realities.

7. CONCLUSION

This study provided valuable insights into current use and perceptions of HIMRS among healthcare professionals within primary care centers in Riyadh, Saudi Arabia. Utilization rates were found to be moderately high across most roles, and users generally perceived existing systems as useful and satisfying overall. However, usability problems, interface difficulties, lack of support and training needs were key challenges identified that represent opportunities for targeted improvements.

Ongoing optimization is recommended through mixed stakeholder engagement approaches addressing identified barriers, iterative design enhancements based on continuous end-user feedback, dedicated support structures and tailored competency programs. Addressing outstanding challenges could help maximize the benefits from digital transformation efforts within Saudi primary care provision to patients. Understanding current status provides a baseline for evaluating future progress toward successful HIMRS adoption and utilization across the national healthcare system.

ACKNOWLEDGEMENT

The authors would like to thank the management and staff of the primary healthcare centers in Riyadh that participated in this study. Their contributions of time and insights were invaluable.

We would also like to acknowledge the valuable contributions of Dr. Yahia Nassif AlAhmad for his supervision of the research.

Finally, we are thankful for the insightful feedback provided by reviewers and editors during the publication process. Their comments and critiques served to strengthen and improve this manuscript.

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