The Impact of Health Information System on Medical and Pharmaceutical Decision-Making in Government Hospitals: A Cross-Sectional Study in Saudi Arabia

Mana Ali Alsulaiman[1], Mohammed Ahmed Alshehri[2], Naif Nasser Alotaibi[2], Abdulrahman Mohammad Al Ghamdi[2], Adel Ali Almaashy[2], Fouad Burayd Alzahrani[2], Ali Hadi Al Dughman[3], Nada Dhafer Al Mukhalas[4], Munahia Mohammed Mubarak Alyami[5], Hassan Shajea Al Rezg[5]

[1]Senior Specialist in Health Informatics Management, Specialized polyclinic National guard, KSA.
[2]Pharmacy technician, Specialized Polyclinic National Guard, KSA.
[3]Pharmacist, Najran Health Cluster, KSA.
[4]MSN,Bsc,RN,CBHQ, Nurse, Quality Improvement Director, Najran Health, KSA.
[5]Health Informatics, Najran Health Cluster, KSA.

Abstract

Background: Health information systems are essential for obtaining the data needed to make medical and pharmaceutical decisions to improve healthcare outcomes. Therefore, the study aimed to investigate the impact of health information systems on medical and pharmaceutical decision-making in government hospitals in Saudi Arabia. Methods: A cross-sectional study was conducted among 368 healthcare workers (HCWs) including Medical Informatics, physicians, pharmacists, and administrators from August 2024 to October 2024. Study participants were selected using simple random sampling techniques. Descriptive statistics mean and percentage were calculated. The study used a generalized linear mixed model. Variables with a p-value < 0.05 were considered as predictors of HIS use. Results: The results showed a statistically significant positive relationship between the effectiveness of health information systems and the efficiency of decision-making, as these systems contributed to improving the accuracy and reliability of the available data. The R^2 value was 0.259, indicating that 26% of the variance in decision-making can be explained by health information systems. Conclusion: The study emphasizes the need to strengthen training and resources allocated to these systems to ensure better health outcomes, which enhances the effectiveness of health care delivery.

Keywords: Decision-Making, Health Information, Government Hospitals, Saudi Arabia.

1. Introduction

Health systems and hospitals are facing enormous challenges, especially in the field of health information management, and the resulting spread of information and its arrival at a level where traditional methods are unable to deal with it effectively and efficiently [1].

As it is known that health organizations are intensive information and produce large amounts of data every day, which means that safe and reliable health care depends greatly on access to accurate, effective and reliable information and its timely use [2,3]. In addition, health information plays an important and major role in making health care planning decisions. Therefore, providing support systems to analyze information effectively is crucial to making informed decisions and enhancing the efficiency of data collection, storage, organization and retrieval processes [4]. There is no doubt that health information systems have many benefits in the health sector, as this is not limited to reducing errors and increasing the speed of health care, but it may also reach reducing costs by coordinating services between different medical specialties and improving health care [5]. One of the basic keys to health systems is the presence of a well-functioning health information system that ensures production, analysis, dissemination and use of reliable and timely information about health factors, the health system, performance and health status [6].

There is a relationship between information systems and decision-making, as information systems and technology have helped officials make appropriate decisions to deal with the challenges they face immediately [7]. According to Greens, medical decision-making requires three main areas: the availability of accurate health information about the problem, the availability of knowledge and experience, and finally the availability of problem-solving skills. Health decisions depend on reaching the correct treatment for the patient, diagnosing his condition, reviewing the results of his examinations and x-rays, and at the same time directing attention and focus on pathological values that exceed the normal rates of a healthy person, which directs thinking towards a specific path. It also provides recommendations specific to that patient resulting from processing those data and values and linking them to his condition and original data [8]. Therefore, developing health information systems is an indispensable necessity to keep pace with changes, solve problems, make decisions efficiently, and integrate between various medical specialties in order to improve the quality of health services for patients. The current study aims to examine the impact of health information system on Medical and Pharmaceutical Decision-Making in Saudi Government Hospitals.

2. Methods

Study design

This cross-sectional study used a validated online questionnaire hosted on Google Forms® platform. The questionnaire items for this study were developed with the help of experts in Health Information research, medical and pharmacy specialties and based on literature review [9,10]. The questionnaire was divided into two parts. The first part was designed to obtain the socio-demographic characteristics of the respondents, including gender, age, income,

educational level, etc. The second part included 18 items and investigated the health information system and medical and pharmacy decision making in Saudi Arabia. A five-point Likert scale (strongly agree - strongly disagree) was used. The survey was conducted from August 2024 to October 2024.

Study Participants and Sample Size

All healthcare workers (HCWs) including Medical Informatics, physicians, pharmacists, and administrators in hospitals at Saudi Arabia were included. HCWs who were working as hospital managers, sub-operations and heads of departments/units were randomly selected and formed the study population. HCWs who were working in various administrative positions in hospitals for at least one year prior to the survey period were included in the study. The minimum required sample size was calculated via Raosoft®, using a 95% confidence level and a 5% margin of error (significance $\alpha = 0.05$) with a 50% response distribution. It was found to be 368 respondents.

Data collection

The survey was distributed electronically to a diverse group of health informatics stakeholders, physicians, pharmacists, and other health professionals through online channels, including email and social media platforms (e.g., WhatsApp® and Facebook® groups). Participants were informed that participation was voluntary and that they could withdraw, and participants' identities were kept confidential to encourage open and honest responses. The survey was conducted in both English and Arabic to accommodate the linguistic diversity of participants.

Data analysis

Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA), version 26. Frequency and percentages were obtained for the categorical variables, while mean and standard deviation (SD) were calculated for the scale variables. Various inferential statistical tests were employed to identify significant variations within the study groups, including the independent t-test, one-way analysis of variance (ANOVA), Pearson's correlation (r), multiple linear regression, and logistic regression.

3. Results

Socio-Demographic Characteristics of the Respondents

A total of 368 responses from HCWs were collected. The study group falls within the age group of 18-60 years. About (7.9%) of the participants are less than 25 years old, (32.6%) are between 25 – 30 years, followed by (34.8%) are between 31 – 40 years. Among the study groups, (63.3%) male, (36.7%) Female. Most respondents were working as Medical Informatics (48.6%), physicians (23.6%), pharmacists (10.6%). Nearly, 40.5%) of the HCWs had 1-3 years of experience, (35.9%) more than 7 HCWs . Besides, the majority of participants holding a bachelor's degree (72.0%), as shown in table (1).

Table 1.demographic traits of participants (n=368)

	Categories	Frequency	Percent %
Age (years)	< 25 years old	29	7.9%
	25-30 years old	120	32.6%
	31-40 years old	128	34.8%
	> 40 years	91	24.7%
sex	male	233	63.3%
	Female	135	36.7%
Educational level	Bachelor's degree	265	72.0%
	MSc	84	22.8%
	PhD	19	5.2%
Occupation	Medical Informatics	179	48.6%
	physicians	87	23.6%
	Pharmacist	39	10.6%
	other	63	17.1%
Monthly Family Income (SAR)	2000−6000	188	51.1%
	6000−12,000	104	28.3%
	>12,000	76	20.7%
Years of experience	1-3 years	149	40.5%
	4-6 years	87	23.6%
	≥ 7 years	132	35.9%

Level of implementation of the health information system

The results in Table (2) show that the level of application of the health information system from the point of view of the study sample came with an arithmetic mean of (4.20), which is the degree of agreement in responding to the paragraphs of this axis. The results of the table also show that the first dimension "Elements of a health information system" obtained first place according to an arithmetic mean of (4.32), and that the second dimension "Retrieving health information" obtained last place with an arithmetic mean of (4.08).

Table 2. Mean, Standard Deviation, and Chi-Square for the Level of implementation of the health information system statement.

	Paragraph	Mean	Std. Deviation	Chi-Square	p-value
Elements of a health information system					
1	The electronic medical record provides quick access to patient examination results.	4.44	0.82	404.51	.000
2	E-consultation facilitates communication between primary health care providers, doctors and pharmacists.	4.30	0.89	305.63	.000
3	Virtual clinics help in quickly diagnosing the patient's condition and making it easier for him.	4.24	0.95	274.66	.000
	The Average	4.32	0.88		
Retrieving health information					
1	The health information system provides all the necessary information.	4.44	0.85	424.51	.000
2	The health information system used takes into account the legal and ethical considerations of patient data.	3.75	1.46	149.05	.000
3	The devices and technologies used provide appropriate information that serve the hospital's objectives.	4.23	0.96	274.45	.000
4	The health information system produces statistical data and information that meet the needs of the various hospital departments in a timely manner.	3.88	1.36	171.67	.000
The Average		4.08	1.16		
Access to health information					
1	The health information system provides accurate and reliable data and information.	4.17	1.04	251.22	.000

2	The health information system provides timely data and information.	4.32	0.93	334.66	.000
3	The health information system provides highly efficient data and information.	4.24	1.05	307.72	.000
4	The health information provided by the information system is suitable for various emergencies and urgent circumstances.	4.06	1.11	200.71	.000
The Average		4.20	1.03		
HCWs efficiency					
1	The HCWs working in the information system are highly efficient in dealing with the available devices.	4.29	0.96	316.96	.000
2	HCWs are provided with the basic skills needed to deal with modern information systems.	4.11	1.06	218.41	.000
3	The management HCWs individuals with high experience in information systems.	4.16	1.08	261.04	.000
4	The HCWs in each department are proficient in handling the available information system	4.26	0.91	288.41	.000
The Average		4.21	1.00		

As is clear from the results of the first dimension, the paragraph that states "The electronic medical record provides quick access to patient examination results." obtained first place with an arithmetic mean of (4.44), and the paragraph that states "Virtual clinics help in quickly diagnosing the patient's condition and making it easier for him." obtained last place with an arithmetic mean of (4.24). According to the results of the second dimension, the paragraph states "The health information system provides all the necessary information." The first place was taken with an arithmetic mean of (4.44), while the paragraph that states "The health information system used takes into account the legal and ethical considerations of patient data." was taken last with an arithmetic mean of (3.75). As is clear from the results of the third dimension, the paragraph that states "The health information system provides timely data and information." ranked first with an arithmetic mean of (4.32), while the paragraph that states "The health information provided by the information system is suitable for various emergencies and urgent circumstances." ranked last with an arithmetic mean of (4.06). According to the results of the fourth dimension, the paragraph that states "The HCWs working in the information system are highly efficient in dealing with the available devices." ranked first with an arithmetic mean of (4.29), while the paragraph that states "HCWs are provided with the basic skills needed to deal with modern information systems." ranked last with an arithmetic mean of (4.11).

Medical and Pharmaceutical decision making

Table 3. Mean, Standard Deviation, and Chi-Square for the medical and pharmaceutical decision-making statement.

	Paragraph	Mean	Std. Deviation	Chi-Square	p-value
1	Management collects sufficient information about the problem in order to make a decision about it	3.87	1.36	164.69	.000
2	Management analyzes alternatives in order to make a decision.	4.33	0.98	352.07	.000
3	The administration takes into consideration the appropriate timing for making a medical decision	4.24	0.92	270.13	.000
4	Management makes the most efficient decisions.	4.08	1.10	209.86	.000
5	Electronic medical record and electronic consultation help in accurate medical decision-making	4.34	0.86	337.66	.000
6	Phone diagnosis and virtual clinics help speed up medical decision-making	4.17	1.06	257.69	.000
7	The health information system produces statistical data and information that contributes to making the right medical decision.	4.01	1.11	221.55	.000

The Average	4.15	1.06

The results in Table (3) show that the level of medical decision-making from the point of view of the study sample came with an arithmetic mean of (4.15), which is the degree of agreement in responding to the paragraphs of this axis. The results of the table show that the paragraph that reads "The electronic medical file and electronic consultation help in accurate medical decision-making" obtained first place with an arithmetic mean of (3.95), and that the paragraph that reads "Management collects sufficient information about the problem in order to make a decision about it" obtained last place with an arithmetic mean of (3.87).

Relationship between Health Information System on Medical and Pharmaceutical Decision-Making.

There is a statistically significant impact at the level of significance (0.05) to support sound and effective practices in clinical governance on the performance of employees in government hospitals.

Table 4. Simple linear regression between (Health Information System) and (Medical and Pharmaceutical Decision-Making).

Model	β	t	Sig.	F	p-value	R	R-Square
(Constant)	13.504	9.138	.000	114.84	0.000	.509	.259
Health Information System	1.204	10.716	.000				

Dependent Variable: Medical and Pharmaceutical Decision-Making.

Table (4) shows the simple linear regression between the variables (Medical and Pharmaceutical Decision-Making) and (Health Information System). We find that the value of the statistical significance level for the F-test was (0.000), which is less than (0.05). This means that the relationship between the variables is linear and can be relied on in predicting the dependent variable based on the independent variable. In addition, the R-Square was (0.259). This means that the independent variable (Health Information System) contributes to the dependent variable (Medical and Pharmaceutical Decision-Making) by 26%, and the remaining effects on the dependent variable are due to other variables.

4. Discussion

This study demonstrates the importance of health information systems in enhancing the medical and pharmaceutical decision-making process in government hospitals in the Kingdom of Saudi Arabia. With the increasing volume of data and the challenges facing health organizations, the results provide valuable insights into the importance of developing effective information systems that help integrate tasks between different medical specialties and make decisions to ensure the provision of high-quality health care.

The results indicate that there is a strong relationship between the effectiveness of health information systems and the efficiency of decision-making, as information systems represent a primary source of accurate and reliable information on which clinical practices rely. This is consistent with previous studies that emphasized the importance of health information systems and their role in decision-making, improving work efficiency and reducing medical errors, which

reflects their positive impact on the quality of health care [11,12]. The level of employee satisfaction with health information systems (4.20) is similar to the results of global consensus that reported a high level of the importance of health information systems as a tool for improving healthcare decisions [13].

In addition, information systems have contributed to improving the speed of access to patient information, which improves the effectiveness of medical and pharmaceutical decision-making and thus enhances the quality of care. These results are in line with studies indicated that the use of electronic records facilitates communication between healthcare providers, leading to more accurate and effective medical decisions [14,15]. The results also indicate a statistically significant positive relationship between health information systems and medical and pharmaceutical decision-making processes in government hospitals, as the coefficient (β) for the health information system was 1.204, indicating that improving the performance of health information systems can lead to enhancing the effectiveness of decision-making. The R^2 value of 0.259 indicates that 26% of the variance in medical decision-making can be explained by health information systems, reflecting their significant impact in this context. This supports the results of many previous studies that emphasized the importance of health information systems in improving the quality of healthcare [16]. In addition, the current results emphasize the need for greater investment in developing health information systems and enhancing the training of workers in this field, which contributes to improving the overall performance of hospitals. This investment will have a tangible impact on the quality of health services provided, which ultimately achieves better outcomes for patients.

Therefore, health organizations should focus on enhancing the capabilities of health information systems by improving training on their use and developing features related to information retrieval. It is also recommended to continue research to explore other factors that may influence the medical decision-making process, which contributes to improving health outcomes and raising the level of efficiency of services provided.

5. Conclusion

This study provides strong evidence for the importance of health information systems in improving medical and pharmaceutical decision-making. Given the results, the study recommends increased investment in developing health information systems and training health personnel to enhance the quality of health care in government hospitals in Saudi Arabia.

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