Knowledge, Attitudes and practices Towards Use of Technology in Patient Management among Health Care Staff in Saudi Arabia

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ABSTRACT

The use of technology in patient management has brought a change in the delivery of health care in Saudi Arabia. This study evaluates the Knowledge, Attitudes and practices of healthcare staff in Saudi Arabia on the application of technology in managing patients. Descriptive research approach was used and self-administered questionnaires were administered to 186 healthcare staff, selected through random

sampling technique. The study shows that healthcare providers have a diverse understanding and adoption of technology. Most understand the value of technology in terms of efficiency. The attitudes toward technology are mostly positive with technology being seen as crucial to deliver high-quality care. However, some practices regarding data privacy and security affect perceptions and usage. The findings of the study suggest the importance of elaborate training interventions for each healthcare role, approaches to managing resistance to change, and information on protection of data. The future work should focus on the effectiveness and consequences of technology adoption on patient and staff experience and the best practices in technology adoption. To overcome these challenges is important for achieving the vision of using technology in improving the patient management and healthcare in Saudi Arabia.

KEYWORDS: Electronic health Records (EHRs), patient Management, healthcare Staff.

1. Introduction

Global adoption of technology advancement has remained conspicuous in the healthcare systems, changing the patient care system. This change is being driven by the need to make care more effective, better for the patient, and smarter in its use of resources. Still, Saudi Arabia has specifically focused on applying technology in patient management as a tool capable of solving the kingdom's health care issues (Alshahrani et al., 2019).

Saudi Arabia has made large investments in digital health infrastructure, allowing for the use of blockchain technology, telemedicine, remote monitoring, mobile health (mHealth) apps, and artificial intelligence (Health Sector Transformation Program 2021).

Health care continued to embrace technologies that assumed global practices of patient management including those in Saudi Arabia. Considering the Kingdom's Vision 2030 strategy a great effort is being made to improve the quality of healthcare service by using sophisticated technologies. This comprised the use of telemedicine, artificial intelligence commonly known as AI and the implementation of electronic Health record commonly known as EHRs influential tools that are redesigning way health care practitioners and patients engage. The move towards the enhancement of the use of technology in the delivery of health care is more than just the introduction on new gadgets; it entails a change of culture of the health care staff to the gadgets (Revolutionizing Healthcare in KSA Saudi Arabia | Technology, 2024).

The use of information technology (IT) in the healthcare industry has also been prioritized by the Saudi government. Some hospitals have begun employing healthcare information systems to deliver high-quality patient care to accomplish this (Altuwaijri, 2008).

According to Evans (2016) and Graber et al. (2017), EHR was one of the first digital health technologies to be widely embraced (Evans, 2018; Graber et al., 2017). In order to offer a digital substitute that enables rapid access, backup, and recovery of patient data, Saudi Arabia began implementing EHR in the early 2000s (AlSadrah,

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2020; Sebai et al., 2001).In order to enhance clinical efficiency, decrease mistakes in patient history records, and establish a nationwide database of patient information, the Ministry of Health Saudi Arabia implemented an EHR system called the Unified Health File. By enabling physicians to make better judgments based on precise and up-to-date data, the usage of EHRs enhanced patient care (Yousef et al., 2020).

It has also been determined that electronic health records are a useful tool for assisting in the management of noncommunicable diseases (Hazazi & Wilson, 2021). EHRs are used in many of Saudi Arabia's medium-sized private hospitals in addition to MOH institutions (Aldosari, 2014).

EHRs were created to store patients' critical information, including basic demographic information, medical diagnosis details, and treatment plans. The potential influence of patient participation and enhancement in healthcare delivery is represented by the availability of those data via mobile applications or online portals (Dendere et al., 2019; Lyles et al., 2020).

Electronic health records are therefore a major step-up in-patient management practice. It supports integrated storage of medical knowledge for the professionals cutting short delays related to paperwork as well as chances of erroneous entries. For EHRs to be implemented effectively across the continuum of care, there must be a change of organisational culture or staff attitude since the staff must work in a new way on patient clinical records to support better patient outcomes. The advantages of the integrated access to data are clearly seen in the synergy of medical teams (Almaiman et al., 2014).

Following these current trends, Saudi Arabia in March 2017 unveiled a new National Model of Care that incorporates eHealth, health innovation canters, virtual self-care programs, a platform for Saudi medical appointments, referral facilities, and health education initiatives.

Even though integrating technology has many advantages, there are still obstacles in the way of the Saudi healthcare system's broad embrace of these advancements. Effective implementation may be hampered by obstacles like staff aversion to change, a lack of training on new technologies, and worries about data protection. Resolving these issues is essential to creating a welcoming atmosphere where technology can flourish and improve patient care procedures45.(Almaiman et al., 2014; Uraif, 2024).

Study problem

The application of technology in healthcare has changed the way patient is managed, but there are still key issues in the effective use of the technology among the health care workforces. Because EHRs, telemedicine and other related technologies are slowly becoming integrated into healthcare systems, it is important to assess the knowledge, attitude and practice of healthcare workers regarding these technologies. Although technology could improve patient care, there are challenges that include lack of training, resistance to change and issues to do with data security and confidentiality that hamper the use of technology.

Research indicates that healthcare professionals often face difficulties navigating various technological platforms due to a lack of standardization and integration. Clinicians may need to log into multiple systems for different tasks, leading to frustration and inefficiencies in patient management. This disjointed landscape not only affects healthcare providers but also impacts patient experiences; patients may struggle to engage with multiple applications for their care needs. The complexity of these systems can create friction that discourages both providers and patients from fully utilizing available technologies (Akhtar et al., 2022).

Moreover, studies have shown that problems with health information technology (HIT) can adversely affect patient outcomes. Issues such as system access difficulties, software malfunctions, and inadequate communication between information systems can lead to delays in care and increased risks for patients. These technical challenges highlight the need for healthcare staff to possess adequate knowledge and confidence in using technology effectively. Without proper training and support, the potential for technology to improve patient management is significantly diminished (Ash et al., 2003).

Another key factor of concern is the staff's attitude towards technology. Attitudes can enhance the adoption of new tools in clinical practice, and negative attitudes might hinder or slow down the change in adopted patterns of working. It is crucial to know how healthcare managers and other staff members evaluate the role of technology in the management of patient data to define areas, in which changes can be introduced to facilitate the use of technologies (Jamal et al., 2009).

There are concerns related to data privacy and security that can influence attitudes towards technology use. Healthcare staff may hesitate to adopt new technologies if they perceive them as posing risks to patient confidentiality or if they are unsure about compliance with regulatory standards. Addressing these concerns through education and clear communication about data protection measures is vital for fostering trust in technological solutions (Akhtar et al., 2022).

The problem is further compounded by varying levels of technological proficiency among different healthcare roles. For instance, nurses may have different experiences and comfort levels with technology compared to physicians or administrative staff. This disparity can create barriers to effective collaboration and communication when utilizing integrated technological systems for patient management (Chaudhry et al., 2006).

To address these challenges, it is essential to conduct a comprehensive assessment of knowledge, attitude and practice regarding technology use among healthcare staff. By identifying specific areas where knowledge is lacking, or attitudes are negative, targeted training programs can be developed to enhance skills and promote a culture of innovation within healthcare settings. Such initiatives not only improve individual competencies but also contribute to better team dynamics and overall patient care quality.

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2. Literature review

The awareness among the healthcare providers about the technologies to manage patients such as EHRs, telehealth, and mHealth apps is essential for using them. In research concerning the knowledge attitudes and practices of healthcare staff it has been found that knowledge varies depending on the staff's background, education and previous experience with technology. For instance, Kruse et al. (2016) revealed that staff with more experience of EHRs training had better capability to handle patients' data and they were more satisfied and involved in EHRs use. In addition, training that increased knowledge of HIT was found to lead to better diagnostic accuracy and increased patient satisfaction (Li et al., 2020).

Another research by Alsadan et al. (2018) found that although most of the HCPs understand the possible advantages of HIT, they rarely have comprehensive information about the capabilities of these systems. This limited knowledge can lead to underutilization or misuse of technology hence compromising the quality of patient care. Thus, the ongoing education and practical training exertion are vital for healthcare staff to adapt to new technology (Sadoughi et al., 2021).

The study conducted by Hasanain et al. (2015) investigates the knowledge, acceptance, and preferences of healthcare professionals regarding Electronic Medical Record (EMR) systems in seven public hospitals across Saudi Arabia. The findings reveal that both English language proficiency and education levels are significantly correlated with computer literacy and EMR literacy among healthcare staff. Participants whose first language was not Arabic showed a stronger preference for using EMR systems compared to those who spoke Arabic, indicating that language barriers may hinder EMR adoption in a predominantly Arabic-speaking environment. The study also highlights that higher education levels correlate with increased computer and EMR literacy, suggesting that educational background influences attitudes towards technology adoption. A significant majority (approximately 83%) of participants preferred using EMRs over traditional paper records, with a notable preference among staff in smaller hospitals. However, barriers such as lack of knowledge, experience with EMR systems, and staff resistance were identified as key challenges to implementation. The authors recommend that hospitals assess staff's English proficiency and computer literacy before implementing EMR systems and provide targeted training programs to enhance these skills, thereby increasing acceptance and effective use of technology in patient management (Hasanain et al., 2015).

This paper by Sana A. AlSadrah focuses on the perception of EMRs implementation and its challenges in the Saudi Arabia healthcare sector. Although the government has embarked on a process to improve the adoption of EMR since 2008, several challenges have however retarded the processes, some of which include; Attitudinal barriers among the healthcare professionals, low levels of computer literacy among the same professionals, and poor IT support among others. The review integrates data from other studies to show that despite a good understanding of the advantages of the EMRs, specifically in enhancing the quality and speed of patient care, the use of EMRs is still limited, especially in small and rural hospitals. The author

underlines that only a few hospitals have adopted complete EMR systems; there are considerable differences in the hospital's adoption of such systems on the regional level. Suggestions are provided to overcome these obstacles and enhance the implementation of EMRs; stressing more on training and development to suit hospital requirement. In general, the review reveals the importance of EMRs in enhancing the health care system in Saudi Arabia although it is recognized that there are number of barriers that need to be addressed to achieve the potential of EMRs (AlSadrah, 2020).

The study by Al Otaybi et al. investigates the performance, barriers, and satisfaction of healthcare workers regarding electronic medical records (EMRs) in Saudi Arabia through a national multicenter survey involving 2,684 participants across four cities. Findings indicate that nearly half of the respondents reported high computer usage experience, and 54.3% had attended EMR training. The median performance score for EMRs was 24, while satisfaction scores ranged from 16 to 80, with a median of 53. Notably, older participants and those who attended training exhibited higher performance and satisfaction levels. The primary benefits identified were enhanced quality of care and productivity, whereas significant barriers included temporary loss of access to patient records during system failures and concerns over privacy and security. Overall, the study highlights a generally positive attitude towards EMRs among healthcare workers in Saudi Arabia, though it underscores the need for addressing technical and operational challenges to improve their implementation (Otaybi et al., 2022).

In a cross-sectional study on electronic health record (EHR) adoption among healthcare providers in Saudi Arabia, high levels of knowledge and usage were observed across both Saudi and non-Saudi participants. The study, which included 521 healthcare providers from various occupations and regions, found that the majority recognized the significance of EHRs for improving efficiency and reducing medical errors. Usage was also high, with EHRs commonly employed for laboratory reports, medication prescriptions, follow-ups, and hospitalization procedures. However, there was a notable gap in training participation, which resulted in skill deficiencies for some participants, emphasizing the need for additional training programs to optimize EHR utilization across healthcare providers (Abdullah Alharbi, 2023).

3. Methodology

Given the nature of the current study topic (Knowledge, Attitudes and practices Towards Use of Technology in Patient Management among health care staff in Saudi Arabia). To achieve the study objectives, the researcher used the descriptive method, which is: the type of research by which all members of the research community or a large sample of it are questioned; with the aim of describing the phenomenon being studied in terms of its nature and degree of existence. (Al-Assaf, 2016, p. 211).

Study Community

The current study community consists of health care staff in Saudi Arabia.

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Study Sample

The origin of scientific research is to be conducted on all members of the research community; because this is more likely to confirm the results, but the researcher resorts to choosing a sample of them if this is not possible due to their large number, for example" (Al-Assaf, 2003, p. 96); therefore, the researcher chose a random sample, where the sample amounted to (186) of health care staff in Saudi Arabia.

Study tool

Based on the nature of the data and the methodology followed in the study, the researcher found that the most appropriate tool to achieve the objectives of this study is (the questionnaire). The study tool was built by referring to the literature and previous studies related to the subject of the study, Knowledge, Attitudes and practices Towards Use of Technology in Patient Management among health care staff in Saudi Arabia. The researcher designed the initial questionnaire and distributed it to the study sample to find out the data that this tool seeks to collect. The validity and reliability procedures for this tool were verified. The following is a detailed explanation of how to prepare the tool and the procedures taken by the researcher to verify the validity and reliability of the tool.

Data Analysis

The researcher used the statistical software SPSS for data analysis, which is the appropriate method for such types of studies. Several statistical methods were employed, including:

▪ Pearson Correlation coefficient: This was used to ensure the validity of internal consistency.

▪ Cronbach's Alpha Scale: This test was utilized to confirm the reliability of the questionnaire.

▪ Frequencies and percentages: of study sample responses.

▪ Mean and standard deviation: for each statement in the questionnaire, as well as the calculation of the mean and standard deviation for each axis of the questionnaire.

▪ Simple Linear Regression coefficient: This was used to determine the strength and direction of the relationship between the independent variable and the dependent variable.

Validation of questionnaire

The validity of the study tool means ensuring that it measures what it was prepared to measure. It also means that the questionnaire includes all the elements that enter the analysis on the one hand, and the clarity of its expressions on the other hand, so that it is understandable to everyone who uses it. The researcher verified the validity of the study tool through:

Honesty of arbitrators

The face validity method was used, with the aim of ensuring the validity of the questionnaire and its suitability for research purposes, by presenting it to a group of academic and specialist arbitrators, and asking them to express an opinion regarding the extent of the validity and validity of each paragraph of the questionnaire and its suitability for measuring what it was designed to measure, and introducing Necessary amendments, whether by deletion, addition or reformulation. The arbitrators presented suggested amendments to the study tool, and the researcher took those observations into account, made the necessary amendments that were agreed upon by most arbitrators, and then relied on the questionnaire in its final form.

Internal consistency validity

Through internal consistency, we know the extent to which each paragraph of the questionnaire is consistent with the axis/dimension to which this paragraph belongs. To calculate the validity of the internal consistency of the study tool, the Pearson correlation coefficient was calculated (Pearson Correlation Coefficient), through which the correlation coefficients were calculated between the score of each item and the total score of the dimension (the average score of the items of the dimension) to which the item belongs. The following tables show the validity of the internal consistency.

Table (1): internal consistency results

N = 236		
Knowledge Towards Use of Technology in Patient Management among health care staff in Saudi Arabia	Pearson Correlation Coefficient	Sig
1- I am knowledgeable about the key features and functions of electronic health records (EHR) systems in patient management.	.802**	.000
2- I understand the role of technology in improving patient safety and reducing medical errors.	.563**	.000
3- I am aware of how technology supports clinical decision-making, such as through clinical decision support systems.	.779**	.000
4- I have a good understanding of telemedicine applications and how they benefit patient follow-up and remote care.	.774**	.000
5- I know the types of information (e.g., lab results, imaging) that can be efficiently managed through EHR systems.	.870**	.000
6- I understand data security protocols and privacy requirements when using technology for patient management.	.787**	.000
7- I am familiar with using mobile health (mHealth) applications to support patient care, such as for patient monitoring.	.716**	.000
8- I know how technology can support interdisciplinary communication and collaboration in patient care.	.741**	.000
9- I understand the importance of updating and maintaining electronic systems to ensure accuracy in patient records.	.785**	.000
attitude Towards Use of Technology in Patient Management among health care staff in Saudi Arabia		
1- I believe that EHR systems are essential for high-quality and efficient patient care	.633**	.000
2- I am confident that using technology in patient management reduces the likelihood of errors and improves overall safety	.575**	.000
3- I am open to adopting new technologies that support patient-centered care and improve workflows	.804**	.000
4- I feel that technology can enhance communication between healthcare	.827**	.000

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providers and patients		
5- I am comfortable learning new digital tools if they can enhance the quality of care	.827**	.000
6- I believe that EHRs and other digital tools help streamline administrative tasks, allowing more time for patient interaction	.885**	.000
7- I am concerned that technology in patient management might negatively impact the human aspect of care	.784**	.000
8- I believe the potential benefits of technology in patient management justify the training required to use it effectively	.833**	.000
Practices Towards Use of Technology in Patient Management among health care staff in Saudi Arabia		
1- I regularly use EHR systems to document patient interactions and update patient records	.852**	.000
2- I incorporate telemedicine or virtual consultations in patient follow-up care when appropriate	.894**	.000
3- I engage with clinical decision support systems (e.g., alerts, reminders) to assist in patient treatment and diagnosis	.819**	.000
4- I follow data security protocols (e.g., logging out of systems, password management) to ensure patient confidentiality when using digital tools	.872**	.000
5- I participate in training sessions and workshops to improve my competence with patient management technologies	.728**	.000

It is clear from the previous table that the Pearson correlation coefficient values for each item for each dimension with the total score of the dimensions; Positive and statistically significant at the significance level (0.01), where the values of the correlation coefficients ranged from (.0 563) as a minimum to (0. 894) as a maximum. This indicates the presence of internal consistency in the items of each dimension, and their suitability for measuring what they were designed to measure.

Reliability of the questionnaire

Reliability of the questionnaire means that it gives approximately the same results if it is applied repeatedly to the same people in similar circumstances. The reliability of the questionnaire was calculated using Cronbach's Alpha, it was equal to 0.977. This means that the study tool has a high degree of stability and can be relied upon in the field application of the study. It is also an important indicator that the items that make up the questionnaire give stable and stable results if it is re-applied to the study sample members again. Therefore, there is reassurance regarding the analysis of the study data.

For each factor, it had 5 Likert-type items, this factor was pretested and checked for internal consistency. Accordingly, all the items were found to qualify internal consistencies table 2 shows the values of Cronbach's Alpha coefficient (α) of each factor. Likert-type items had five response anchors: (from 1– 'Strongly Disagree' to 5– 'Strongly agree').

Table (2): Reliability of the questionnaire

Factors	Number of items	Cronbach's alpha
Knowledge Towards Use of Technology in Patient Management among health care staff in Saudi Arabia	9	0.954
attitude Towards Use of Technology in Patient Management among health care staff in Saudi Arabia	8	0.958

Practices Towards Use of Technology in Patient Management among health care staff in Saudi Arabia	5	0.981
Total questionary	22	0.977

It is clear from above table in Cronbach's Alpha coefficient (α) of each factors is very high where it ranged from 0.931 to 0.981

Study implementation procedures:

The questionnaire was sent to health care staff, where the researcher converted the questionnaire to electronic in order to collect the largest possible amount of the study sample, where the researcher distributed the questionnaire and after examining it, the researcher obtained (186) questionnaires valid for statistical analysis, after which the data was entered and processed statistically by computer using the (SPSS) program, and then the researcher analyzed the data and extracted the results.

Statistical processing methods:

To achieve the objectives of the study and analyze the data that was collected, many appropriate statistical methods were used using the Statistical Package for Social Sciences program, abbreviated as (SPSS28), after the data was coded and entered into the computer.

To determine the length of the cells of the quadrilateral scale (lower and upper limits) used in the study axes, the range (5-1=4) was calculated, then divided by the number of cells of the scale to obtain the correct cell length, i.e. (4/5= 0.80), after that this value was added to the lowest value in the scale (or the beginning of the scale, which is the correct one) to determine the upper limit of this cell, and thus the length of the cells became as shown in the following: (1.00 - 1.80) Strongly disagree, (1.80 – 2.60) disagree, (2.60 - 3.40) neutral, (3.40- 4.20) agree, (4.20-5) Strongly agree.

4. Results

Table (3): Characteristics of the study participants

Characteristics	N = 186	Frequency	Percentage
educational degree	diploma	144	77.4
	Bachelor's	42	22.6
Profession	Administrative	22	11.8
	Physician	36	19.3
	Nurse	55	29.5
	Specialist	40	21.5
	Technician	33	17.7
Years of Experience	Less than 3 years	24	12.9
	4 - 10	30	16.1
	11-15	72	38.7
	15+	60	32.3

The study studied 186 individuals, 77.4% had diploma degree, 22.6% had bachelor's degree, 11.8% were Administrative, 19.3% were Physician, 29.5% were Nurse,

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21.5% were Specialist, 17.7% were Technician. 38.7% had 11- 15 Years of Experience, 32.3% had more than 15 Years of Experience, 16.1% had 4-10 Years of Experience, and 12.9% had less than 3 Years of Experience (Table 3).

For factor 1: Knowledge Towards Use of Technology in Patient Management among health care staff in Saudi Arabia, the researcher calculated the mean, standard deviation (SD), relative weight, level of agreement, and ranking for each item. Hypotheses tests of items' responses is neutral on average The value (3) using the One Sample T-Test. Table (4) shows the results.

Table (4): Knowledge Towards Use of Technology in Patient Management among health care staff in Saudi Arabia

N = 186	Mean	Standard deviation	Relative weight	T-value	Sig	Agreement degree	Rank
1- I am knowledgeable about the key features and functions of electronic health records (EHR) systems in patient management.	4.41	0.91	88.14	23.85	.000	Strongly agree	3
2- I understand the role of technology in improving patient safety and reducing medical errors.	4.73	0.69	94.58	38.71	.000	Strongly agree	1
3- I am aware of how technology supports clinical decision-making, such as through clinical decision support systems.	4.15	1.21	83.05	14.67	.000	agree	4
4- I have a good understanding of telemedicine applications and how they benefit patient follow-up and remote care.	3.88	1.24	77.63	10.93	.000	agree	6
5- I know the types of information (e.g., lab results, imaging) that can be efficiently managed through EHR systems.	4.08	1.24	81.69	13.42	.000	agree	5
6- I understand data security protocols and privacy requirements when using technology for patient management.	3.64	1.33	72.88	7.45	.000	agree	7
7- I am familiar with using mobile health (mHealth) applications to support patient care, such as for patient monitoring.	4.42	1.08	88.47	20.27	.000	Strongly agree	2
8- I know how technology can support interdisciplinary communication and collaboration in patient care.	3.14	1.46	62.71	1.43	.154	neutral	9
9- I understand the importance of updating and maintaining electronic systems to ensure accuracy in patient records.	3.59	1.41	71.86	6.48	.000	agree	8
Mean of factor1	4.01	0.90	80.11	17.17	.000	agree	

The average of the sample members' answers to the "knowledge Towards Use of Technology in Patient Management among health care staff in Saudi Arabia" dimension was (4.01 out of 5) with a relative weight of 80.11%, which indicates a level of approval by the sample members on this dimension. The highest item received the highest degree of approval from the sample members was: The paragraph that states, "I understand the role of technology in improving patient

safety and reducing medical errors." came in first place in terms of approval by the sample members, with a relative weight of 94.58%.

While the item that received the lowest degree of support from the sample members was: The paragraph that states, "I know how technology can support interdisciplinary communication and collaboration in patient care." ranked next to last in terms of approval by the sample members, with a relative weight of 62.71%.

For factor 2: attitude, the researcher calculated the mean, standard deviation, relative weight, level of agreement, and ranking for each item. Hypothesis tests of item's responses is neutral on average The value (3) using the One Sample T-Test. Table (5) shows the results.

Table (5): attitude Towards Use of Technology in Patient Management among health care staff in Saudi Arabia

N = 186	Mean	Standard deviation	Relative weight	T-value	Sig	Agreement degree	Rank
1- I believe that EHR systems are essential for high-quality and efficient patient care	3.95	0.97	78.98	15.09	.000	agree	1
2- I am confident that using technology in patient management reduces the likelihood of errors and improves overall safety	3.93	1.03	78.64	13.97	.000	agree	2
3- I am open to adopting new technologies that support patient-centered care and improve workflows	3.93	1.03	78.64	13.97	.000	agree	3
4- I feel that technology can enhance communication between healthcare providers and patients	2.76	1.26	55.25	-2.90	.004	neutral	8
5- I am comfortable learning new digital tools if they can enhance the quality of care	3.63	1.17	72.54	8.27	.000	agree	5
6- I believe that EHRs and other digital tools help streamline administrative tasks, allowing more time for patient interaction	3.22	1.31	64.41	2.59	.010	neutral	7
7- I am concerned that technology in patient management might negatively impact the human aspect of care	3.73	1.15	74.58	9.74	.000	agree	4
8- I believe the potential benefits of technology in patient management justify the training required to use it effectively	3.41	1.31	68.14	4.78	.000	agree	6
Mean of factor2	3.57	0.90	71.40	9.77	.000	agree	

The average of the sample members' answers to the "attitude Towards Use of Technology in Patient Management among health care staff in Saudi Arabia"was (3.57out of 5) with a relative weight of 71.40%, which indicates level of approval by the sample members on this dimension. The highest item received the highest degree of approval from the sample members was the paragraph that states, "I believe that EHR systems are essential for high-quality and efficient patient care." came in first place in terms of approval by the sample members, with a relative weight of 78.98%.

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While the item that received the lowest degree of support from the sample members was the paragraph that states, "I feel that technology can enhance communication between healthcare providers and patients." ranked next to last in terms of approval by the sample members, with a relative weight of 55.25%.

For factor3: Practices Towards Use of Technology in Patient Management among health care staff in Saudi Arabia, the researcher calculated the mean, standard deviation, relative weight, level of agreement, and ranking for each item. Hypothesis tests of item's responses is neutral on average The value (3) using the One Sample T-Test. Table (6) shows the results.

Table (6): Practices Towards Use of Technology in Patient Management among health care staff in Saudi Arabia

N = 186	Mean	Standard deviation	Relative weight	T-value	Sig	Agreement degree	Rank
1- I regularly use EHR systems to document patient interactions and update patient records	4.26	0.76	85.16	22.50	.000	Strongly agree	1
2- I incorporate telemedicine or virtual consultations in patient follow-up care when appropriate	4.10	0.82	81.94	18.25	.000	agree	3
3- I engage with clinical decision support systems (e.g., alerts, reminders) to assist in patient treatment and diagnosis	4.13	0.80	82.58	19.37	.000	agree	2
4- I follow data security protocols (e.g., logging out of systems, password management) to ensure patient confidentiality when using digital tools	3.74	1.05	74.84	9.65	.000	agree	5
5- I participate in training sessions and workshops to improve my competence with patient management technologies	4.00	1.05	80.00	12.99	.000	agree	4
Mean of factor 3	4.13	0.80	82.58	19.37	.000	agree	

The average of the sample members' answers to the "training" dimension was (4.13 out of 5) with a relative weight of 82.58%, which indicates a high level of approval by the sample members on this dimension. The highest item received the highest degree of approval from the sample members was The paragraph that states, "I regularly use EHR systems to document patient interactions and update patient records." came in first place in terms of approval by the sample members, with a relative weight of 85.16%.

While the item that received the lowest degree of support from the sample members was: The paragraph that states, "I follow data security protocols (e.g., logging out of systems, password management) to ensure patient confidentiality when using digital tools." ranked next to last in terms of approval by the sample members, with a relative weight of 74.84%.

5. Discussion

The results indicate that while many healthcare professionals possess a foundational understanding of EHRs and their functionalities, gaps remain in comprehensive knowledge about advanced features and integration capabilities. This aligns with previous studies that highlight the correlation between healthcare staff training and their proficiency in utilizing technological tools. The limited exposure to training programs contributes to underutilization or misuse of technology, ultimately compromising patient care quality.

The perception that healthcare staff has about technology is crucial in the enhancement of technology. This research showed that having positive attitudes was helpful for the implementation of new tools, while negative perceptions hinder the process. Issues to do with data privacy and security were also cited as important factors in determining attitudes. Some healthcare care professionals are likely to resist the adoption of new technologies if these are associated with risks to patient privacy or regulatory non-conformity. It is crucial to establish trust in technological solutions by focusing on the above issues and providing accurate information through education.

Despite the acknowledged benefits of technology in improving patient management, several barriers persist. Resistance to change among staff, inadequate training, and concerns about data security were prominent challenges identified in this study. These issues resonate with previous findings that emphasize the need for a cultural shift within healthcare organizations to facilitate technology adoption. Moreover, varying levels of technological proficiency among different healthcare roles can create additional obstacles to effective collaboration and communication when utilizing integrated systems.

6. Recommendations

To build on these findings, future research should explore the following areas:

1. Comprehensive Training Programs: Develop structured training initiatives tailored to various healthcare roles to enhance knowledge and skills related to technology use.

2. Change Management Strategies: Investigate effective change management strategies that can be implemented within healthcare organizations to address resistance and promote a culture of innovation.

3. Impact Assessment: Conduct longitudinal studies to assess the long-term impacts of technology integration on patient outcomes and staff satisfaction.

4. Data Security Education: Implement educational programs focused on data protection measures to alleviate concerns regarding privacy and security.

5. Standardization Efforts: Explore avenues for standardizing technological platforms across healthcare settings to reduce complexity and improve user experience for both providers and patients.

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References

Abdullah Alharbi, R. (2023). Adoption of electronic health records in Saudi Arabia hospitals: Knowledge and usage. Journal of King Saud University - Science, 35(2), 102470. https://doi.org/10.1016/j.jksus.2022.102470

Akhtar, N., Khan, N., Qayyum, S., Qureshi, M. I., & Hishan, S. S. (2022). Efficacy and pitfalls of digital technologies in healthcare services: A systematic review of two decades. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.869793

Aldosari, B. (2014). Rates, levels, and determinants of electronic health record system adoption: A study of hospitals in Riyadh, Saudi Arabia. International Journal of Medical Informatics, 83(5), 330–342. https://doi.org/10.1016/j.ijmedinf.2014.01.006

Almaiman, A., Bahkali, S., Alfrih, S., Househ, M., & El Metwally, A. (2014). The use of health information technology in saudi primary healthcare centers. Studies in Health Technology and Informatics, 202, 209–212.

AlSadrah, S. A. (2020). Electronic medical records and health care promotion in Saudi Arabia. Saudi Medical Journal, 41(6), 583–589. https://doi.org/10.15537/smj.2020.6.25115

Alshahrani, A., Stewart, D., & MacLure, K. (2019). A systematic review of the adoption and acceptance of eHealth in Saudi Arabia: Views of multiple stakeholders. International Journal of Medical Informatics, 128, 7–17. https://doi.org/10.1016/j.ijmedinf.2019.05.007

Altuwaijri, M. M. (2008). Electronic-health in Saudi Arabia. Just around the corner? Saudi Medical Journal, 29(2), 171–178.

Ash, J, M, B., & Coiera, E. (2003). 1. Ash JS, Berg M, Coiera E. Some unintended consequences of information technology in health care: The nature of patient care information system-related errors. JAMIA. 2004;11:104-112. Journal of the American Medical Informatics Association, 11, 104–112.

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E., Morton, S. C., & Shekelle, P. G. (2006). Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care. Annals of Internal Medicine, 144(10), 742–752. https://doi.org/10.7326/0003-4819-144-10-200605160-00125

Dendere, R., Slade, C., Burton-Jones, A., Sullivan, C., Staib, A., & Janda, M. (2019). Patient Portals Facilitating Engagement With Inpatient Electronic Medical Records: A Systematic Review. Journal of Medical Internet Research, 21(4), e12779. https://doi.org/10.2196/12779

Evans, R. S. (2018). Electronic Health Records: Then, Now, and in the Future. Yearbook of Medical Informatics, 25, S48–S61. https://doi.org/10.15265/IYS-2016-s006

Graber, M. L., Byrne, C., & Johnston, D. (2017). The impact of electronic health records on diagnosis. Diagnosis, 4(4), 211–223. https://doi.org/10.1515/dx-2017-0012

Hasanain, R. A., Vallmuur, K., & Clark, M. (2015). Electronic Medical Record Systems in Saudi Arabia: Knowledge and Preferences of Healthcare Professionals. Journal of Health Informatics in Developing Countries, 9(1), Article 1. https://www.jhidc.org/index.php/jhidc/article/view/135

Hazazi, A., & Wilson, A. (2021). Leveraging electronic health records to improve management of noncommunicable diseases at primary healthcare centres in Saudi Arabia: A qualitative study. BMC Family Practice, 22(1), 106. https://doi.org/10.1186/s12875-021-01456-2

Jamal, A., McKenzie, K., & Clark, M. (2009). The impact of health information technology on the quality of medical and health care: A systematic review. Health Information Management: Journal of the Health Information Management Association of Australia, 38(3), 26–37. https://doi.org/10.1177/183335830903800305

Lyles, C. R., Nelson, E. C., Frampton, S., Dykes, P. C., Cemballi, A. G., & Sarkar, U. (2020). Using Electronic Health Record Portals to Improve Patient Engagement: Research

Priorities and Best Practices. Annals of Internal Medicine, 172(11 Suppl), S123–S129. https://doi.org/10.7326/M19-0876

Otaybi, H. F. A., Al-Raddadi, R. M., & Bakhamees, F. H. (2022). Performance, Barriers, and Satisfaction of Healthcare Workers Toward Electronic Medical Records in Saudi Arabia: A National Multicenter Study. Cureus, 14(2), e21899. https://doi.org/10.7759/cureus.21899

Revolutionizing Healthcare in KSA Saudi Arabia | Technology. (2024, March 25). https://saudihealthcareconsulting.com/revolutionizing-healthcare-delivery-technological-advancements-in-saudi-arabia/

Sebai, Z. A., Milaat, W. A., & Al-Zulaibani, A. A. (2001). HEALTH CARE SERVICES IN SAUDI ARABIA: PAST, PRESENT AND FUTURE. Journal of Family and Community Medicine, 8(3), 19.

Uraif, A. (2024). Developing Healthcare Infrastructure in Saudi Arabia Using Smart Technologies: Challenges and Opportunities. Communications and Network, 16(3), Article 3. https://doi.org/10.4236/cn.2024.163003

Yousef, C. C., Thomas, A., Alenazi, A. O., Elgadi, S., Abu Esba, L. C., AlAzmi, A., Alhameed, A. F., Hattan, A., Almekhloof, S., AlShammary, M. A., Alanezi, N. A., Alhamdan, H. S., Eldegeir, M., Abulezz, R., Khoshhal, S., Masala, C. G., & Ahmed, O. (2020). Adoption of a Personal Health Record in the Digital Age: Cross-Sectional Study. Journal of Medical Internet Research, 22(10), e22913. https://doi.org/10.2196/22913