



## The Role of Clinical Leadership in Health Information Technology Adoption in the Gulf Cooperation Council Countries: A Scoping Review

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### Abstract

**Background and objectives:** The purpose of this scoping review was to conduct a scoping review that examines evidence on the role of clinical leadership and successful Information Technology (IT) adoption in healthcare organizations in the Gulf Cooperation Council (GCC) countries. Electronic Health Records (EHR) is increasingly being implemented in the GC countries. Clinical leaders' attributes and characteristics are considered as important factors in the successful implementation and adoption of EHR, but there is limited evidence around the role of the attributes and characteristics of clinical leaders in the successful adoption and use of EHR in GCC countries. The aim of this scoping review was to synthesize evidence on the association between skills, perceptions, and attitudes of clinical leaders and the successful adoption of EHR in GCC countries.

**Methods:** A scoping review of the literature was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) guidelines. PubMed and Google Scholars databases were searched based on well-defined eligibility criteria.

**Results:** A total of 12 studies were included in the scoping review that was predominantly conducted in Saudi Arabia from 2011 and later. The findings suggest that clinical leaders who have effective communication and coordination skills with the ability to engage EHR users and who are skilled in project and change management strategies and follow up and have knowledge of health IT are best suited to lead successful development, implementation and use of EHR in GCC countries' healthcare systems.

**Conclusion:** Based on the findings of this scoping review, it provides moderate level evidence that there is a positive impact of clinical leaders on successful IT adoption; therefore, it is highly recommended that clinical leaders with effective coordination and communication skills are involved as project leaders in EHR adoption. It is also recommended that the clinical leaders should actively engage the end users of EHR and regularly follow the planning, development, and implementation phases of EHR adoption. The findings indicate clinical leaders who have informatics skills and prior experience with IT projects are likely to develop a vision that comprises a long-term commitment to the use of IT.

### Keywords

Electronic health records adoption; Gulf cooperation council; Clinical leaders' attributes and characteristics

### Introduction

Health Information Technology (HIT) uses has transformed healthcare and has become a necessity to improve the quality of healthcare delivery, and achieve better health outcomes for patients. HIT has been defined as "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of information, data, and knowledge for communication and decision making" [1]. HIT encompasses the use of information technology to record, analyses, and disseminate patient health data, and consists of numerous technologies ranging from simple data charting to more sophisticated clinical decision support systems and prediction models. One example of the HIT is the use of EHR, which is believed to be the backbone of supporting the integration of various aspects of patient care and coordination. Iakovidis defined EMRs as "digitally stored healthcare information about an individual's lifetime with the purpose of supporting continuity of care, education and research, and ensuring confidentiality at all time" [2]. Over the last several decades, migration of patient records from paper based storage to digital format has proved to be beneficial and the implementation and adoption of EHR have been increasing around the world.

In the GCC countries, i.e., Saudi Arabia, Bahrain, Qatar, Kuwait, Oman, and United Arab Emirates (UAE), EHR is increasingly being implemented in the healthcare systems for the last several decades [3]. There is no doubt that EHR is rapidly being adopted in healthcare around the globe, but the adoption of EHR in healthcare comes with daunting challenges [4]. In other words, the adoption of technology has been slow in healthcare compared to other service industries [5].

The challenges and barriers in the adoption of EHR have been studied in the U.S. and European healthcare systems. Numerous factors have been identified as essential for the adoption of EHR in the healthcare industry, such as facilitating conditions, user friendliness, social impact, and attitudes and behaviors of the end users [6]. Perceptions of the end users, similar to the clinical leaders' perceptions, are considered as important factor in the successful implementation and adoption of EHR [4]. End users, for example physician users, can have both positive and negative perceptions about the potential benefits and adoption of EHR. A systematic review of the perceptions of healthcare professionals about the use and adoption of EHR in GCC countries found both positive and negative perceptions among healthcare professionals [7]. Similarly, supportive attitudes and behaviors of clinical leaders are considered

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essential for the successful adoption of EHR in healthcare because there is association between the EHR adoption and clinical leadership [8]. Clinical leaders are healthcare professionals who have been assigned leadership roles at different levels in the healthcare system, for example they could be responsible for the EHR implementation and project management at any organizational level. For the purpose of this scoping review, we have defined clinical leaders as healthcare professionals who are responsible for EHR implementation and project management at any organizational level and who deliver care in clinical units, departments, and divisions, such as department and division directors, chief executives, and other department heads. The role of clinical leadership in EHR adoption has been studied in the U.S. and European healthcare context, but there is limited evidence around its role in the adoption of EHR in the GCC countries. More specifically, there is limited evidence around the role of attributes and characteristics of clinical leaders on the successful adoption and use of EHR in GCC countries.

### **Related literature**

Over the last several decades, information managers have migrated healthcare systems from the manual or paper based records to EHR in GCC countries. Different terminologies have been used to describe EHR, such as electronic medical records, automated health records, and computer based patient records. EHR is still not used in the majority of the Middle Eastern and GCC countries' healthcare systems [9]. In the following sections, I will discuss the implementation of EHR in some of the GCC countries such as Saudi Arabia, Qatar and United Arab Emirates, as well as examples from the Middle East, such as Jordan and Turkey.

Several hospitals in Saudi Arabia have implemented EHR, including the National Guard Health Affairs, KFSH and RC, and armed forces hospitals [10]. However, the implementation of EHR in Saudi Arabian hospitals is very low; by 2008, only 15% of the provinces had implemented EHR [11]. Several studies have reported on the implementation of EHR in Saudi Arabia; however, the role of clinical leadership in the adoption of EHR was rarely discussed [10, 12].

In Jordan, integration of the health information systems, such as administrative databases, laboratory and computerized physicians' orders, into EHR have been carried out successfully [13]. After successful implementation of the EHR under the project named Hakeem, EHR implementation was scaled to the rest of the countries' healthcare systems [14]. Nationwide EHR implementation in Turkey was carried out by Turkey's NHIS (NHIS-T) with almost 71% of the private and university hospitals connected to the national database by 2010 [15]. In the UAE, the implementation of EHR has significantly increased during the last decade, and several healthcare providers have adopted the Middle East Electronic Medical Record Adoption Model (EMRAM). The number of healthcare providers implementing EHR under the EMRAM program increased from 23 to 33 between 2011 and 2016, and most of them had reached stage 5 in its adoption [16].

The successful implementation of EHR has been related to several benefits, including improved healthcare outcomes, processes, and medical billing. Even though EHR has been implemented in the most advanced healthcare systems, including Malaysia, the United States, China, Singapore, the United Kingdom and Korea, the desired level of distribution of EHR has not been achieved [17]. In order to obtain benefits of EHR implementation, it is vital that the EHR is completely adopted. Effective leadership and project management has been regarded as an important factor for the successful adoption of EHR [18].

In the context of GCC countries and the Middle East, successful implementation of EHR has been linked to factors such as organizational structures, coordination, and degree of acceptance to change, workflow processes and adapting to best practices [19-21]. Some studies conducted to explore the success and failure factors of EHRs in Saudi Arabia found that the planning stage of EHR implementation is very crucial for its successful adoption. The study by Abouzahra also found that risk management and communication were the main factors of project failure in EHR implementation. These factors highlight the importance of the clinical leadership in the successful implementation of EHR, because the above-mentioned factors are very much dependent on the perceptions, attitudes, and skills of clinical leaders. For example, good leaders heading the implementation of EHR can influence resistance from the staff through effective change management strategies. This is of particular importance when studies have found that micro-level factors, such as resistance from physicians and individual perceived complexity, are attributed to low rates of EHR adoption [22]. Clinical leaders are one of the main stakeholders during the implementation of EHR. The factors influencing the successful implementation of EHR are greatly dependent on the perceptions, attitudes, and skills of individuals in leadership roles and can be overcome through effective leadership strategies [18].

Studies have demonstrated a significant association between clinical leaders' attributes and skills and the successful outcome of EHR implementation. Several studies have reported positive associations between leaders' explicit knowledge of IT and outcomes of the health information system adoption [22-24]. Among these studies, most of the clinical leaders were trained in technology use, skilled in customizing technology solutions, and skilled in technology project implementations.

Other than the technology knowledge, clinical leaders' attitudes and perceptions also have positive associations with the successful adoption of EHR. For example, studies have associated the positive effect of hospital leaders' beliefs in the usefulness of technology and its adoption [25]. Self-confident, steadfast, and proactive leaders are believed to contribute to successful adoption of EHR [26]. Those leaders who are skilled in IT and had previous experiences of technology related projects implementation are more likely to promote proactive leadership partnerships and behaviors, which are directly linked to the successful implementation and adoption of EHR [8].

### **Rationale for the study**

Evidence from the literature shows that the role of clinical leadership is a key factor in the adoption of EHR in healthcare. Effective clinical leadership with competence in technical informatics and project management skills in healthcare information are essential for the successful implementation and adoption of new technologies in healthcare. In the GCC countries, healthcare is undergoing a ubiquitous digital transformation, similar to the healthcare systems in the rest of the world. Clinical leaders' knowledge about how and what to do in order to support effective integration of technology into healthcare is essential to manage the digital transformation. However, there is lack of evidence on what type of clinical leadership skills, attitudes, and perceptions contribute to the effective adoption of technology in healthcare in GCC countries. In 2014, Australian and Norwegian researchers conducted a systematic literature review

on the impact of clinical leadership and concluded that clinical leaders positively contributed to the successful adoption of EHR in healthcare organizations [8]. However, none of the 32 studies included in the systematic review were from the healthcare system in the GCC countries or the Middle East. There are increasing interests in the implementation of EHR in the healthcare systems in the GCC countries and the existing evidence around the topic is limited. This scoping review aimed to synthesize evidence around the role of clinical leaders in the adoption of EHR in healthcare to address this knowledge gap.

### **Objective**

The aim of this scoping review was to synthesize evidence on the association between skills, perceptions, and attitudes of clinical leaders and the successful adoption of EHR in the GCC countries.

### **Research question and scope**

The aim was addressed by answering the research question: what are the attitudes, perceptions and leadership skills of clinical leaders that affect the adoption of EHR in GCC countries to improve organizational and patient outcomes? The topic and research question of the scoping review was guided by the objective of the course guidelines and was limited to the healthcare services management area. The study scope was limited to the implementation and adoption of EHR in GCC healthcare provider organizations.

### **Materials and Methods**

The scoping review was conducted by following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) extension for scoping reviews (PRISMA-ScR) guidelines [27]. The detailed methodology was followed as stated below.

#### **Eligibility criteria**

The scoping review included studies that explored the association between characteristics of clinical leaders, i.e. attitudes, perceptions and skills, and the successful adoption of EHR or the effect of clinical leadership on the outcomes related to EHR adoption in healthcare organizations in the GCC countries. Clinical leaders in the context of the scoping review were defined as those having a leadership role in a healthcare organization, such as department and division directors, chief executives, and other department heads. Only studies exploring adoption of EHR within the context of GCC countries' healthcare organizations were included in the review. We also included those studies where the main focus of the study was not the leadership attributes in the adoption of EHR, but findings did mention the leadership attributes and characteristics in relation to the EHR adoption. Adoption of EHR was defined as the decision to obtain an EHR from its development to implementation, including continuing use and regular improvement. Articles considered eligible to be included in the scoping review included empirical studies, white papers, reports, reviews and qualitative interviews.

#### **Information sources**

Two electronic databases were chosen for the scoping review, i.e. Google Scholar and PubMed/MEDLINE. Google Scholar is an interdisciplinary database that provides scholarly literature by easily exploring related works, authors, citations, and scientific publications. PubMed/MEDLINE offers a great variety of advanced features such as its flexibility to use the MeSH (Medical Search Headings) vocabulary,

which is a powerful tool for narrowing down the search results. Google Scholar and PubMed/MEDLINE were systematically searched between December 31, 2019 and January 1, 2000, for the identification of the studies. This window period was selected to have an extended window period for literature search due to limited evidence of topic in the GCC countries' context. In addition to Google Scholar and PubMed/MEDLINE database, a snowballing approach was also adopted to actively search for reports or white papers and studies in the reference lists of other articles or studies. Only studies published in English language in the GCC countries' healthcare context were included in the scoping review.

#### **Search strategy and key terms**

Individually tailored search strategies for Google Scholar and PubMed/MEDLINE data bases were designed based on the key terms and their synonyms. The research question was conceptualized into its component parts for the development of the search strategy. The key words related to a) the setting i.e. healthcare providers, b) HIT or EHR, d) clinical leadership, and d adoption of EHR. The search strategies for Google Scholar and PubMed/MEDLINE are presented in the table below.

#### **Data management**

Reference Management Software EndNote was used to manage records and data throughout the scoping review process.

#### **Selection process**

The identified studies were subjected to a screening process where the researcher screened studies that explicitly discussed the role of clinical leadership in the adoption of EHR within the context of Healthcare organizations in GCC countries. The articles and studies retrieved from Google Scholar and PubMed/MEDLINE databases and those snowballed from other sources were first subjected to the identification process of duplicates studies, which were removed at the outset of the analysis. After the duplicates were removed, the studies were subjected to the screening and selection process. First, the studies were selected by searching for the key terms in their titles and abstracts. Any studies that did not mention the key words in their titles or abstracts were excluded. Second, studies with the role of clinical leadership in the adoption of EHR outside of the healthcare context were excluded. Studies describing aspects other than the EHR in the HIT context were also excluded from the analysis. The articles included after this stage of the screening process were fully read and excluded if they did not fulfill the inclusion criteria. The final list of articles was subjected to a data extraction process.

#### **Data collection process**

Data was extracted from the included studies by using standardized quantitative and qualitative data extraction forms. The reviewer piloted the data extraction forms before the start of the review. Any discrepancies were resolved through a consensus reached by discussions with the supervisor, and any unresolved discrepancies were discussed with a third party for arbitration.

#### **Data synthesis**

First, general study characteristics data, such as publication year, country, healthcare context, and type of healthcare facilities and clinical leaders, were extracted in the data extraction sheet. Second, inductive content analysis was carried out [28,29], which is a suitable method to explore rationales, strengths, and limitations [30]. Third,



directed content analysis was used to extract data from the studies included in the scoping review [29].

Data was analyzed through a narrative approach, i.e. the studies were regarded with a holistic approach. The attributes and characteristics of the clinical leaders were categorized based on the IT competence model by a model that divides competence of business managers into explicit IT knowledge and tacit IT knowledge [31]. The attributes and characteristics of the clinical leaders were then grouped based on the model by which provides a conceptual framework for HIT adoption [32]. Avgar’s model (2012) framework described different stages of HIT adoption process, i.e. investment, implementation, and use, and at various levels of decision making in the healthcare organizations, i.e. strategic, operational, and frontline. Within the context of this scoping review, Avgar’s framework was partially applied, i.e. the clinical leaders’ attributes and characteristics were analyzed within the context of different stages of EHR adoption and not for the various levels of decision making level as insufficient data was available for the later.

### Ethical appraisal

Even though there are no typical ethical guidelines for systematic literature reviews [33] some considerations were addressed during this study. The researcher carefully selected the inclusion and exclusion criteria and made sure that the included studies had obtained ethical approvals where applicable. The results of the study may have unintended consequences; therefore, the policy implications were considered. No ethical approval was required to conduct this study because only secondary data was obtained from the public domain.

### Results

The final search strategies were executed in the selected databases, and snowballing was also performed in the reference lists of the relevant articles. The final data base search was carried out on May 9, 2020.

### Study selection

A total of 1487 records were retrieved from the selected databases and the additional sources after duplicates were removed. All the retrieved records were screened by the title and abstracts and 1411 records were excluded leaving 76 records for full text reading. A total of 64 of the 76 records were excluded after full text reading, leaving 12 articles to be included in the scoping review as shown in Figure 1.

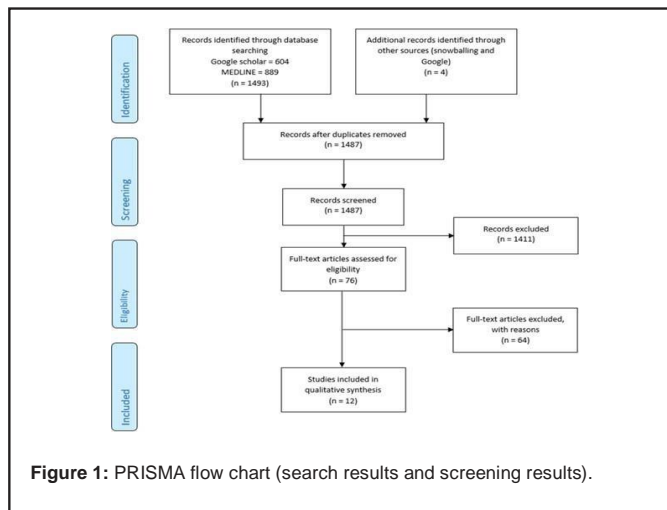


Figure 1: PRISMA flow chart (search results and screening results).

### Study characteristics

All of the studies were published in 2011 and later. One study was about the healthcare system in UAE [34], and one about the healthcare context in Saudi Arabia, UAE and Bahrain combined [35]. The context of the studies ranged from primary healthcare centers to general and tertiary hospitals. Both public and private sector hospitals were included in the studies. Of the 12 studies, six were about the implementation phase of EHR adoption [34-39], three were about implementation and use phase of EHR adoption [40-42], two were about pre-implementation and implementation phase [43,44], and one was about all the stages of EHR adoption [45]. An overview of the included studies is given in Table 1. Of the 12 studies included in the review, 10 (83.3%) were about the healthcare context in Saudi Arabia as shown in supplementary table [36-44]. The healthcare context included national health informatics, and large, medium, and small hospitals both in private and public sectors (supplementary table).

Table 1: Search strategies for Google Scholar and PubMed/MEDLINE are presented in the table.

Search strategies for Google Scholar and PubMed/MEDLINE	
Google Scholar	"Gulf Cooperation Council" OR "Bahrain" OR "Kuwait" OR "Oman" OR "Qatar" OR "Saudi Arabia" OR "United Arab Emirates" and "clinical leadership" OR "medical leadership" and "healthcare" and "Health information technology" OR "health technology" OR "medical technology" OR "HIT" OR "Electronic Health Records" OR "Electronic Medical Records" OR "EHR" OR "EMR" and "adoption" and "Skills" and "attitude"
PubMed	Gulf Cooperation Council OR Bahrain OR Kuwait OR Oman OR Qatar OR Saudi Arabia OR United Arab Emirates and leadership and Health information technology OR health technology OR medical technology OR HIT OR Electronic Health Records OR Electronic Medical Records OR EHR OR EMR and technology adoption and attitude

The following sections present the findings after the synthesis of the selected articles. In the first sections, the results of the thematic analysis of the clinical attributes and characteristics are presented. Later, the clinical leaders’ attributes and characteristics are shown in relation to EHR adoption phases according to Avgar’s framework.

### Attributes and characteristics of clinical leaders

According to the results of the deductive thematic analysis, clinical leaders’ attributes and characteristics related to the effective EHR adoption were categorized and grouped into different themes. The summary of the attributes and characteristics of the clinical leaders necessary for the adoption of EHR is shown in Table 2. Below is the detailed description of the each of the themes that resulted from the deductive thematic analysis of the included studies.

Table 2: Studies included with healthcare contexts.

Country	Number of studies	Healthcare context
Saudi Arabia	10 (83.3%)	Public and private hospitals, primary healthcare clinics, large, medium and small hospitals

UAE	1 (8.3%)	Health Information System in Abu Dhabi
Bahrain, UAE and Saudi Arabia	1 (8.3%)	National health informatics

### Ability to involve or engage EHR users

The most common attribute of clinical leaders that affect EHR adoption was the clinical leaders' ability to involve and engage EHR users [34-45]. Rae and Nasser (2011) and Arnaout (2015) related the engagement and involvement of the EHR users with incentivizing good users with rewards, which also increased their job security [34,38]. Some of the articles more specifically described physicians' engagement and involvement as mandatory for the successful implementation and adoption of EHR [40-42]. Aldosari (2017) found that involving staff in the planning, development, and implementation phases of EHR adoption was important for effective adoption of EHR [43]. Lastly, some authors argued that clinical leaders' ability to engage and involve staff helped leaders manage perception and attitudes of EHR users through behavior change [44,45]. Rae and Nasser (2011) stated that identification and appointment of champions for EHR adoption was effective, i.e. awarding incentives to the top performers among the team members [34]. One of the specific approaches to engage and involve users for an effective adoption of EHR was to make users aware of the technology implementation through proper capacity building and training [34,36].

### Coordination and communication

The second most stated category of the attributes of the clinical leaders for the effective adoption of EHR was their ability to effectively coordinate and communicate with the relevant stakeholders [34-43]. Rae and Nasser suggested that clinical leaders' ability to enhance relationships vertically and horizontally in the organization structure and inter-organization communication were necessary for the effective adoption of EHR. Arnaout regarded the development of implementation roadmaps as an important aspect of an effective coordination and communication in this regard [38]. Another aspect of the effective coordination and communication attribute among the clinical leaders was their ability to clearly define tasks and responsibilities for the EHR adoption team members [34].

### Follow up

The third most evident attribute of the clinical leaders in the effective adoption of EHR in the Gulf region was the clinical leaders' ability to properly follow up during the EHR planning, development, and implementation [34-39]. Rae and Nasser regarded supervision and monitoring the transformation of health records as an effective strategy of the clinical leaders to effectively follow EHR [34]. Arnaout argued that team involvement in the implementation of EHR was essential for effective follow up. Aswad stated that a clinical leader's attribute that positively affected adoption of EHR was to hold regular meetings with the EHR end users about the challenges that they faced during the daily operations and giving effective feedback to the users [45]. Azza El.Mahalli found that focus group discussions with the EHR users to discuss the benefits of the EHR increased the adoption rate of EHR [39].

### Leadership in project management

Effective project management skills emerged as a category of the attributes of the clinical leaders for effective adoption of EHR [34,43]. Rae and Nasser described that the clinical leaders should have the

ability to develop SMART (Specific, Measurable, Achievable, Realistic, and Timely structured) objectives for the EHR implementation project that will be effective in EHR adoption [34]. Other important aspects of the effective leadership in project management were the clinical managers' ability to acquire resources for the development and adoption of EHR, as well as effective project time and cost management [34]. It was also found that clinical leaders' ability to take system-level decisions in a proactive and democratic manner was an important factor in the adoption of EHR. Lastly, effective planning and implementation was regarded as an important aspect of the leadership project management skills.

### Information technology knowledge

Knowledge about IT was regarded as an important attribute of the clinical leaders for the effective adoption of EHR [34,43]. More specifically, Aldosari stated that health information industry knowledge was an important aspect of the IT related skills for the clinical managers [43]. On the other hand, Rae and Nasser described the IT related skills of clinical leaders as their ability to be mindful in key functions of the systems in the design and implementation of EHR [34]. Aswad Akmal described that an understanding of the clinical workflow was essential for EHR adoption, and clinical leaders' ability to set and enforce clinical processes was an important attribute of clinical leaders for effective adoption of EHR [45].

### Perceptions and attitudes of behavior control

Another important category that emerged as clinical leaders' attribute for successful adoption of EHR was their perceptions and attitudes of behavior control [35,45]. Aspects of the leaders' perceptions and attitudes of behavior control included commitment of the clinical leaders during all phases of EHR implementation, accountability, and responsibility for EHR implementation, and their ability to use change readiness indicators to manage users involved in the development and implementation of EHR [35,45].

### Effectiveness and clarity of change management strategy

One of the most described aspects of the clinical leaders' attributes was their ability to develop effective and clear change management [34-38]. This attribute also included the clinical leaders' ability to conduct effective risk analysis [34].

### EHR adoption phases and clinical leaders' attributes

The clinical leaders' attributes and characteristics were also mapped according to the different phases of EHR adoption. Not all the studies specified how the effect of the clinical leaders' attributes and behaviors were related to the organizational levels, but it was possible to relate their attributes and characteristics to the different stages of EHR adoption, as shown in Table 3. It is evident from the results that the majority of the attributes and characteristics were discussed in relation to the implementation phases of the EHR adoption.

**Table 3:** Summary of the clinical leaders' attributes and characteristics for the adoption of HER.

Attitudes, perceptions and skills of leaders/managers	Description
Ability to involve/engage EHR users	Incentivize good EHR users with rewards and provide job security to them Engage physician users for successful implementation of EHR Involve project staff in the planning, development and implementation phases Manage perceptions and attitudes of EHR users/change behavior
Follow up	Supervise and monitor the transformation of health records Ability to monitor and follow up on EHR implementation, the team involved in the implementation Hold regular meetings with EHR users about the challenges they are facing, and feeding back to them Conduct periodic focus groups with EHR users to identify and discuss perceived benefits of the EHR systems
Leadership in project management	Ability to develop SMART (Specific, Measurable, Achievable, Realistic, and Timely structured) objectives Acquire the required resources for the development and adoption of EHR Project time and cost management Time management, team building and conflict management
Effective coordination and communication	Enhance relationships vertically and horizontally in the organization structure Inter organization communication Develop and share implementation roadmaps Develop effective communication
IT Knowledge	Mindful in key functions of the systems in the design and implementation of EHR Health Informatics industry and control knowledge
Communicate clear vision and goals for EHR adoption	Clearly define tasks and responsibilities for the EHR adoption team members
Identify and appoint champions for ERH adoption	Award incentives to top performers among the team in EHR implementation and adoption
System level decision making	Ability to take decisions in participative and democratic manner
Planning and implementation	Ability to plan for conducting EHR related and clinical activities in parallel
Effectiveness and clarity of change management strategy	Effective risk analysis and change management strategy development Clarity in change management strategy
Training on information management (users' involvement)	Keep staff aware of the effect of technology implementation
Perceptions and attitudes of behavior control	Commitment of the leaders during all the phases of EHR adoption Accountability and responsibility for EHR implementation Ability to use change readiness indicators to manage all the stakeholders in the EHR development and implementation Commitment of leaders to develop and implement EHR system
Understanding clinical workflow	Set and enforce clinical processes

**Table 4:** Clinical leaders' attributes and characteristics in relation to EHR adoption phases.

Attributes and characteristics	Adoption phase		
	Pre Implementation phase	Implementation phase	Use phase
Ability to involve/engage EHR users	Aldosari, 2017 Aswad Akmal, 2015 Aljarullah et al., 2017	Rae & Nasser, 2011 Aldosari, 2014 Arnaout, 2015 Aldosari, 2017 Aswad Akmal, 2015 Aljarullah et al., 2017 Al-Rayes, Alumran and AlFayez, 2019 Aljarullah et al., 2018	Aldosari, 2014 Aswad Akmal, 2015 Aljarullah et al., 2017 Al-Rayes, Alumran and AlFayez, 2019 Aljarullah et al., 2018
Effective coordination and communication	Aldosari, 2017 Aswad Akmal, 2015	Rae & Nasser, 2011 Arnaout, 2015 Aldosari, 2017 Aswad Akmal, 2015 ALKRAIJI, Osama and Fawzi, 2014 Azza El.Mahalli, 2015	Aswad Akmal, 2015
Follow up	Aswad Akmal, 2015	Rae & Nasser, 2011 Arnaout, 2015 Aswad Akmal, 2015 Azza El.Mahalli, 2015	Aswad Akmal, 2015
Leadership in project management	Aldosari, 2017 Aldosari, 2017	Rae & Nasser, 2011 Rae & Nasser, 2011 Aldosari 2017 Aldosari, 2017	
IT knowledge	Aldosari, 2017	Rae & Nasser, 2011 Aldosari, 2017 Alkrajji, Jackson and Murray, 2013	
Perceptions and attitudes of behaviour control	Aswad Akmal, 2015	Aswad Akmal, 2015 ALKRAIJI, Osama and Fawzi, 2014	Aswad Akmal, 2015
Effectiveness and clarity of change management strategy	Aswad Akmal, 2015	Rae & Nasser, 2011 Almaiman et al., 2014 Aswad Akmal, 2015 Alkrajji, Jackson and Murray, 2013 Al-Rayes, Alumran and AlFayez, 2019	Aswad Akmal, 2015 Al-Rayes, Alumran and AlFayez, 2019

## Discussion

The findings of this scoping review reveal that there is an increasing interest in the GCC countries to discuss the importance of clinical leaders' attributes and characteristics in the successful adoption of EHR. However, the review did not find studies from all the GCC countries. With the majority of the studies conducted in Saudi Arabia, the attributes and characteristics of clinical leaders were explored within the context of all levels of healthcare ranging from primary healthcare to tertiary healthcare in both private and public health sector. In addition, the findings in this scoping review also

suggest that clinical leaders who have effective communication and coordination skills with the ability to engage EHR users, are skilled in project and change management strategies and follow up, and have knowledge of health information technology are best suited to lead successful development, implementation and use of EHR in GCC countries' healthcare systems (Table4).

This scoping literature review is the first of its kind to explore the association between the clinical leaders' attributes and characteristics to the successful adoption of EHR in GCC countries. Majority of the studies were of empirical nature and applied mixed methods approaches. There was only one study covering the healthcare system in UAE among the GCC countries [34]. Rae et al. conducted a mixed methods study in UAE by studying the health information system in Abu Dhabi and their major focus was to explore the challenges in the development of centralized digital EHR systems in the UAE [34]. Alkariji et al. focused on identifying the challenges and opportunities in health informatics in the GCC countries, and included three countries in their analysis, i.e., Saudi Arabia, Bahrain, and UAE [35]. The study was part of a larger project that aimed to map out the overall development of EHR development in the GCC region. The rest of the studies included in this scoping review were covered EHR adoption in Saudi Arabia. Aldosari et al. conducted a mixed methods study to determine the rates, levels, and determinants of EHR system adoption in 16 public and six private hospitals in Riyadh, Saudi Arabia [40]. Almainan studied the overview of electronic dental records in primary healthcare clinics in Saudi Arabia through an exploratory study that mainly focused on the implementation phase of the EHR adoption [37]. Arnaout conducted an exploratory qualitative study in Saudi Arabia to explore the lived experiences of healthcare SME leaders on their strategies to adopt EHR [38]. Aldosari conducted a study of three large cities in Saudi Arabia and investigated the practices of EHR project managers in terms of their practices' relationships with successful or unsuccessful implementation and adoption [43]. Their sample size consisted of 35 highly skilled EHR project managers with 10 years or more of experience. The study by Aswad was a PhD thesis using a mixed methods study design to develop a framework for understanding the factors for EHR adoption. The study by Aljarullah also aimed to develop a framework that could support policy initiatives in primary healthcare physicians in Saudi Arabia. Azza conducted their study in large Saudi Arabian hospitals to explore the adoption and barriers to the use of EHR by nurses. Alkariji et al. used an exploratory interpretative approach to explore the barriers of EHR adoption in Saudi Arabia. Rayes et al. studied the adoption of EHR among physicians in Saudi Arabia through a cross-sectional qualitative study. They used the technology acceptance model featuring resistance to change, influence and trainings. Lastly, Aljarullah et al. explored the factors that support policy initiatives in the primary healthcare physicians' acceptance of EHR in Saudi Arabia.

This scoping review aimed to identify the clinical leaders' attributes and characteristics associated with the adoption of EHR in GCC countries, since the adoption of EHR is a major challenge in healthcare systems of both the developed and developing countries. In the literature, several theories have been developed to explore the users' acceptance of new technology, such as Theory of Reasoned Action, Theory of Planned Behavior, and the Technology Acceptance Model. Overall, the technology adoption theories point to three main factors for technology acceptance and adoption, i.e. attitudes towards technology, perceived benefits of the technology, and perceived usability of the technology in practice [41].

The findings of this scoping review suggest that clinical leaders with IT skills, specifically in health informatics, are likely to lead the process of EHR adoption. It is suggested that the clinical leaders and other healthcare professionals should acquire the IT related competencies before they are involved in the development and implementation of EHR [46]. The findings in this scoping review are in line with the evidence that IT competences of business leaders are strongly associated with the successful technology adoptions [47-49].

Clinical leaders' support of the end users of EHR at all the stages of EHR adoption is needed to tackle the stressful situation that the end users face as a result of the new technology and workload [50,51]. Clinical leaders with strong managerial skills have the ability to fill this gap and provide the right support at the right stage of EHR adoption [52,53].

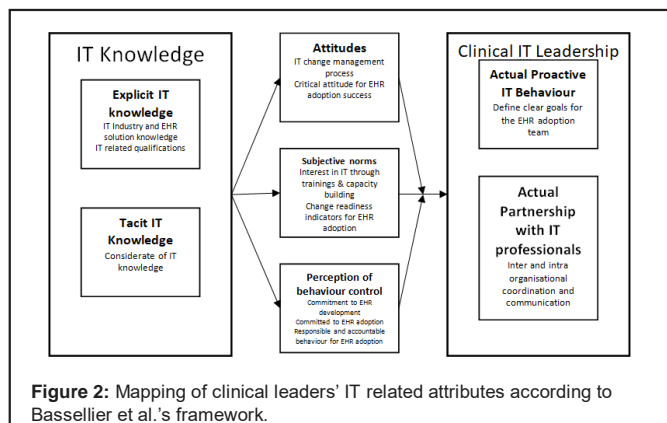
Ongoing capacity building of the EHR users is crucial and helpful in sustaining the users' interest and engagement with the new technology; therefore, the top management role in providing such support on a continuous basis is crucial for appropriate EHR adoption [54]. Other than the formal capacity building and training, it is crucial that the clinical leaders hold regular meetings with EHR users and the champions among them to maintain their eagerness to be involved in the adoption of EHR [55].

One of the crucial steps in leading the successful implementation and adoption of EHR systems is the clinical leaders' ability to manage change effectively. This attribute of the clinical leaders is of paramount importance because EHR adoption requires several levels of interaction with the staff, managers, and end users. It is suggested in the literature that prior assessment of the potential users of EHR should be conducted in hospital settings in terms of their capacity building, involvement, and interests [56,57]. The implementation of EHR in healthcare settings increase the workload of physicians and other healthcare professionals [58]; therefore, it is of paramount importance that clinical leaders provide proper support and effectively lead the change management process for the successful adoption of EHR.

This scoping review focused on the attributes and characteristics of clinical leaders that were associated with the successful adoption of EHR systems. However, in practice, there were numerous factors in the complex healthcare environment that affected the successful adoption of EHR, such as health policies, legal aspects, and financial constraints. This review did not focus on clinical leaders' sociodemographic factors, such as age, gender, ethnicity, and cultural background, which could also have influenced the results of the studies. This should be addressed in future studies. Further studies are required to understand GCC countries' healthcare workforce, which relies heavily on an expatriate healthcare workforce. This leads to a high turnover of staff, which affects clinical leadership and healthcare organizations' future prospective on technology.

When the findings of the study were mapped according to the Bassellier's framework of IT adoption, it appears that the findings are in line with the results suggested in the literature, i.e. attributes and characteristics of the clinical leaders were associated with successful adoption of EHR as shown in Figure 2.





There are some potential limitations of this scoping review as follows. We only included studies published in English language, and given that the predominant language in the GCC countries is Arabic, we could have missed studies on this topic which were published in Arabic language. Due to the time limitation, only two data bases were selected for this study. Therefore, other studies published on the topic could have been missed. Since the focus of the study was GCC countries, the generalizability of the findings to other countries and healthcare settings could be limited. Other limitation of the study is that Avgar's framework was partially applied because insufficient data was available on the various level of decision-making.

The findings of this review suggest that clinical leaders should be involved proactively in all stages of the EHR adoption, i.e., planning and development, implementation, and use phases. However, the deeper analysis shows that the included studies in this scoping review related the leaders' attributes and characteristics predominantly to the implementation stage of EHR adoption, as shown in Table 4. This finding may suggest that the top management of the EHR projects should focus more on the implementation stage of the EHR adoption when it comes to the clinical leaders' attributes and characteristics. Based on the findings of this scoping review, the following recommendations are suggested for the successful implementation and adoption of EHR in the GCC countries.

- Clinical leaders leading the development and implementation of EHR should follow effective coordination and communication strategies and improve the relationship both vertically and horizontally in healthcare organizations.
- Clinical leaders should actively engage and involve the end users of EHR through incentives and rewards, proper conduct capacity building, and manage perceptions and attitudes of EHR users.
- Clinical leaders should properly follow up during the EHR planning, development and implementation, and provide feedback on the challenges that the users face in practice.
- Clinical leaders should use effective project management approaches to manage the different stages of EHR adoption and acquire the needed resources for the successful adoption of EHR.
- Clinical leaders should be well trained and experienced in health informatics-related skills

## Conclusion

This scoping review synthesizes evidence around the clinical leaders' attributes and characteristics and their association with

the successful adoption of EHR in the GCC countries' healthcare systems. The findings suggest that clinical leaders with effective communication skills and follow up, effective project and change management skills, and competence in health IT are more likely to lead the successful adoption of EHR in GCC countries. It is highly recommended that clinical leaders with effective coordination and communication skills are involved as project leaders in EHR adoption. It is also recommended that the clinical leaders should actively engage the end users of EHR and regularly follow the planning, development and implementation phases of EHR adoption.

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