Perceptions of healthcare professionals about the adoption and use of EHR in Gulf Cooperation Council countries: a systematic review

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ABSTRACT
Introduction  Electronic health records (EHRs) can improve the quality and safety of care. However, the adoption and use of the EHR is influenced by several factors, including users’ perceptions.

Objectives  To undertake a systematic review of the literature to understand healthcare professionals’ perceptions about the adoption and use of EHRs in Gulf Cooperation Council (GCC) countries in order to influence the implementation strategies, training programmes and policy development in the GCC region.

Method  A systematic literature search was undertaken on seven online databases to identify articles published between January 2006 and December 2017 examining healthcare professionals’ perception towards the adoption and use of EHR in the Gulf context.

Results  The fourteen articles included in this review identified both positive and negative perceptions of the role of EHR in healthcare. The positive perceptions included EHR benefits, such as improvements to work efficiency, quality of care, communication and access to patient data. Conversely, the negative perceptions were associated with challenges or risks of adopting an EHR, such as disruption of provider–patient communication, privacy and security concerns, high initial costs and inadequate training.

Conclusion  Positive perceptions of EHRs by the healthcare professionals could facilitate the adoption of this technology in the Gulf region, particularly when barriers are addressed early. Negative perceptions may inform change management strategies during adoption and implementation. The perceptions should be further evaluated from a technology acceptance perspective.

INTRODUCTION
The traditional paper-based medical record is rapidly being replaced by modern health information technologies (HITs) to better manage patient information.1 2 Electronic health records (EHRs) can assist healthcare providers in generating, storing and retrieving vital patient information, ranging from medical histories to lab diagnostics, for the provision of high-quality care at different levels.3–5 EHRs are crucial for improving patient safety, quality of care and the efficiency of patient care delivery, as well as reducing medical errors and healthcare costs.6 7 Menachemi and Collum further note that the system assists healthcare providers to easily share and access patient data at any point of care, resulting in enhanced delivery of care.8 These benefits have been associated with positive perceptions of the EHRs by healthcare professionals.9 10 Similarly, patients have largely reported positive perceptions and high satisfaction with the
use of EHRs mainly due to benefits related to access to personal health records and acting as an educational resource despite having few concerns, such as disruption of doctor–patient interaction and privacy issues. Thus, the EHR has emerged as an important tool for enhancing efficiency in healthcare processes, facilitating information sharing between healthcare providers themselves and between healthcare providers and their patients, and improving the quality of care as well as patient safety.

Due to these perceived benefits of EHRs in health service provision, the systems are increasingly adopted in various healthcare settings across the world. The countries in the Gulf Cooperation Council (GCC), namely Saudi Arabia, Kuwait, Oman, Qatar, United Arab Emirates (UAE) and Bahrain have also increased their investments in various forms of HITs to improve efficiency and delivery of healthcare services in hospitals and primary care centres. For example, the UAE launched a health information system (HIS), known as Wareed in 2011 to link electronic medical records in all public hospitals and clinics across Dubai and the Northern Emirates to improve efficiency in the public healthcare system. By the end of 2010, Oman had implemented the national repository of EHRs while Saudi Arabia committed $1.1 billion between 2008 and 2011 for the development of E-health programme and implementation of various health information tools, including EHRs to improve health and care services as part of its E-health strategy in Saudi Vision 2030. Despite these tremendous efforts in EHR adoption, there have also been notable challenges and barriers, such as increased costs during the implementation, privacy concerns and user acceptance.

Khoja and colleagues noted that although cost/benefit analysis needs to be determined, the increasing demand and misuse of health technologies will most likely increase the overall costs. These challenges are more noticeable in the GCC nations and other developing countries compared with those with advanced economies because they still have less developed infrastructure and governance.

Several other factors, such as the lack of adequate implementation policies, inadequate staff capabilities and capacity and distrust in the system have also been cited to contribute to the low adoption rates of EHRs and related HITs in the GCC countries. In relation to healthcare professionals who are the primary users of EHR systems in healthcare settings, their capabilities, including lack of the requisite skills and knowledge to use the systems due to lack of or inadequate training in health applications that discourage their use have been shown to have negative impacts on EHR adoption and use. Furthermore, healthcare professionals’ perception appears to play a significant role in EHR adoption and use with several theories and models predicting technology acceptance, such as the Technology Acceptance Model postulating that users’ attitude is a significant determinant of acceptance and use of new technology. However, little is known about the perceptions of healthcare professionals on the adoption and use of EHRs in healthcare settings in the GCC context. The objective of this paper is to report the findings from a systematic review of the literature examining the perceptions of healthcare professionals towards the adoption and use of EHRs in order to influence the implementation strategies, training programme and policy development in the GCC region. Although implementation and adoption are often used interchangeably, Murphy asserted that these terms differ in that the former is a short-term process of introducing an EHR system while adoption focuses on the long-term success through various strategies, such as providing adequate staff training. Conversely, the concept of use refers to actual utilisation of the EHR systems by the individual users to perform various functions during the process of care provision.

METHODS

Search strategy

Seven electronic databases (Scopus, PubMed, Proquest, Science Direct, Informit Health Collection, CINAHL and Medline via OvidSP) were systematically searched to identify articles published between January 2006 and December 2017 examining the healthcare professionals’ perceptions about the adoption and use of EHR in healthcare settings in the GCC. The search string was: (perception OR attitude OR perspective OR beliefs) AND (electronic health record OR EHR OR electronic medical record OR EMR OR electronic record OR digital record OR digital medical record OR digital health record OR digitised record OR digitized record OR electronic health information system OR health information system OR HIS OR ehealth OR digital health) AND (GCC OR gulf cooperation council OR gulf countr* OR Bahrain OR Kuwait OR Oman OR Qatar OR Saudi Arabia OR United Arab Emirates OR UAE OR middle east). Online supplementary table 1 shows the complete search strategy using an example of PubMed database.

Article selection

A priori inclusion and exclusion criteria were applied to guide article selection for inclusion. Specifically, an article was included if it meets all of the following criteria: (1) examined the perceptions of healthcare providers towards the adoption or use of EHR in healthcare prior to, during and after implementation; (2) reported factors influencing users’ perceptions; (3) was conducted in any of the GCC countries listed in the search terms; (4) was a peer-reviewed, empirical research paper; (5) was published between January 2006 and December 2017; (6) the full-text of the article was available for review and (7) was published in English or Arabic language. Review articles, opinions and commentaries were excluded from this review.

Applying the PRISMA approach for article selection, the online software Covidence was used to facilitate article selection. After removing duplicate articles, two reviewers (BA and KB-H) independently screened the titles and
abstracts of the identified articles against the eligibility criteria. The full-text of selected articles were then examined independently by the two reviewers, followed by process of concordance. The reviewers then extracted relevant titles from the reference lists of the selected articles, and the above screening process was repeated until saturation was reached, and there was an agreement between the two reviewers. Figure 1 summarises this process.

Data quality, analysis and presentation

Each article was reviewed using the Mixed Methods Appraisal Tool (MMAT) to assess the quality and the risk of bias. The article quality was evaluated based on five criteria for each category of study design. A scoring system of 0, 1 and 2 for ‘No’, ‘Can’t tell’ and ‘Yes’ for each criterion was used. Since MMAT also has two screening questions that were scored in the same manner, the total quality score in this systematic review was 14. Bibliometric information was then extracted from the selected articles, including the author/s names, the purpose of the paper and key findings of the study. They were then thematically analysed using an inductive approach by author BA, then reviewed by KB-H and MA, to identify the common themes using the approach described by Braun and Clarke.

RESULTS

Applying the article selection process detailed above, 14 articles were selected for inclusion in this review. The selection process and the number of records excluded at each stage is presented in figure 1. Selected articles varied across a number of areas, as shown in table 1. More than half of the articles were conducted in the Kingdom of Saudi Arabia and the remaining in other four countries of the GCC: Oman, Kuwait, UAE and Bahrain. Nine papers were published within the last 5 years, that is, between 2014 and 2019. A variety of settings are represented, with ten articles examining the hospital setting, three in primary health centres and one examining both hospitals and primary health. Furthermore, the articles varied in their participant cohorts, including physicians, nurses or a combination of occupations. Study designs included cross-sectional using surveys, or a focus group interviews of physicians. All articles had a high quality score of at least 12 except one which had a score of 9.

Article purpose and key findings

Five articles examined healthcare professionals’ perceptions of EHRs in their practice settings. Users’ satisfaction with these systems was evaluated in four
### Table 1: Selected articles description

| Article # | Author/s       | Year of publication | Country       | Study design            | Study setting     | Types of participants                                                                 | Number of participants |
|-----------|----------------|---------------------|---------------|-------------------------|-------------------|----------------------------------------------------------------------------------------|------------------------|
| 29        | Shaker et al   | 2015                | Saudi Arabia  | Cross-sectional survey  | Hospital          | Physicians                                                                             | 317                    |
| 30        | El Mahalli     | 2015                | Saudi Arabia  | Cross-sectional         | Hospital          | Nurses                                                                                 | 185                    |
| 31        | Khalifa        | 2013                | Saudi Arabia  | Cross-sectional         | Hospital          | Healthcare professionals                                                               | 158                    |
| 32        | Hasanain et al | 2015                | Saudi Arabia  | Cross-sectional         | Hospital          | Physicians, nurses, pharmacists, laboratory staff, receptionists, administrators and others | 333                    |
| 33        | Asiri et al    | 2014                | Saudi Arabia  | Cross-sectional         | Hospital          | Nurses                                                                                 | 333                    |
| 34        | Alzobaidi et al| 2016                | Saudi Arabia  | Cross-sectional         | Hospital          | Physicians                                                                             | 129                    |
| 35        | Alharthi et al | 2014                | Saudi Arabia  | Cross-sectional         | Hospital          | Physicians                                                                             | 115                    |
| 36        | Alasmary et al | 2014                | Saudi Arabia  | Cross-sectional         | Hospital          | Physicians and nurses                                                                   | 112                    |
| 37        | Al-Mujaini et al| 2011              | Oman          | Cross-sectional survey  | Hospital          | Physicians                                                                             | 141                    |
| 38        | Al Farsi and West| 2006            | Oman          | Survey                   | Hospital          | Physicians                                                                             | 66                     |
| 39        | Alsaleh and Al-Azmi | 2008            | Kuwait        | Cross-sectional         | Primary care      | Physicians, pharmacists and receptionists                                             | 839                    |
| 40        | Al-Azmi et al  | 2008                | Kuwait        | Cross-sectional         | Primary care      | Physicians                                                                             | 321                    |
| 41        | Al Alawi et al | 2014                | UAE           | Cross-sectional         | Primary care      | Physicians                                                                             | 23                     |
| 42        | Abdulla et al  | 2016                | Bahrain       | Cross-sectional         | Hospital and primary care | Doctors, nurses, lab specialists, clerk and others                                      | 152                    |

Articles.35 38 39 41 Barriers of adopting HITs were also explored from the providers’ perspectives in two articles.30 31 Lastly, three articles evaluated users’ satisfaction with an EHR in relation to what they perceived to be influencing factors.33 36 42

Many of the articles reported findings related to healthcare professionals’ perceptions of the benefits and barriers to implementing EHRs, and factors affecting the perceptions of healthcare professionals towards EHR. This is explored in greater detail in the next section. In five papers, positive perception and high overall satisfaction with the EHRs among healthcare professionals were reported.29 33 34 36 38 40 41 Conversely, two articles reported a negative perception and low satisfaction with the EHRs.35 37 For instance, Alharthi and colleagues35 reported less than half (48.7%) of respondents stated they were satisfied with the EHR. Table 2 presents the purpose and key findings of the articles.

### Themes

From the reviewed articles, three main themes related to the healthcare professionals’ perceptions of EHRs emerged. These included: (1) perceived benefits of EHRs, (2) perceived barriers to EHR adoption and use, and (3) perceived influencing factors of EHR perceptions. The detailed themes are presented in table 3 with different shades of blue colour, representing how much the themes were discussed. The most commonly reported theme is represented by the darkest shade.

#### Perceived benefits of EHRs

The articles reported that healthcare professionals perceived the use of EHRs to have several benefits. These included using EHRs to make workflow more efficient,29 31 33 34 36 38 40 42 improved access to clinical data,29 36 38 40 42 positive impact on patient safety,29 33 35 38 39 42 and improved communication between providers or between provider and patient.29 38 40 For instance, 92% of the respondents in a study by Al-Azmi et al40 reported that they could more easily access a patient’s medical history in an EHR compared with a paper record. Al Farsi and West38 reported 95% of physicians stated that the EHR improves communication between hospital departments. Moreover, EHRs were reported to reduce both medical errors29 30 33 34 36 38 39 42 and long-term healthcare costs.29 33 Alzobaidi et al34 reported 84% of respondents had a high level of agreement that the EHR has a role in reducing medical errors, with Al Farsi and West38 reporting 67% agreement level with the role. Overall, the majority of healthcare professionals perceived EHRs to have numerous benefits that enhance healthcare delivery.
Table 2  Selected articles purpose and key findings

| Article # | Paper author and year | Purpose | Key findings |
|-----------|-----------------------|---------|-------------|
| 29        | Shaker et al, 2015    | To determine the physicians’ perception about electronic medical record system (EMRs) in the context of its productivity in order to improve its functionality and advantages. | The majority of the respondents perceived EMRs to have positive impacts. |
| 30        | El Mahalli, 2015      | To assess the adoption and barriers to the use of an EHR by nurses at three governmental hospitals implementing the same EHR software and functionalities in Eastern Province, Saudi Arabia. | The respondents reported several barriers to the adoption of EHRs in hospitals. The most frequently cited include loss of access to medical records due to computer or power failure, lack of continuous training/support from IT staff, additional time for data entry, system hanging up, the complexity of technology and lack of system customisability. |
| 31        | Khalifa, 2013         | To identify, categorise and analyse barriers perceived by different healthcare professionals to the adoption of EMRs in order to provide suggestions on beneficial actions and options. | Human and financial barriers are the main challenges to the successful implementation and adoption of EMRs. |
| 32        | Hasanain et al, 2015  | To examine both the knowledge and preferences of current or potential EMR users, at seven hospitals in three cities, within the western region of Saudi Arabia. | Lack of knowledge or experience using EMRs and staff resistance were the main barriers to EMR implementation in Saudi Arabia. |
| 33        | Asiri et al, 2014     | To explore the direct and indirect effects of the organisational factors (ie, organisational support, adequate training and user involvement) and the professional factors (ie, nurse autonomy, organisational citizenship behaviour, and nurse–client relationship) on nurses’ attitude and acceptance of the EMR using the proposed model in King Abdul Aziz Medical City (KAMC). | Nurses had varied attitudes towards EMR/EHR, but the majority, including those of KAMC had a positive attitude. |
| 34        | Alzobaidi et al, 2016 | To assess the readiness of the physicians in Al-Hada Military Hospital in Taif city toward implementing EMR. | Physicians had positive attitudes that favour the adoption of EMRs. |
| 35        | Alharthi et al, 2014  | To measure physician satisfaction with a recently introduced electronic medical record (EMR) and to determine which of the individual attributes of EMR were related to physician satisfaction. | Majority of the physicians had low overall satisfaction with the system. |
| 36        | Alasmary et al, 2014  | To explore the association between age, occupation and computer literacy and clinical productivity and users’ satisfaction of the newly implemented EMR at PSMMC as well as the association of user satisfaction with age and position | EMR users with high computer literacy skills were more satisfied with using EMR than users with low computer literacy skills. |
| 37        | Al-Mujaini et al, 2011| To evaluate the knowledge, attitude and practice of physicians towards the EMR system. | Majority of the respondents had a negative perception towards EMR. |
| 38        | Al Farsi and West, 2006| To assess physician satisfaction through the identification of positive and negative impacts of EMR after introduction in Oman | EMR implementation had positive and negative impacts, and the physicians were satisfied with the system. |
| 39        | Alsaleh and Al-Azmi    | To evaluate the user interaction satisfaction with the newly implemented EMRs in the primary healthcare centres in Kuwait and to compare the pattern of reactions to the implemented EMRs among the PHC providers in Kuwait. | The healthcare providers had an overall positive attitude of the EHRs regarding the system’s benefits and ease of use; however, these attitudes were influenced by various factors, including computer experience, education and training, age and length of experience. |
| 40        | Al-Azmi et al, 2008   | To elicit the opinion of the physician working in the primary healthcare facilities in Kuwait to the newly introduced EMRs in the government clinics of Kuwait as well as their appreciation of its utilities and advantages | Respondents were positive and satisfied with the EHR/EMR. |
Perceived barriers to EHR/EMR adoption and use

The review of the selected literature also identified several perceived barriers to adopting and using EHRs. This included the complexity of the system and an interface that is not user friendly, where design disrupted as opposed to enhanced workflow, or where it negatively impacted as opposed to supporting communication between the healthcare providers and their patients. El Mahalli reported the majority (81.6%) of the respondents agreed that EHRs are complex and difficult to use. Shaker et al. reported only 35.1% of the respondents agreed that EHR enhances workflow. Security and privacy of the patient data was also a concern to healthcare professionals. At an individual level, inadequate training in how to use the EHR, lack of EHR literacy, and limited English language posed significant barriers. Hasanain et al. reported 12.6% of respondents had poor English language that limited their ability to use EHR. El Mahalli also found that the lack of continuous training from the IT department was a significant barrier to implementing EHR in Saudi hospitals, with 85.9% of healthcare professionals citing the barrier. Lastly, the systems were also perceived to be costly during the implementation phase.

Perceived influencing factors of EHRs

The perceptions of the healthcare professionals were found to be influenced by various factors across the three levels of the individual, the organisation and the system. Individual factors, including age, occupation and level of computer literacy, were found to have a significant positive association with users’ satisfaction with EHRs. Alasmary et al. reported a significant correlation between EHR satisfaction and age (r=0.263, p=0.011) and level of computer literacy (r=0.343, p<0.01). Although the authors did not report whether higher satisfaction with the EHR was observed among the younger or older professionals, they noted that satisfaction was higher with higher computer literacy skills. Al-Azmi et al. also reported EHR satisfaction was significantly correlated with age (F=0.033, p<0.001) with younger professionals more satisfied than older ones. There was also a significant difference in perception of the EHR benefit that EHR results in better communications between younger and older healthcare professionals with the former group having a higher agreement level (F=3.659, p=0.0269). However, the older and younger professionals did not significantly differ in perception that EHR enhances efficiency (F=0.966, p=0.405) and improves performance (F=1.612, p=0.201). Computer literacy was also found to have a highly significant positive relationship with EHR literacy (r=0.44, p<0.001). Lastly, the level of English proficiency was also highly significantly correlated with computer literacy (r=0.44, p<0.001) and electronic medical record (EMR) literacy (r=0.31, p<0.001).

With regards to professional and organisational factors, Asiri et al. reported a weak but positive significant relationship between nurses’ attitude towards EHR and nurse involvement (β=0.1176, p<0.05), nurse-client relationship (Beta=0.0044, p<0.05) and adequate training (β=0.1645, p<0.05). Conversely, there was no association between nurses’ attitude towards EHR and management support (β=0.0003, p>0.05), nurse autonomy (β=0.0016, p>0.05), or organisational citizenship behaviour that includes identifying with the organisation of work (β=0.0045, p>0.05).

Lastly, the system factors that had a significant influence on attitude towards EHRs included perceived usefulness and perceived ease of use. The two system attributes were found to have a positive moderate significant relationship with the attitude towards EMR usage and acceptance perceived usefulness (β=0.51, p<0.05) and perceived ease of use (β=0.19, p<0.05). Another study examined these aspects in terms of system quality, which include efficiency, reliability, service quality, ease of use and responsiveness as well as information quality based on content and accuracy. However, a positive significant relationship was found only between service quality and user satisfaction (t=3.210, p<0.05).

**DISCUSSION**

The findings in this systematic review identified that healthcare professionals in GCC countries have varied perceptions of the EHRs regarding the systems’ benefits and challenges or risks of use. However, the perceptions are largely influenced by various factors that can be classified at the individual, organisational or system-level and are likely to affect the successful adoption of the EHR.

The review identified a perception that the adoption of EHRs results in improvements across access to clinical data, communication, work efficiency, quality of care,
| Reference                  | Perceived benefits of using EHR/EMR | Perceived barriers to adopting EHR/EMR |
|----------------------------|-------------------------------------|--------------------------------------|
|                            | Improved access to clinical data    | Security and privacy issues           |
|                            | Improved quality of care            | Workflow disruption                   |
|                            | More efficient workflow             | Communication disruption              |
|                            | Improved patient safety             | Complicated and not user-friendly     |
|                            | Improves communication              | Inadequate training                   |
|                            | Good source of education            | High initial cost                     |
|                            | Reduces error                       | EHR/EMR literacy                      |
|                            | Reduces costs                       | Poor English language                 |
| Shaker et al, 2015         |                                      |                                      |
| El Mahalli, 2015           |                                      |                                      |
| Khalifa, 2013              |                                      |                                      |
| Hasanain et al., 2015      |                                      |                                      |
| Asiri et al, 2014          |                                      |                                      |
| Alzobaidi et al, 2016      |                                      |                                      |
| Alsaleh and Al-Azmi, 2008  |                                      |                                      |
| Al-Mujaini et al, 2011     |                                      |                                      |
| Alharthi et al, 2014       |                                      |                                      |
| Al-Azmi et al, 2008        |                                      |                                      |
| Alasmary et al, 2014       |                                      |                                      |
| Al Farsi and West, 2006    |                                      |                                      |
| Al Alawi et al, 2014       |                                      |                                      |
| Alasmary et al, 2014       |                                      |                                      |
| Abdulla et al, 2016        |                                      |                                      |
patient safety including reduced medical errors and costs. These findings are concurrent with other studies. King and colleagues noted that majority of physicians in the USA perceived the EHR to be useful in ambulatory care practice due to its benefits in enhancing overall patient care, enabling access of patient data remotely and reducing medical errors. Further, Tharmalingam et al. reported that healthcare professionals in Canada perceived the interconnected EHRs to be valuable in improving the quality of care since they enable access to medical data at any point of care. Thus, the positive perception of an EHR by healthcare professionals in GCC countries identified in this review could be attributed to the perceived benefits of EHR. Krousel-Wood et al. similarly found a positive association between EHR benefits and perceptions of the EHR. These findings suggest that healthcare providers in the GCC countries have positive perceptions of EHRs due to their potential benefits; thus, they are more likely to adopt the system which would increase the adoption and use in healthcare.

The negative perceptions identified in this review are largely related to the challenges and risks of using an EHR. This includes complex and non-user-friendly systems, workflow and communication disruptions, increased workload, security and privacy issues, high initial costs, inadequate training and lack of EHR literary as well as language challenges. A previous study in the USA reported similar challenges, including complexity and lack of adequate technical support. Moreover, an international survey involving 45 countries from different settings found a negative perception and low satisfaction with EHR in 67% of respondents, citing issues such as poor usability, limited functionality and lack of user training. Negative perceptions have been found to be negatively associated with user satisfaction and acceptance of technology. Thus, the identified negative perceptions towards EHR among the healthcare professionals in the GCC countries could act as a potential barrier to the successful adoption of EHRs in these settings as opposed to positive perceptions that are perceived as facilitators for EHR adoption.

This systematic review also identified that healthcare professionals’ attitude towards EHR is influenced by various factors. Specifically, they included personal, organisation or system factors such as age, perceived usefulness and organisational support. Previous studies have also shown the influence of these factors on healthcare professionals’ perception of EHR. At the individual level, Duarte and Azevedo showed that younger professionals in Brazil were more satisfied with EHRs than older counterparts which is similar to the findings of this systematic review. Moreover, computer literacy and training have been found to be positively associated with increased users’ satisfaction and acceptance of technology. The system factors including perceived usefulness and perceived ease of use were found to be positively associated with healthcare professionals’ perceptions of EHRs. Previous studies have similarly reported that perceived usefulness and perceived ease of use of a system could increase acceptance and use of a technology that facilitate adoption.

CONCLUSION

This systematic review evaluated the current literature reporting healthcare professionals’ perceptions of EHR adoption in the GCC countries and the factors influencing these perceptions. Professionals in these countries perceived EHR to be beneficial in healthcare
service provision by improving patient safety and quality of care, access to patient health information, workflow and communication between healthcare providers and patients as well as reducing healthcare costs in the long run. The perception of these benefits could facilitate the adoption of EHRs in these settings. Conversely, the impact on workflow and communication disruptions, inadequate training, high initial costs and privacy and security issues may hinder the successful adoption of an EHR. The healthcare professionals’ perceptions of the EHRs are, however, influenced by various factors at the individual, organisational or system levels. Therefore, the governments and policymakers in GCC countries should adequately understand the factors that are likely to affect the successful adoption and use of EHRs. Significant emphasis should be placed on human factors with healthcare professionals targeted as the end-users of the systems.

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