

## Original Research

# Factors Impacting Providers' Perceptions Regarding a Midwestern University-Based EMR

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### ABSTRACT

The potential for Information Technology (IT) to enhance the healthcare provision has long been recognized. One application of IT in healthcare, Electronic Medical Records (EMR) systems, has generated particular interest. Technical and structural barriers are often analyzed to understand EMR deployment. This study sought to examine cultural barriers to better explain the potential success and failure of EMRs. Successful EMR implementations are of interest to telemedicine researchers as they provide an IT infrastructure on which many telemedicine applications can be built. This investigation sought to understand the role and impact of individual and organizational issues on perceptions regarding EMRs by providers now employing an EMR system at Michigan State University (MSU). A 144-item survey was administered to 41 participants and descriptive statistics were employed for data analyses. Data indicated that providers reported mixed results regarding perceptions of EMRs at MSU. More than 45% of the respondents reported that they consider the MSU EMR system a bad choice. Yet, these same providers reported high levels of satisfaction across multiple aspects of system usability. Demographic variables did not emerge as highly correlated with perceptions of the EMR system at MSU. However, positive perceptions about EMRs in general were highly correlated with positive perceptions of the EMR system at MSU. Because results indicate that perceptions of the impacts of EMRs in general are more often correlated with perceptions of a specific EMR implementation than demographic variables, health organizations should focus their energies on EMR education and training.

### INTRODUCTION

THROUGHOUT EARLY WORK in telemedicine, researchers experimented with and evaluated many synchronous and asynchronous systems meant to deliver healthcare from a distance using telecommunication technologies. Such applications were typically stand-alone trials as researchers sought to establish the ef-

ficacy and cost-effectiveness of healthcare via telemedicine.

Telemedicine, like healthcare in general, has evolved significantly over the years. Telemedicine originally included things such as video conferencing technologies, but it has grown to include technologies such as data management tools, which include electronic medical records (EMR) systems. As healthcare organizations

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seek to improve the provision of healthcare by integrating the entire continuum of care, telemedicine systems that operate independently are less attractive. Rather, healthcare organizations that tie telemedicine systems into existing Information Technology (IT) infrastructure can be more beneficial.

The potential for IT (including telemedicine) to improve the provision of healthcare has long been recognized. One specific application of this, EMR systems, has generated particular interest. The potential of EMRs has been recognized for 4 decades, with the earliest research into primitive EMR applications occurring in the late 1960s.<sup>1</sup> As healthcare has increasingly focused on integrating IT, the presence of an established EMR system could be viewed as the foundation for all other IT systems. Telemedicine, especially the common application of home monitoring, could benefit significantly from successful adoption of EMRs. An increased focus on factors that lead to EMR success is important, as researchers can build on the foundation it provides to roll out increasingly sophisticated and useful telemedicine applications.

Despite the potential benefits to be garnered via widespread adoption of EMRs, adoption in the United States (U.S.) has been slow.<sup>2</sup> A recent survey published by the National Center for Health Statistics indicated that in 2005, only 23.9% of office-based physicians were using a full or partial-functionality EMR. In addition, physicians in metropolitan statistical areas were more likely to use EMRs. Physicians in the Midwestern U.S. and Western U.S. were also more likely to use EMRs than those located in the Northeastern U.S.<sup>3</sup> Additionally, a variety of studies have shown there is a gap between large and small practices, with smaller practices lagging in overall EMR adoption.<sup>4-6</sup> Many factors have been cited as potential barriers to EMR adoption. Shortliffe<sup>7</sup> begins his list by highlighting the difficulty of making the business case for EMRs.

One reason for the difficulty in making the business case for EMRs includes the notion that IT services are viewed as areas that generate a large expense. It can be problematic to measure the contribution of IT to an organization's performance; the "productivity paradox" of Information Systems research and the work fo-

cus on improving measurement of IT to organizational performance is a testament to this.<sup>8-10</sup> Another reason for the difficulties facing the business rationale for EMRs is that incentives are not aligned properly when providers are asked to invest heavily in IT and EMRs, while beneficiaries of these investments tend to be other groups and organizations (health systems, patients, payers, etc.).<sup>11</sup> Despite these problems, a variety of studies have shown that installing EMRs should provide financial benefits.<sup>12,13</sup> Other benefits of widespread adoption included reducing medical errors and improving quality of care,<sup>14</sup> cost savings for healthcare systems,<sup>15</sup> and improving continuity of care.<sup>16</sup>

With the ability to make a business case for EMRs improving, other factors must be attributed to the slow adoption of EMRs. Shortliffe describes structural and cultural barriers as other barriers to widespread EMR implementation.<sup>7</sup> Structural barriers relate to aspects of the general healthcare system that makes it difficult to successfully adopt EMRs on a large scale. Such issues include challenges in adopting technical and administrative standards, as well as decentralized and fragmented national healthcare systems. More centralized and coordinated national healthcare systems have eased the adoption process<sup>17</sup> evidenced by the fact that over 50% of primary care physicians in Sweden, The Netherlands, Denmark, Finland, and Australia are using EMRs.<sup>18</sup> Recent efforts in the U.S., such as the appointment of an Office of the National Coordinator for Health Information Technology, could help eliminate structural barriers through increased coordination of national initiatives.<sup>19</sup>

Cultural barriers are also a factor when an organization is looking to implement an EMR. Such barriers include a lack of trust in IT to ensure patient confidentiality and security,<sup>20</sup> as well as fears that increasing levels of IT will lead to generic models of healthcare that depersonalize health services.<sup>21</sup> Also, some providers are reluctant to dedicate time to familiarizing themselves with IT and possible changes in workflow.<sup>22</sup> This is a result of providers viewing IT as something that supports the provision of healthcare, instead of viewing IT as an asset that can enhance an organization's goal of providing quality service.

It could be argued though that some of these cultural barriers may be disappearing. Berner et al.<sup>2</sup> suggest that as newer healthcare professionals who are more familiar with computers and technology enter the field, acceptance of EMRs could accelerate. Further, research has demonstrated that experienced providers can save time through the use of IT.<sup>23</sup> Other work has shown that clinicians believe EMRs can provide efficiency gains when reviewing charts and writing prescriptions.<sup>5</sup> Others have commented that well-designed EMRs can enhance the ability of providers to ensure the security and privacy of patient data.<sup>7</sup> While some cultural barriers may be disappearing, actual adoption still lags—providers recognize the potential but are not committed to trying technology in their own practice.<sup>24</sup>

Widespread adoption of EMRs is a worthy goal, but it will not be achieved easily—financial, structural, and cultural barriers present significant issues to be addressed. Continued research into such barriers will ease the process of integrating EMRs into the provision of care. This, in turn, will provide an established IT base on which to build more successful telemedicine systems. This particular research focuses on issues related to barriers hindering EMR adoption in the context of a university-based healthcare system.

## MATERIALS AND METHODS

This investigation sought to understand the role and impact of individual and organizational issues on perceptions regarding EMRs by physicians at Michigan State University (MSU). This investigation sought to identify the following regarding providers at MSU: perceptions of the general impacts of EMRs, initial and current attitudes toward adoption of the EMR system at MSU, perceptions of the success and impacts of the EMR at MSU, and relationships between demographic or experiential variables and perceptions of the EMR system.

### *Participants and EMR background*

In total, 41 healthcare providers affiliated with the MSU HealthTeam were recruited. The MSU HealthTeam is a large, university-affili-

ated healthcare provider in East Lansing, MI, with approximately 190 physicians encompassing 14 specialties.<sup>25</sup> The sample included 27 males and 14 females. Regarding age, 41% of participants were between 35 and 50, and 51% were over the age of 50. The providers in our sample were experienced with computers, as self-reported computer skills were fairly high with over 56% rating their skills as high and no providers rating their skills below average. All participants reported having used the computers for test result retrieval, literature searches, entering patient information, and retrieving patient information.

At the time of this study MSU had been using Centricity, a system by General Electric (GE), for approximately 4 years. This was MSU's first experience with an EMR. Initially, the feasibility of using an EMR as a single-unit initiative was explored by the MSU Department of Family Practice. However, in anticipation of wider use, the department included representation from other units in its initial planning stages. The work group developed a prioritized list of EMR functions, requested proposals from vendors, evaluated their responses, and in the end, Centricity was selected as the best fit for MSU.

Regarding implementation, the Department of Family Practice was the first to adopt the system and other clinics in the MSU HealthTeam followed suit. The EMR system was rolled out across all clinics concurrently, with four EMR implementers leading efforts at the clinics. Individual implementers were given latitude in training users and rolling out the system to the clinics, but the overarching goal was to have all clinics move forward together. Training was generally conducted via one on one or small group sessions, with on-line training a recent development. Most clinics are fully operational, with a few lagging behind due to a variety of barriers. The EMR system currently supports up to 265 concurrent users, with technical help provided by four staff members responsible for EMR support.

### *Data collection and analysis*

A 144 item survey, which took approximately 30 minutes to complete, was administered to 41 participants in this study. Many

portions of this survey were based on an instrument used in an EMR investigation by Laerum, Ellingsen, and Faxvaag.<sup>26</sup> Descriptive statistics were employed to understand perceptions of EMRs in general and at MSU. Survey responses were correlated to find factors that demonstrated potential trends regarding perceptions of the EMR system. Finally, several factors were correlated in order to find relationships between user perceptions of the EMR and other key variables.

## RESULTS

The data provide an array of findings regarding providers and the EMR system at MSU. Provider data ranging from EMR and computer use, perceptions of the general impacts of EMRs, attitudes toward EMR adoption and implementation at MSU, and perceptions of success and impacts of the EMR are reported.

### *Provider perceptions of the general impacts of EMRs*

Providers demonstrated largely positive perceptions of the general impacts of EMRs. A majority of respondents reported they believe EMRs have or will have a beneficial or highly beneficial impact on access to healthcare in rural areas (83%), clinicians' access to up-to-date knowledge (80%), quality of healthcare (71%), interactions within the health team (68%), and continuing medical education (68%).

Despite the largely positive perceptions of the general impacts of EMRs, data indicated some measures for which there were mixed perceptions. For example, 37% of participants responded that EMRs are detrimental to the enjoyment of the practice of medicine, while 39% reported no detriment or benefit. In addition, one-third of the participants responded that EMRs are detrimental to personal and professional privacy.

### *Providers' attitudes toward EMR adoption and implementation at MSU*

Healthcare providers have mixed perceptions of the EMR system at MSU regarding

adoption and overall success of the system. When asked about attitudes toward adoption, many participants favored the adoption of the EMR system initially and still consider it a good choice (45%), while a few did not initially favor the adoption, but now consider it a good choice (11%). Conversely, a number of participants were initially in favor of the EMR system but now consider it a bad choice (34%), and a few originally opposed the adoption of the EMR system and still consider it a bad choice (11%). Also, there was a negative response toward perceptions of the implementation, as the majority of participants (76%) disagreed on some level with the statement "The implementation of the EMR system went smoothly."

### *Providers' perceptions of success and impacts of the EMR at MSU*

The overall ratings of satisfaction and success of the EMR system at MSU were mixed, with only 27% rating the success as good or excellent, 56% as fair, and 17% as poor. Likewise, perceptions of satisfaction with the EMR also varied, with 37% rating their satisfaction with the system as good or excellent, 34% as fair, and 29% as poor. In addition, 44% of respondents reported the EMR is seldom or never/almost never user friendly, while 29% responded it is user friendly about half of the time. No participant responded that the system was always/almost always user friendly.

Perceptions of how the EMR have impacted the ease and quality of performing departmental work were also inconsistent. While 49% of our sample felt that the EMR had decreased the ease of performing departmental work to some extent, 12% felt the EMR had made no impact, and only 39% believed that the EMR had increased the ease of performing departmental work to some extent. Furthermore, 17% of participants felt that the EMR had decreased the quality of departmental work to some extent, 29% felt there was no change, and 54% felt there was an increase to some extent. Varied responses were also discovered regarding whether or not participants agreed with the statement "The EMR system is worth the time and effort required to use it," as 59% agreed, 10% were neutral, and approximately 32% dis-

agreed. Similar mixed results were evident regarding the statement "If given the chance, I would go back to a paper-based system," as 61% agreed, 7% were neutral, and 32% disagreed.

Although there were negative attitudes toward the impacts of the EMR system at MSU, respondents did have some positive things to report regarding usability of the system. Positive perceptions were fairly consistent in regard to providing accurate information (85%), being available when needed (81%), providing up to date information (75%), consistent use of terms and labels in the interface (73%), consistent use of fonts and page layouts (73%), providing the precise information needed (66%), and having good response time (63%). Despite perceptions that the EMR is not easy to use, providers self-report that the system does what it is supposed to do. Overall, providers report that the EMR provides the information that is needed in an accurate and timely manner.

#### *Relationships between demographics and perceptions of the EMR at MSU*

To determine whether any demographic variables such as age, gender, and department and position within the MSU HealthTeam were related to key measures of EMR perceptions, a series of correlations were conducted. Surprisingly, no demographic variables were consistently related to perceptions of the success and satisfaction of the EMR system at MSU. While age was found to be negatively correlated with

the perceived satisfaction of the EMR system at MSU ( $r = -0.401, p < 0.05$ ), this was the only perceptual variable that was directly related to age.

#### *Relationships between general perceptions of EMRs and the EMR at MSU*

Although traditional demographic variables did not have many direct relationships with key perceptual satisfaction and success variables relating to the EMR system at MSU, several measures of the perception of potential impacts of EMRs on healthcare in general did. Particularly, beliefs that EMRs have impacts on the quality of healthcare, enjoyment on the practice of medicine, interactions within the health team, rapport between clinicians and patients, and clinician autonomy were found to be significantly correlated to several key satisfaction perceptions of the EMR at MSU (Table 1).

## DISCUSSION

This investigation surveyed a sample that included over 20% of the providers affiliated with the MSU HealthTeam. While this was not a randomized survey, we feel the data adequately reflect the practice group. Although providers in our sample were proficient with computers and viewed EMRs as having positive impacts on the healthcare industry, general perceptions of the EMR system at MSU

TABLE 1. SIGNIFICANTLY CORRELATED PERCEPTION RELATIONSHIPS ( $p < 0.05$ )

	<i>Satisfaction with EMR system at MSU</i>	<i>System had changed the ease of performing departmental work</i>	<i>System has changed the quality of departmental work</i>	<i>Success of the EMR system at MSU</i>
Impact of EMRs on the quality of healthcare	$r = 0.497$	$r = 0.423$	$r = 0.521$	$r = 0.399$
Impact of EMRs on the enjoyment of the practice of medicine	$r = 0.451$	$r = 0.420$	$r = 0.478$	
Impact of EMRs on the interaction within the health team		$r = 0.505$	$r = 0.346$	
Impact of EMRs on the rapport between clinicians and patients	$r = 0.405$		$r = 0.519$	$r = 0.499$
Impact of EMRs on clinician autonomy	$r = 0.326$		$r = 0.424$	$r = 0.400$

EMRs, electronic medical records; MSU, Michigan State University.

were mixed. Data indicated that the majority of people (79%) were initially in favor of the EMR, yet at the time of data collection almost half of our sample (45%), "now consider it a bad choice." It is apparent that over time the attitudes toward adoption became more negative.

Regarding perceptions of the success of the EMR system at MSU, the fact that 32% of respondents were initially in favor of the system but now consider it to be a bad choice does not bode well toward optimizing the use of EMRs at MSU. Overall measures of perceptions of satisfaction with the EMR system at MSU, success of the system, and how it has impacted the ease of and quality performing work were all mixed. These mixed findings toward adoption, success, and satisfaction measures potentially indicate the need to have a larger team involved in EMR selection, as well as a more formal system rollout. Increasing the number of people who are involved in the EMR selection process, and gaining more input on implementation by members of a health system, it is likely that there will be more provider buy-in, potentially leading to an increase in the satisfaction of the EMR system. This investigation has revealed mixed perceptions of the EMR system at MSU. It is evident from our results that implementation of this EMR system was seen as something that could have been improved. This finding is of great importance because while physicians might use the EMR because they have to, opinions about the implementation of the system may potentially prevent physicians from maximizing their EMR use in ways that could optimize the management of patient care and healthcare costs.

The fact that providers tend to favorably review a variety of specific components of the system, while rating the overall system as lacking in usability, potentially points to organizational issues that should be addressed by EMR administrators. If the system as a whole does not fit into the existing workflow of these practices, or if the workflows are not adjusted to work with the EMR system, overall usability will continue to suffer. Administrators need to decide whether they want to adjust the EMR system, existing workflows, or some combination to improve overall usability.

Perhaps the most powerful finding from this

investigation is that perceptions of the impacts of EMRs in general seem to be the key in determining whether providers like the MSU EMR system. In other words, the belief that EMRs will have significant positive impacts on the healthcare industry is positively related to whether or not the EMR system at MSU is viewed in a favorable light. This suggests there is a great need for educating providers about the benefits of EMRs in general. As such, it is possible that more resources should be allocated to teaching the benefits and potential impacts of EMRs to providers. By selling the positive impacts and potential benefits of EMR systems to providers, it may be possible to improve current perceptions and optimize utilization of specific EMR systems.

Successful implementation of EMRs should be an ultimate goal of telemedicine researchers, as an array of applications can be built upon a successful EMR to enhance healthcare services available through the EMR. Telemedicine researchers, who have a long history of bringing new technology into healthcare organizations, can make significant contributions to this area. Such work will benefit telemedicine as a field, as well as provide valuable information to practitioners implementing EMRs in healthcare organizations.

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