

## **The Electronic Medical Record (EMR)**

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### **Abstract**

The electronic medical record (EMR) comprises a system of recording, processing, storing, recording and transferring health information electronically. Through the use of the EMR, several limitations that are associated with the paper-based medical record system are clearly overcome. For example, in contrast to the paper record, the EMR can play a larger role in medical decision-making, integrating the services of various departments, customizing care to the patients, reducing medical errors, improving quality, reducing costs, etc. In addition, the EMR can effectively help to transfer patient information from one organization to another and in this way help in referrals and improving the access to healthcare. This article examines the problems associated with the implementation of EMR systems, and later discusses the uses of EMRs and its benefits. If EMR system is implemented and used properly, it will help in the improvement of community health.

### **1 Introduction**

The Electronic Medical Record (EMR) is an application that would aid in recording clinical data electronically, making decisions, placing and receiving orders, making requests to the pharmacy, recording X-ray and laboratory findings, and also documenting clinical activities. An EMR system can be utilized in most clinical settings that include physician's private practices, nursing facilities, and ambulatory, inpatient, trauma, intensive and managed care settings. An EMR system requires the use of a computer system along with a network. The network would ensure the transfer and storage of the health information. The Healthcare Information and Management Systems Society (HIMSS) has planned the implementation and use of the EMR system in the United States in 7 stages. Currently, EMR implementation is in stage 2 and stage 3. In stage 6, about 100 % of the hospitals would be covered. In stage 7, there would be building of the regional and national network that would integrate all the EMR systems and ensure that

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information can be safely shared across all hospitals. Before the EMR system can be integrated over various regions, the hospitals should tend to use them as complete solution packages [1].

## **2 Literature Review**

### **2.1 Incidence**

The National Ambulatory Medical Care Survey conducted in 2001 and 2005 noticed an increase in the use of the EMR's by physicians from 18 % in 2001 to 31 % in 2005. Of the 23.9 % physicians who used the EMR's in 2005, about 11.2 % had full usage and 12.7 % had partial usage of the EMR systems. Considering age, sex and specialty types, the EMR usage rates among physicians tends to be constant. Several issues including the size of the practice, number of specialties in the practice, the presence of managed care contracts, etc, played a role in determining the EMR usage. In the Midwest United States, the EMR usage was about 26.9 % and in the West it was highest at 33.4 %. EMR usage was the lowest in the Northeast at 14.4 %. In urban areas, the EMR usage was about 24.8 % whereas in rural and other areas it was about 16.9 %. More than 21.4 % of the physicians use the EMR for recording and presenting demographic data. However, only about 5.4 % of the physicians can actually present epidemiological or public health data. If the physicians used an EMR system completely, then they were more likely to place orders, prescriptions, lab tests, obtain lab results, take and record nursing notes, place reminders and alerts, etc, using the EMR [2]. Studies conducted in Sweden and Norway, where the implementation of the EMR systems has been more intensive, have demonstrated that up to 90 % of the healthcare facilities may actually have EMRs [3]. In one study conducted on a family medicine practice in Dryden, New York, the EMR system was implemented in July 2003 and was installed in three phases. The implementation of the EMR provided several benefits for the organization. The organization had greater revenue and greater profit margins. The obstacles in the EMR implementation were tackled successfully [3].

### **2.2 Benefits**

Using EMR has demonstrated a number of benefits in the improvement of community health. For example, there are decreased storage space requirements and reduced efforts in searching for the records of the patient. In contrast to physically locating paper medical records from files, electronic searches for records can be performed at the computer within seconds. Hence, there would be an improvement in efficiency because a patient's records can be stored in a more accessible manner electronically. In addition, using the EMR, data can be modified and updated quickly. More importantly, the electronic medical records would ensure that data is entered with ease at the point of patient care. Based on the patient's presenting condition, an electronic medical record would have standardized templates for the healthcare professional to input data. The physician can utilize various templates including demographic information, medical conditions sheets, orders, prescription, image requirements, follow-up notes, etc. By picking up and using the right template, the physician can effectively save time, make fewer mistakes, and chart a patient's details more compressively than when using a hard form paper recording system.

In case of the trauma care department, the use of the EMR system is even more critical. Such a system can help to provide immense benefits to the clinician user such as shortening the recording time so that more time is directed to patient care; while at the same time, improving the quality of the documentation and care rendered through the form of alerts, risk information, error reporting, etc. Some of these features could be life-saving in the trauma care or intensive care units. EMR systems permit transfer of information inside and outside of the hospital. When a provider is assigned to a particular patient, the provider as a user would be given rights to access the patient's information. The user would just have to logon any computer on the network with a username and password; and accordingly, access his/her patient's information. Between organizations, information can be transferred. Thus, a patient can go to almost any hospital across the nation, and the hospital can retrieve the patient's health information within a matter of seconds. Through firewalls and encryption, EMRs also permit safer and secure transfer of health information, ensuring that the patient's information is kept confidential. In case of an emergency situations or natural disasters, the EMR is very useful in ensuring that the patient's information can be readily retrieved, and backups of the data to off-site facilities prevent loss of critical health information. Today, EMRs that are available in the market ensure that physicians or other healthcare providers perform fewer keystrokes when entering information. Such electronic systems are faster than the paper system and are saving time, lives, and money. EMRs are also very useful in insurance claims, as it can handle any patient's data in a better manner [5].

### **3 Discussion**

The use of EMR in the healthcare system has demonstrated a number of advantages such that it can improve the quality of patient care, decrease healthcare costs, ensure adherence to government regulations and the standards of accrediting bodies, and improve the accessibility and the delivery of the healthcare. The use of EMR by physicians and other healthcare professionals in the U.S. healthcare system has been slow, and physicians are taking the time to understand the functionality of the system, perceive the benefits, develop solutions to the problems and adapt the system. The use of EMR, especially in outpatient or ambulatory settings, has been problematic. The usage of EMR is in the range of 9 to 29 %, but the figures may not be a true indication at the extent at which physicians use EMR in the U.S. The Office of the National Coordinator for Health Information Technology (part of the Department of Health and Human Services), have tried to use the EMR in a small representative population and to develop measures and solutions directed at a larger population. More than 2700 physicians were interviewed during the period late 2007 to early 2008 and about 62% of the physicians actually responded. The physicians were asked questions about EMR usage and the manner in which they used them. It was found that only 4 % of the physician population had a comprehensive EMR system and 13 % had a basic system. More than 83 % of the physicians did not use EMR, out of which 16 % had purchased one but did not implement it and 26 % wanted to have one within the next 2 years [6].

It was also noted that certain characteristics in the physicians were associated with increased usage of the EMR. The younger physicians adopted the EMR system as they were more inclined to use computers. There were not many differences between the usage of EMR between physicians who served minors, uninsured populations, insured

populations, etc. There was greater usage of all the features in the EMR when a basic system was used compared to an advanced system. Some of the features that the physicians found useful in the EMR included entering, viewing and modifying data of the patient's health, writing prescriptions and refills, giving appointments and referrals, placing orders for tests, etc. Amongst these, one of the most significant functions of the EMR system was to enable the physicians to place prescriptions electronically. According to the benefits of EMR system, about 82 % felt that there would be a positive implication over the quality of care, 92 % felt that the interaction and communications would improve, 97 % felt that there was convenience in accessing the patient's records and 86 % felt that there would be a significant reduction in the rate of errors. The physicians felt that using the EMR helped to avert drug interactions and allergies, reporting of critical laboratory values and ensuring that preventive actions was enabled. About 93 % of the physicians were satisfied with the use of an advanced EMR system and 88 % were satisfied with the use of a basic system. The physicians were more likely to be happy in case an advanced EMR system was utilized. The physicians also had a few barriers to adoption of the EMR including high costs of investment, difficulties in choosing a system, difficulties with having a current system, etc. A high number of physicians chose to adopt an EMR system due to the financial incentives available to them. About 40 % of the physicians felt that having an EMR system could help protect tampering the medical records of the patient that may be done during the assessment of liability in medico-legal cases. Studies had also shown that when the physicians' practice in a group (larger than 50) or in a hospital, were more likely to use medical records than otherwise. Besides, the chances of the EMR system to be advanced and used for several functions was four times higher when adopted by a larger practice compared to a smaller group of physicians [6]. With regards to quality of services, where electronic medical records were used in larger facilities and were fully functional, there was a better control over quality issues. However, it may be difficult to assess to what effect the EMR actually improved the cost-effectiveness and quality of patient outcomes, unless through direct clinical studies. There was greater concern amongst the physicians who actually utilized basic EMR systems, as they were worried about the accuracy and errors [6].

Physicians were also concerned about the potential obstructions or limitations to the use of EMR system. As discussed earlier, the problems were greater and more severe in physicians who utilized basic EMR systems and were in a smaller practice [7]. One of the huge concerns expressed by physicians is the high initial costs of procuring an EMR system. The costs of procuring an EMR system ranged from sixteen thousand dollars to thirty six thousand dollars for every physician. During the period of EMR implementation, some physicians experienced the problem of treating fewer patients, which further increased the costs. In addition, there were initial problems of learning how to use the EMR system and actually spending more time with each patient to input and access the information. This caused a greater concern as now longer time was taken. Physicians often found it very difficult to use computers. This may be a huge concern especially in older physicians and those who are less computer-compliant. The physicians may initially be unable to understand the benefits to quality and improvement in the system of the EMR and may even consider discarding it as pointless unless it improves their work life. Physicians often find it difficult to navigate through an EMR. Some of the basic EMR systems require huge amount of data to be typed, a lot of mouse clicks and several scrolling requirements. On the other hand, an advanced EMR system can potentially help to do away with such problems. Today, more and more the EMR

manufacturers are coming up with solutions for use by the physicians to ensure improvements in the functionality (i.e., user-friendliness) of the system. The use of an EMR system needs to be gradually implemented along with constant support in the form of planning, training, trouble-shooting, and problem-solving. Often complex activities need to be performed to ensure that the functionality of the EMR is complemented. Often, support for EMR system needs to be provided for several years following initial implementation. New staff would join and leave the organization, and if it is a small EMR network, there are chances that support personnel may not be present all the time, making trouble-shooting the system difficult to address. Therefore, for an EMR system to maintain essential support, constant training needs to be provided. The clinician may often have to modify his or her workflow to ensure that the EMR system can be effectively accommodated. In larger organizations, the planning, implementation, training, trouble-shooting, financial support, leadership, expertise support, etc were greater than in smaller organizations [7].

An EMR system should effectively talk to other clinical systems such as LIS, PACS and referral systems. This would ensure that the workflow of various sections is well-integrated and the services provided are comprehensive. In smaller organizations, there was a greater problem in integration as the system used were basic and the technical support require was complex [8].

Another problem noticed with the EMR is that although there are certain benefits in terms of quality, error reduction, ease in decision-making, etc, these may not be quantified and hence may not be apparent to the physicians. In other words, there are chances that no direct financial rewards are obtained to the organization. Some physicians may also feel of doing away with such a system. The use of the EMR may not be utilized to a greater extent in the organization [8].

However, if the EMR systems are planned and implemented in an appropriate manner, there is a greater chance of the benefits being reaped than of the limitations being magnified. One way would be to ensure that the EMR network be large and that exchange of data between various hospitals and practices be ensured. Laboratory support to smaller hospitals can effectively be provided by the larger hospitals if EMR exchanges are present. During the exchange of information within the EMR systems, the criteria laid down under HL& and HIPAA needs to be closely adhered [8]. In community settings, such exchanges would permit exchange of data between the primary or community health centers and the tertiary hospitals and in this way enable provision of specialized health services. Exchanges also help in meeting technical demands, governance, etc [7]. The organization that utilizes the EMR should never consider the direct profits made by incorporating such a system, but instead look at the manner in which the related costs are reduced. The cost benefits of EMR need to assess in other ways such as looking at performance reports, patient satisfaction levels, patient outcomes, reduction in medical errors, quality levels. To encourage greater use of the EMR system by the physicians, incentives need to be provided [8].

In the field of public and community health, the use of EMR is even more critical considering that this is one of the key issues to greater safety and health to the population of the entire nation. Often the EMR system can be integrated with a public surveillance and monitoring systems to identify the risks for communicable diseases. These systems can perform advanced calculations through the use of algorithms and hence predict the risk for any outbreak or epidemic, even before such an event has occurred. The system uses ICD-9 and CPT codes help to detect the presence of any disease. When the

information from various sources are integrated, missing or incomplete data can be supplemented and in this way the risk for an outbreak of any disease can be predicted. EMRs have also been very useful tools in the management of chronic diseases in primary care settings. The use of Evidence-based practices (EBP) on patients can be monitored closely. The use of EBP to assess diseases, determine if recommended tests and procedures are conducted and whether the outcome indicators are closely followed-up, should be ensured. Many countries such as Canada, U.S. and the U.K. have setup targets and conversion of the paper system to the EMR system within a few periods of years. EMR would ensure greater amount of clinical audits and hence help to improve the quality of healthcare [9].

#### **4 Conclusion**

Over the years, there has been an increased use of EMR systems by physicians; however, many obstacles preventing full implementation still need to be addressed. Physicians from smaller practices and hospitals are embracing EMR systems more slowly and are adopting only basic EMR systems that provide limited benefits, which may not be very useful considering the high costs of implementation and maintenance. Also, there may be certain geographical differences in the use of EMR system, as they tend to be used more often in urban areas compared to rural areas where a fewer number of physicians would use an EMR for a greater number of diverse services. Compared to the U.S., in countries such as Sweden and Norway, the implementation and use of the EMR systems have been greater. The EMR has a huge number of benefits and would definitely help to change the face of medicine.

One of the huge advantages of EMR is the ability to incorporate evidence-based practices; and in this way, improve the quality of the services provided. For example, EMRs have a wide use of applications including placing orders and prescriptions, setting reminders and alerts, communicating with others through a messaging system, etc. EMRs, if used properly, can improve the efficiency and quality of services of the organization. They do not occupy a lot of space and can be utilized to search for information promptly. In ICU and ED settings, the role of the EMR is even more critical and can potentially save the life of a patient. A network can be formed, which can be used to quickly disseminate information and effectively integrate services. Several countries have set mandates for converting to fully electronic systems. Some physicians may be turned-off by the huge investments and resources required for procuring an EMR system. However, it is important to note that when EMR systems are used properly, they can translate into huge profits indirectly for the organization by reducing costs in various work processes. Due to initial start-up costs, this may often not be seen as a benefit in the short-term, but would have to be thoroughly researched as it relates to long-term profitability. Each individual organization needs to determine ways in which the benefits of the EMR system could be best applied to the facility. Also, a lot needs to be done to improve the interoperability between the EMR systems within healthcare delivery networks and EMR training must become part of the curriculum in the medical schools. Ideally, a fully functional EMR should be used by the physician.

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