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The role of electronic medical records in enhancing healthcare efficiency and accuracy

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***Abstract*---Background:** EMRs have indeed become a necessity in modern day healthcare systems, as they possibly bring desired changes in the healthcare delivery system as well as increase in the efficacy and reliability of the healthcare sector. EMRs make it possible for providers to maintain the electronic record of patients; optimize information sharing, decrease adverse medical events, and improve integrated client care. **Aim**: This study will assess some of the ten features of EMRs, how these systems enhance health care delivery and the effects of these systems on patients' health outcomes in addition to analyzing the difficulties encountered by health care facilities in the implementation of EMRs. **Methods**: Based on the primary research, it was possible to find out the major characteristics, advantages, and disadvantages of EMRs by analyzing the existing literature of both academic and non-academic nature, including approximately ten peer-reviewed articles, case studies, and reports. **Results**: Some of the benefits understood by the study include efficiency; accuracy; and integrated team approaches of EMRs. It also recognizes key barriers including inadequate financial resources,

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organizational and professional resistance to change, system implementation complexities, concerns on data security and privacy and continuous...systems upgrade and maintenance. **Conclusion**: The potential of EMRs to become significant drivers of better healthcare experience and outcomes is considerable, but the process of adopting them is rife with challenges. Despite all these challenges, healthcare organizations need to overcome financial, technical and cultural barriers in order to invest in proper training for personnel and to maintain adequate security of the data collected.

***Keywords*---**EMR, healthcare productivity, patient treatment experience, medical mistakes, information protection, EMR assimilation issues, healthcare technology.

Introduction

The adoption of Electronic Medical Records (EMRs) has become one of the most impactful advancements altering the ways in which patient information is processed, both stored and accessed in the healthcare setting, and the enhancement of the overall workings and results of the industry. Through the use of EMRs healthcare providers are able to maintain a patients' record electronically because EMRs are accurate which helps clinicians to have real time access to pertinent patient information hence improving on care planning and hence improving on decisions made. Now, as global healthcare organizations work hard to improve their delivery of care and organization of their operations, electronic medical records have become a technology that is expected to bring many benefits such as fewer medical mistakes, increased patient safety and more effective ways of managing long-term illnesses. Nevertheless, the prospects of EMRs include several challenges that institutions implementing EMRs encounter in their enhancement processes. These challenges are initial costs, change in reactive from health care professionals, integrating and compatibility problems, security and privacy issues, and need for frequent updating and recalling of programs. EMRs are explained further on in this research based on their key characteristics, advantages, and disadvantages notably illustrating how they characterize contemporary health practice settings.[1,2]

Characteristics of Electronic Medical Records/Systems (EMRs)

EMR refers to digital records of patient information as opposed to conventional paper-based health records intended to improve execution and handling of patient records in healthcare centres. Another importance of EMRs is that it holds all the data of a patient electronically like diagnoses , treatment, medication, lab tests, reports of radiology tests, and immunization records. The current centralized system was developed to provide right care at the right time by allowing healthcare providers to get timely and accurate information that contains all the information about the patient at any location in the healthcare facility promoting collaboration among doctors, nurses, specialists and other health care professionals.[3]One of the other beneficial features is realization of effective documentation and patient data registration. Integrated templates and form work

as tools that compile structures of dealing with patient encounters in an efficient and timely manner as to minimize administrative tasks. Such forms are sometimes flexible for each specialty depending on what data is needed to fill in particular records concerning a patient. Also, EMRs promote the application of universal coding conventions like ICD-10 for the diagnosis or CPT for other operations, because they make it easy for a standard documentation and these latter can help in reporting and billing practices.[4]

These include decision support tools that are available in EMRs software which are quite reliable. It is embedded in the system to give the health care provider information that will be useful like contraindication, allergy, or any odd result from the investigations. For example, if a doctor gives a medication which might cause problem when used together with another drug the patient is on, the EMR system will notify this. It assists in the reduction of medication related errors and ensures that clinicians have timely access to what they need most for informed decisions making thus raised safety for patients and quality of services.[5]Also, integration of laboratory results and diagnostic imaging is also well facilitated in EMRs. Instead of waiting to receive paper reports delivered to the clinic or hospital, a doctor need not wait to review lab results, radiology reports, and other diagnostic data that will help in diagnosis and overall treatment plan. It also eliminates the possibility of misplacing results, which was usual with paper-based systems.

By the same token, the features of data sharing and interoperability are critical for improving the efficiency of EMRs. Most EMR systems are developed to interface with other health care centers or systems since they can easily and securely exchange patient information amongst multiple health care institutions. It is especially beneficial when the patient is referred to some other specialist doctor or needs attention in different health centers. Interoperability makes it possible to have patient information transferred between providers and devices with reduced avoidable repetitions of tests or procedures.[6]Last but not least, EMR have patient engagement functionality built-in – communication tools. Via patient portals, the patient can view his or her own records, make appointments, complete requests for refills on prescriptions, and send and receive messages from the provider. This level of the access makes the patients become an active participant in their care hence enhancing their satisfaction they get and progress towards the new health model that is Patient-Centered. These features of EMRs are particularly useful in carrying not only the objectives of boosting the effectiveness of the delivery of medical services but also the goal of increasing patient-centricity in medical practice.[5]

Advantages of EMRs in enhancing the efficiency of the Healthcare Systems

Effective Patient Management Systems (PMS) have brought about a new Healthcare paradigm with regard to improved functionality, provision of enhanced health care delivery and administration of fewer burdens. Using EMRs perhaps one of the greatest advantages is the optimization of the streams of health care. The patient records in the conventional paper based systems are usually fragmented in the different departments and to search for any related information one is forced to make several searches. On the other hand, EMRs collect all

patient information in a digital environment thus enabling the healthcare providers to review detailed information of the patient at one time, from any gadget in the healthcare facility. These aspects bring direct patient care benefits by avoiding multiple generation of documents that are needed by the clinicians and minimize the time which is spent in searching for patient charts.[6]the communication between the EMRs and various hospital and clinic departments is made easier. In case of electronic records, a patient record can be accessed by different specialists, doctors and other health care providers no matter the geographical location of the two, in real time. This eliminates confusion or delayed sharing of information which compromises treatment delivery or development of errors. For instance, whenever a client is transferred to a specialist, then the files containing the medical record, X-rays, and treatment options should be available at a glance and not require the patient to go through the exercise of doing repetitive test. Not only that it will enhance the quality of how the healthcare service is delivered but it will also mean that patients' response to the treatments given to them will be faster, organized and more effective.[7]

The other advantage of EMRs in improving efficiency in the delivery of health care is the reduction on overhead expenditure such as that that is incurred on paper records. Described below are some of the elements of EMRs which enhance and even replace some of the traditional manual work: For instance, the billing codes are generated automatically through integrated systems in this way; there is little or no coding done by hand, coding errors decreased and the billing cycle is compressed greatly. EMRs offload many administrative functions including note taking, scheduling, prescriptions, prescriptions and test orders all of which enable more time and focus to be placed on the patients. It therefore allows for effective use of scarce health care human resource asset given that more clients can be attended to per time given the catholic nature of the disease, cut down on waiting time and increase the throughput of health facilities.[8]

In addition, data compiled from EMRs are very useful in managing patient data through data analysis. These systems accumulate huge volumes of clinical and operating data to be mined for trends, resource utilization, and treatment patterns that may require improvement. For instance, using patient information, healthcare service delivery entities are capable of establishing correct incidences of specified diseases, right impacts of specified treatments and also making projections of general healthcare requirements. This kind of decision making improves the health care delivery system since the providers are in a better position to order the right quantities or product since they know the kind of demand the patients will have in the next few days or weeks. Also, if there are areas of potential health concerns unaddressed, EMRs can help to diagnose concerns ahead of time and avoid high costly complications later.[9]It is also undeniable that the Implementation of EMRs helps to improve the utilization of health resources through implementing the avoidance of unnecessary replication of tests and treatments. In paper-based systems, patients are subjected to duplicate tests either because their past records are inaccessible or because of organizational gaps between different doctors. This is eradicated in EMRs by producing a comprehensible unique record of all the patient tests, treatments as well as procedures. This transparency helps the patient's healthcare providers to sometimes check prior tests done to avoid redoing several tests which will save

time and healthcare costs. In another way, since the use of EMRs can help to organize a great amount of documents, including evidences, EMRs can also offer decision-support tools to assist clinicians identify the most suitable tests and treatment according to evidence-based practice, which will also increase the operational efficiency of health care.[10]

Last but not least, Technology has also brought benefit in that EMRs enhance the patient involvement in the health care systems hence make these systems more efficient. As an extension, many EMR systems contain patient portals through which the patient can access his/her records, keep an appointment, request a refill of a prescription and interact with the physician. This convenience eliminates additional work load on the health care staff as they would have to perform all these activities manually. In addition, patients who take more responsibility for their own care will be more compliant with prescribed treatments, attend all clinical appointments, undertake medical check ups and therefore have better health outcomes and a more effective and cost efficient healthcare system. Overall, EMRs do more than improve organization-specific internal medical care delivery; they also align medical practice to focus more on patients, thus increasing the overall effectiveness in health care.[11]

Improving Precision and Heightened Minimal Mistakes through EMRs

Electronic Medical Records (EMRs) are a key aspect of patient record keeping because they originate from the replacement of traditional paper records a method which reduces inefficiencies and possibilities of wrong entries. For case EMR correctness, one of the key ways EMRs affect the typical recommendations is in avoiding singular source data entry. When records are kept on paper, notes to the chart, for example, are handwritten, making it hard to decipher what was written, and thus creating the possibility of errors and misunderstanding. These barely readable or even writers' enigmatic remarks can result in wrong patient handling and diagnosis, wrong assignments of medicines and other quite important tendencies. While, on the other hand, do use the fixed forms and pre-printed documents where data entered by the personnel is always put down in a structural and comprehensible way. There is reduced likelihood of errors arising from misunderstanding with the information as well as guaranteeing uniformity with definitions in accessing patient database.[12] In addition, EMRs decrease plant errors in administering drugs through the CPOE system as well as other components. CPOE enables the practitioners to type the prescriptions and medications orders instead of writing scripts that can be ambivalent or slippery in deciphering or include errors during transcription. This system is designed to also check with the patient medical details, any known allergies to certain drugs or other particulars that agree with this prescribed medication to determine if the drug is safe for use by the patient. Also, EMRs can be interconnected with pharmacy systems to monitor stock of the medicines, use and dosage to avoid some problems like double administration, or wrong dosage. EMRs have a great potential for increasing the accuracy of patient care due to the minimized human factor in prescribing and administration of medicines.[13]

Another feature is that, diagnostic test results are integrated into EMRs in order to enhance the level of accuracy. In a manual system, patients' results can get

lost, end up on the wrong file or may even be written illegibly; diagnosis and treatment is therefore in this case delayed. With EMRs, diagnostic results from laboratories and radiology departments are immediately documented in the patient's EMR when they are available. This real-time access enables the practitioners to be in a position to look at results promptly in an effort to quick development of health complications and making decisions about treatment. Third, EMRs can highlight abnormal findings, which require a provider to perform further testing or take necessary action to avoid delayed or failure of diagnosis.Except for refining the accuracy within the clinical setting, EMRs also augment data access for the correct healthcare system. They cannot fade, tear or even be misplaced in the same way that paper records often do because they are electronic. Electronic records are safe and coupling duplicate copies, which means that information can be minimalized due to disaster, system breakdown, or even people mistakes. This high level of data security would help to keep patient data complete and correct, no matter what happens. Further, the option of audit trail is incorporated in the EMRs to detect who has accessed the patients' records and what modifications he made. It serves to keep the data accurate, also provides accountability that is so important in the health care sector and compliance with the laws of the states.[14]

In the same way, for healthcare providers, they help reduce errors associated with transfer of information since the different doctors in the patient's health care team can access his/her electronic record. When patient information is transmitted on paper documents or when using word of mouth in manual systems there is increased chances of either missing out some information or misunderstanding them. Through the use of EMRs patient information can be transferred with ease and efficiency within a healthcare institution or between care facilities and this is beneficial in that all caregivers involved in taking care of a particular patient shall work with similar information pertaining to the patient in question. They underscore how coordination minimized problems like repeated tests, wrong treatments or delayed consultation that are likely to reduce quality and safety of services provided to patients.[15]As a result, improved accuracy of the reception is contributed to by EMRs being standardized, legible, and updated in real-time, which allows for speedy support of clinical decision-making that also reduces the chances of medication or diagnostic errors. Decision support tools, medication management systems, and real time test result upload makes it possible that the health care providers receive the best and up dated right information making health care safer for patients.[16]

The Effects of EMRs on Patients and Outcomes

EMRs have really affected the kind of care that patients receive as well as their health since they way health care providers fund the delivery of treatment has changed significantly through the integration of EMRs. One of the most notable enhancements discussed is the way that EMRs have the potential to give the different healthcare givers an all-encompassing perspective of the patient. Using paper-based systems, clinicians miss, loose or receive partial, out-of-date patient records, that results in care gaps or delayed interventions. EMRs compile the necessary patient information with patient's medical history, diagnosis, prescriptions, patients' allergies, test results, and treatment plans within one

unified electronic archive that is available to all the providers who have the right to access the patient's records. This enhanced patient's electronic record offers clinicians extended comprehensive patient data to make right time optimized decisions and consequently, better care.[17]

However, with the implementation of EMRs the integration of care is better made among the healthcare givers and is useful for the patients with conditions such as chronic diseases and requires care from different doctors. In a paper-based system, most of the communication between the health care providers can be painstaking, disjointed, or even erroneous. Nevertheless, with the help of EMRs, the patient information can be safely exchanged in real-time between various care points so that different representatives of the healthcare system can act faster and more coordinated. For instance, a diabetes patient may be under the care of an endocrinologist as a specialist in treating diabetes, cardiovascular disease and a general physician. Each of them can use EMRs to have access to the same information and share a patient's history and further avoid the lack of treatment coordination or missed details. Such level of integrated not only minimize chances of medical mistakes but also commonly enhance the quality of individual and comprehensive patient care**.**[18]

Difficulties in Adopting EMRs in Health Organizations

Although the EMRs has many benefits and advantages that can greatly help in increasing the efficiency, accuracy and over all, health care outcomes, the EMRs also poses some challenges in the health care settings. The major challenge that has been attributed to lack of full implementation of EMR is the capital intensive investment required in purchasing the systems, implementing the systems, and training of health care personnel. Acquisition and implementation of EMR systems may be costly to healthcare institutions especially in the form of one off payments, and especially the small practices or facilities operating in underfunded areas. These costs include cost of acquiring the software, cost of acquiring new equipment to support the system as well as cost of hiring IT personnel to support the infrastructure. Secondly there are continuous costs of software upgrades, system maintenance, adaptation to new technologies, etc. These costs, especially for many healthcare providers in LMICs, can be a barrier to the successful implementation of EMRs and, as a result, the realization of potential benefits.[19]The other key problem of EMR implementation is the lack of desire of healthcare workers to change their working model. Most of the doctors, nurses, and administrative staff are used to the conventional paper-based systems and they are slow in adopting the new style of records since they may not be familiar with it, may find it inconvenient and or may have a phobia for computers. The change to an electronic system often results in a major change in organizational culture within healthcare, and some of the workers believe that the EMRs are complicated and a nuisance to the process of patient care. There is also the issue of time spend on data entry and on the interface reducing time with patients. This resistance can be high especially when the staff members of the organization have not been trained on how to use the system and end up working hard as they struggle to use it. This challenge therefore requires great change management techniques, communication of imminent benefits of EMRs, and skill development that enables personnel to get along well with the system**.** [20]

Another challenging that come with EMR implementation is Integration issues. A number of healthcare organizations have disparate applications for handling different aspects of patient care such as laboratory information, imaging and other products such as pharmacy. Making these multiple systems operate smooth requires effort. Inadequate application integration may mean that various systems cannot share information, and end up as isolated pockets, meaning that a patient's records may be partial, information transfer may be slow and data errors are likely to occur. For instance, if an ease of integration between a hospital's own EMR system and another department, such as radiology or a laboratory information system, is lacking, the results from diagnostic tests will not be available to the attending physician on the spot. The above highlighted lack of interoperability is a significant problem, especially in the healthcare organization that functions across multiple buildings, regions, or even facilities. Addressing these integration problems demands a lot of technology knowledge and most of the time calls for expensive modifications on the existing systems making it a challenge to implement the EMR.[21]

The security of data and privacy also constitute another challenge of the EMR system. Patient information is always considered sensitive and with the integration of the electronic records there is high probability of data leaks or data intrusion. Many healthcare facilities have rules that regulate the use of the facility, for instance, for the use of the Health Insurance Portability and Accountability Act, or HIPAA in the United States, the usage of patients information needs to be protected. Nonetheless, these regulations have not fully prevented the guarantees involving the expansion of the electronic health records to escalate the risks of cyber criminals, hackers and thefts. Ensuring that patients' data are not disclosed to unauthorized persons is an expensive process involving investing in securities such as encryption, firewalls and security checks. Furthermore, healthcare organizations should make sure that everyone in their organization understands information security measures not to violate them by any chance. This, therefore, brings the problem of data security of patients' information especially given the fact that healthcare information is increasingly being digitalized and integrated.[22]The input of data in the EMRs can have some complications with the quality and accuracy of the data. although EMRs aim in creating order and standardization in the patient data, they again rely on the input of the other healthcare practitioners. This leads to the creation of wrong medical records that in turn cause wrong diagnosis, wrong treatment and different types of harm to the patient. For example, clinician may unintentionally enter the wrong doses of medication or omit to change some information of the patient's allergies, which cause severe reactions. Data entry accuracy can be accomplished with frequent training, strict vigilance, and frequent audit for the use of EMRs to optimize for errors. Furthermore, the integration of clinical decision support systems (CDSS) can help identify that the information is inconsistent, or when it is missing, but these systems have limitations and may require human supervision.[23]

Another difficulty relates to how useful the EMR systems are. EMR systems or electronic medical record systems have been described to be difficult to use and complex by many healthcare providers. Complex cumbersome systems make the working process slower and frustrate healthcare employees at the workplace. For

instance, it takes a very long time to enter a patient's record or search for a record from the system, not to mention that such activities can significantly hinder the care delivery processes and leave clinicians bogged down by administrative tasks. In order to solve these problems of usability, it must be understood that EMR systems are for the use of healthcare personnel and so, the interface should be simple, custom workflows should be integrated into the system, and necessary features of the system should be reachable quickly and easily. Preferably, there should be options that enable the customization of the systems to respond to the requirements of individual healthcare facility because the increased user satisfaction contributes to increased performance rates as well.[24]

Lack of infrastructure in some of healthcare organizations is also a barrier to EMR implementation. Implementing EMR systems is hard for conditions that can be described as rural or underdeveloped because internet connection and other technological resources can be scarce in such regions. Lack of steady connections makes searches in EMRs slow and in some cases makes them unavailable that not only negates their benefits but also interfere with the patients' treatment. Like with any healthcare EMR software, having outdated hardware could limit the device's ability to support the features and functionalities of a modern EMR system; ultimately this will lead to some inefficiencies and some technical problems. To overcome these infrastructural deficiencies, there is need for a considerable invest to improve technology and for the ability to provide Internet connectivity to unserved customers.[25]Overall there is a challenge concerning the constant maintenance and updates of the EMR systems. EMR systems require frequent update since advances in healthcare technologies are ever constant in terms of regulations, standards, and or clinical practices. But this can be a downside when bringing out frequent updates since it may forcefully cause downtimes in the healthcare systems since there may be modifications in the systems, modification to procedures, or retraining effected to the workforce. These disruptions can harm the received patient care, as well as cause resistance from the side of the healthcare workers that can be overloaded with the constantly appearing changes. It is for this reason, therefore, that issues to do with management of update to the system must be well communicated, proper training instituted, and proper support given to ensure that there is order to the EMR systems.[26,27,28] Thus the adoption of EMRs in healthcare setting we have seen has great opportunities of enhancing the achievement of better care and patient status but not without the challenges that come with it. Different financial aspects, the level of resistance to change, integration problems, concerns with data security and, last but not least, the requirement for constant updates all make the adoption of EMRs more challenging. Solving these issues implies the further development of authoritative goals, construction of infrastructures, preparation, and encouragement of all healthcare workers, as well as constant data protection. [29]By addressing these challenges, there is a possibility for the effective infusion of EMRs enhancing the efficiency of the health institutions, and therefore, care delivery.[30,31,32]

Conclusion

Altogether, EMRs have the possibilities of changing the approach to healthcare through better, more precise, complete, and more coordinated patient data and

more efficient work; however, the deployment of these emergent technologies bears quite a number of challenges. The costly investment is one of the factors that weigh the healthcare organizations down together with the challenges from the implementers, technological problems in interfacing, issues on data privacy, and the need to update the system continuously all of which form barriers that hinder the full realization of ideal EMRs. To overcome these obstacles, it is necessary to provide detailed planning, great amount of investments in infrastructure, wide coverage of healthcare staff training and, severing protection of data. In the end, when implemented with the correct best practices EMRs hold the potential to be a critical vehicle to improve the patient care, the health and well-being of the populace, and the efficiency and efficacy of healthcare systems on a world wide basis. With advancement in technology, the potentials that EMRs holds as a tool that seeks to revolutionaries the practice of healthcare could not be overemphasized given the future of patient care that could be efficient, accurate and available.

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دور السجلات الطبية الإلكترونية في تعزيز كفاءة ودقة الرعاية الصحية

الملخص

الخلفية: أصبحت السجلات الطبية الإلكترونية ضرورة في نظم الرعاية الصحية الحديثة، حيث من المحتمل أن تُحدث تغييرات مرغوبة في نظام تقديم الرعاية الصحية، بالإضافة إلى زيادة فعالية وموثوقية قطاع الرعاية الصحية. تسمح السجلات الطبية الإلكترونية لمقدمي الرعاية الصحية بالحفاظ على السجل الإلكتروني للمرضى، وتحسين تبادل المعلومات، وتقليل الحوادث الطبية السلبية، وتحسين الرعاية المتكاملة للعملاء.

الهدف: تهدف هذه الدراسة إلى تقييم بعض الخصائص العشر للسجلات الطبية الإلكترونية، وكيفية تحسين هذه الأنظمة في تقديم الرعاية الصحية، وتأثيراتها على نتائج صحة المرضى، بالإضافة إلى تحليل الصعوبات التي تواجهها المنشآت الصحية في تنفيذ السجلات الطبية الإلكترونية.

الطرق: استنادًا إلى البحث الأساسي، تمكنا من التعرف على الخصائص الرئيسية والمزايا والعيوب للسجلات الطبية الإلكترونية من خلال تحليل الأدبيات الموجودة سواء الأكاديمية أو غير الأكاديمية، بما في ذلك حوالي عشرة مقالات محكمة، دراسات حالة، وتقارير.

النتائج: من بين الفوائد التي تم فهمها من الدراسة: الكفاءة، الدقة، والأساليب المتكاملة للعمل الجماعي في السجلات الطبية الإلكترونية. كما تم التعرف على بعض الحواجز الرئيسية مثل نقص الموارد المالية، المقاومة التنظيمية والمهنية للتغيير، تعقيدات تنفيذ النظام، المخاوف بشأن أمان البيانات وخصوصيتها، بالإضافة إلى الحاجة المستمرة لترقية وصيانة الأنظمة.

الخلاصة: يمتلك النظام الإلكتروني للسجلات الطبية إمكانات كبيرة ليصبح محركًا رئيسيًا لتحسين تجربة الرعاية الصحية ونتائجها، لكن عملية تبنيه مليئة بالتحديات. على الرغم من كل هذه التحديات، يجب على المنظمات الصحية تجاوز الحواجز المالية والتقنية والثقافية من أجل الاستثمار في تدريب مناسب للموظفين وضمان الحفاظ على أمان البيانات المجمعة.

الكلمات المفتاحية: السجل الطبي الإلكتروني، إنتاجية الرعاية الصحية، تجربة علاج المرضى، الأخطاء الطبية، حماية المعلومات، مشكلات تكامل السجلات الطبية الإلكترونية، السجل الطبي الإلكتروني، تكنولوجيا الرعاية الصحية.