

Study of Electronic Medical Records

Sumeet D. Shinde, Shreeram S. Geedh, Saurabh R. Kannaujia, Prajakta Khelkar, Vinod Alone

B.E. Comps Student, B.E. Comps Student, B.E. Comps Student, Professor, Professor,
B.E. Computer Engineering,

Padmabhushan Vasantdada Patil Pratishthan's College of Engineering, Mumbai, India.

Abstract : The Electronic Medical Records System is trending right now but some of the hospitals or government-based hospitals are still using old methods to store, maintain and retrieve patient records. Some government-based clinics are using a paper-based approach to store patient records because they still don't have software or an electronic system that can maintain their patient records. In this paper, we discuss how they can migrate from paper-based records to electronic records storing methods and the challenges or rules, they need to phase to convert their system from paper-based to paperless. In this paper, we are discussing the existing Electronic Medical Records system and what we need to improve in the upcoming Electronic Medical Records System so that next-generation systems are much improved than previous ones.

IndexTerms - Electronic Records, Electronic Medical Records, Electronic Health Records, Electronic Record Management System, Health Information Records.

I. INTRODUCTION

Electronic Medical Records(EMR) computer database is considered a significant component of any medical aid system. EMR will be defined as a group of electronic health information about patients, one in every one of the main challenges that physicians face is how they will have valued information that may help them to achieve greater insight into their patients. Different modern hospitals are using different systems for medical records. A doctor's EMR within the office is meant to enable reference to outside sources of patient data, other clinicians using the identical or different EMRs. The desire to connect a clinician with the local system holding all patient data from different resources is an important goal. Health Information Exchange (HIE) in which different large institutions could connect hospitals and academic centers could exchange information with each other is difficult because of the different EMR structures of the different medical systems they have. This raises the need for a useful representation of EMR that enables fast and accurate access to knowledge and understanding of the content.

Nowadays, Electronic Medical Records are used to store patient's information and this has been a widely used method of keeping data intact within the organization. But if we store this data in a centralized manner then every hospital staff can store data from their respective organization. By this, central authorized staff can collect required data from these hospitals and try to improve or analyze the condition of hospitals and their patients. The Electronic Medical Records System which we have designed can improve the quality of data storage so that patient's data can be much clearer to analyze.

II. What are Electronic Records?

Electronic records (ERs) are either born digitally or converted from paper records employing a scanner. ERs is also a mixture of text, graphics, data, audio, pictorial, or other information representation in digital form that's created, modified, maintained, archived, retrieved, or distributed by an automatic data processing system. ERs aren't just a group of knowledge but also the implications of a happening. Besides, records have to provide evidence of the document's content and structure; the context of its creation is present and accessible. ERs are created from an organization's financial, human resource, and company databases. Word processors (e.g., WordPerfect, Microsoft Word), Spread Sheet (e.g., Excel), E-mail, Computer-aided-Design (CAD) and Web publishing tools (e.g., Dreamweaver) are the sources for the creation of ERs.

If we store medical records in an exceedingly style of electronic records then the data which is required is easily be found and maintained. Nowadays every organization or business companies keep their records in a softcopy manner in their servers, so that every second history would be recorded and stored if unfortunately, they have some information within the future they'll access it and appearance into it. Following are the kinds of records that supported their values:

2.1 Administrative Records

Records that pertain to the origin, development, activities, and accomplishments of the agency. These generally constitute two categories: policy records and operational records.

a) Policy Records:

Records that relate to the organization like plans, methods, techniques, or rules which the agency has adopted to hold out its responsibilities and functions. These include three basic categories.

b) Organizational Documents:

Budgets and budget planning records, fiscal records, organizational and functional charts.

c) Governing Documents:

Manuals, directives, orders, and interpretations issued from top authority levels, correspondence files of high-level officials, regulations, circulars, instructions, memoranda or regular issuances that establish a course of action, and staff studies or special reports regarding methods of workloads and performances.

d) Reporting Documents:

Annual reports, periodic progress or summary reports, special reports or accomplishments, transcripts of hearings, minutes of meetings and conferences, and agency histories.

e) Operational Records:

Records necessary to implement administrative policies, procedures, and operations. The operational value is that the usefulness of a record within the conduct of an organization's business. Examples include mandates, procedural records, or records that give direction.

2.2 Legal Records

Records of legal value include those with evidence of legally enforceable rights or obligations of the State. These may include:

- Records regarding property rights: land, probate, contracts, agreements, leases, licenses. Records referring to citizenship rights: statistics, like birth, death, marriage, some legal proceedings, and criminal cases.
- Records regarding employment: veterans' records involving legal rights attached to employment, basic state personnel records, and, in some cases, payroll records.
- Records containing the data required to shield the State against claims or to enforce statutes: executive orders, rules, regulations, and records to ascertain or support judicial opinions and interpretations.

2.3 Fiscal Records

Records that have fiscal value relate to an agency's financial transactions. These could also be budgets, payrolls, vouchers, and accounting records. After records have served their primary administrative purpose, it's going to be necessary to preserve them to document the expenditure of public monies and to account for them for audit purposes and requirements.

2.4 Historical Records

Records that deserve permanent preservation for reference and research purposes are selected for deposit within the State Archives at the Connecticut State Library. These records are retained for several uses. Public officials use archival records to shield the govt, to convey consistency and continuity to their actions, to forestall duplication of efforts, and to search out successful ways for solving recurrent problems. Records also are kept to shield citizens' legal rights and for research in many fields to advance public knowledge and understanding.

2.5 Research Records

Records utilized in scholarly studies and investigations. Researchers want to increase human knowledge using basic historical evidence. These records may include important information on individuals, corporate bodies including their problems and conditions, and significant historical events. Researchers may include case files and correspondence of a regulative and quasi-judicial nature, statistical and other data on economic development, population changes, and/or major movements in our society. Many of those records have informational, administrative, and archival value.

2.6 Electronic Records

The Connecticut Uniform Electronic Transactions Act (CUETA) defines an electronic record as "a record created, generated, sent, communicated, received or stored by electronic means, including, but not limited to, facsimiles, piece of email, telexes, and internet messaging" (CGS, Section 1-267). Electronic messages sent or received within the conduct of public business are public records.

III. THE RECORD CYCLE OF LIFE

The life cycle of electronic data comes in five phases. The everyday information life cycle diagram breaks them down:

- Creation:** Suppose the record may be a contract proposal. If your business generates the proposal, the record cycle begins with the document's creation. If it receives a contract proposal by email, the life cycle begins when the document arrives.
- Distribution and use:** Once you receive a proposal, it should be distributed to the managers who accept, reject, or negotiate the offer. The document must be accessible to everyone who must read or evaluate it until this phase of the record cycle ends.
- Storage and maintenance:** After your company signs the contract, the document needs to be stored somewhere secure. It should only see occasional use, for instance, if the opposite party threatens to sue you for a contract breach.
- Retention:** You will keep the document in your files even after the contract is finished. It's going to be useful for reference, as a tax record, or because the law requires your company to stay some documents on file for some years.
- Disposal:** When the document is not any longer of any use, and there is no legal requirement to stay it on file, you'll safely delete it. The document's record cycle has reached its end.

IV. STRUCTURE OF ELECTRONIC RECORDS

According to the Victorian Electronic Records Strategy (2003): to access people from all groups of management to all or any sorts of records, ERs must have a standard record structure. While creating ERs, despite the recommended structure to electronic records, the subsequent points also must be taken into consideration:

- Self-documenting interprets and understands the knowledge in an exceeding record without regard to external documentation, which relies on ASCII (American Standard Code for Information Interchange) text. By doing this, documents are often viewed on any computer.

- b) Self-contained implies that the structure contains all information about the record. Information related to a record stored in one place is easier to manage than stored separately within the kind of its components.
- c) Extensible implies that the structure of the information may be extended by adding new metadata or new record type without affecting the fundamental structure of the information. The recommended structure is expressed by using XML (Extensible Markup Language). XML is a text-based mark-up language and the specifications are easily extensible.

V. WHAT ARE THE ADVANTAGES OF ELECTRONIC MEDICAL RECORDS?

Examples of the various benefits of electronic medical records in hospitals and other healthcare facilities include:

- a) Improved Quality of Care: Computerized notes are often easier to read than a physician's handwriting. This reduces the danger of errors and misinterpretations that may negatively impact the standard of patient care.
- b) Convenience and Efficiency: Medical and staff not should waste time sorting through cumbersome paper records. Users can access electronic health records quickly and efficiently with just some strokes on a keyboard.
- c) Saving Space: Electronic health records eliminate the requirement to store documents in bulky file cabinets, which frees up extra space within the office for medical supplies and equipment, and other essentials.
- d) Patient Access: Many EMR systems include a patient portal that permits patients to look at their case history and knowledge whenever they need it.
- e) Financial Incentives: Installing a licensed EMR can facilitate your fulfill the Meaningful Use requirements for Medicaid and Medicare, making you eligible for various incentives from the central.

VI. WHAT ARE THE DISADVANTAGES OF ELECTRONIC MEDICAL RECORDS?

There also are several disadvantages of electronic medical records, such as:

- i. Potential Privacy and Security Issues: like almost every electronic network nowadays, EMR systems are susceptible to hacking, which suggests sensitive patient data could represent the incorrect hands.
- ii. Inaccurate Information: thanks to the instantaneous nature of electronic health records, they have to be updated immediately after each patient visit — or whenever there's a change to the data. The failure to try and do so could mean other healthcare providers will depend upon inaccurate data when determining appropriate treatment protocols.
- iii. Frightening Patients Needlessly: Because an electronic health record system enables patients to access their medical data, it can create a situation where they misinterpret a file entry. this will cause undue alarm, or maybe panic.
- iv. Malpractice Liability Concerns: There are several potential liability issues related to EMR implementation. for instance, medical data could stray or destroyed during the transition from a paper-based to a computerized EMR system, which may lead to treatment errors. Since doctors have greater access to medical data via EMR, they will be held responsible if they are doing not access all the knowledge at their disposal.

VII. IMPORTANCE OF MAINTAINING GOOD MEDICAL RECORDS

Good medical records:

- a. Communicate vital information about a patient's history and health status.
- b. Act as the basis of planning and continuing medical treatment.
- c. Serve as a source of information about the quality of care rendered to patients.
- d. Are a record of consent, refusal, referrals, etc.
- e. Serve as a source of information for medical (insurance) related cases.
- f. Serve as a source of research and education.
- g. Provides evidence on whether care rendered met the professional standard of care.

7.1 Essential Ingredients of a Good Medical Record Medical records should be maintained serially in chronological order with dates and they should preferably contain the following entries in them:

- a. General particulars of the patient e.g.; Name, age, sex, address, emergency contact number, who brought him/her [with details], etc.
- b. Consent form duly filled and signed or thumb impression taken.
- c. Dates and timings of examination/admission and discharge - inpatients.
- d. Dates and timings of all visits and consultations.
- e. Details of the complaints - in chronological order.
- f. Personal and past history.
- g. Physical and laboratory/investigation findings (reports enclosed).
- h. Treatment given/surgical procedures in detail (immediate entry not later).
- i. Day-to-day prognosis.
- j. In case of death; precise cause of death, date, and time of death.
- k. Details of consultation by other doctors and their opinion.
- l. In medicolegal cases police need to be informed both at the time of admission as well at the time of discharge.
- m. Inpatients - details of discharge, cause of discharge – cured/referred to other centers/discharge on request or against medical advice (DMMA), etc.
- n. Any other special findings which you feel noteworthy

VIII. GUIDELINES FOR PREPARATION AND MAINTENANCE OF MEDICAL RECORD

Doctors should prepare and maintain medical records in the following manner:

- i. Maintain different registers for specific purposes in their office or place of practice.
- ii. Maintain a separate register for the medical certificates issued, wherein all details must be entered. Every certificate must include two identification marks, if not, at least one identification mark of the patient, his signature/left thumb impression should be taken in the space meant for that. Certificates are to be prepared in duplicate and one copy must be kept in the records as an office copy which should contain the receipt signature of the patient or the legal representative.
- iii. All medical records including certificates must be prepared in a prescribed proforma.
- iv. All medical records should be written legibly or typewritten e.g., writing diagnosis or
- v. prescription in capital letters is a better way. Scribbling must be avoided.
- vi. Medical records must be accurate, up to date, placed in order, and complete in all respects. Incomplete or altered records create room for suspicion.
- vii. Any alterations in the medical record made must be initiated without obliterating the original entry. E.g., drawing a single line over the sentence/word.
- viii. The doctor must take some time/spend some time to prepare the patient's details in documentary form or get them prepared by a trained competent assistant (in western countries trained medical clerks are used by the doctors).
- ix. Sincere efforts should be made to computerize the data so that we can minimize the errors and the paperwork can be brought down.

The patient has the Right to Obtain Medical Records.

IX. METADATA AND AUTHENTICATION

Metadata is structured information that permits us to explain, locate, control, and manage other information. EMR generates metadata that's invisible to a mean somebody however, any alterations might be viewed under the "track changes" feature of the program. Hence, doctors and healthcare professionals are authorized not only to access the EMR but also to change or edit the record. Metadata can be used to track person(s) who accessed the electronic record, what varieties of information was being viewed and whether the record was modified etc. Unlike paper records, visual inspections are needed to detect any alterations.

X. REVIEW OF MAJOR ELECTRONIC RECORD MANAGEMENT SYSTEMS

ERMS could be a central management and storage system for medical records that meets the legal requirements of a corporation by retaining all the important records. ERMS records document and support the operational, performance, and administrative activities of hospitals. ERMS manages these records for electronic storage and retrieval by authorized staff of a hospital, allows elimination of paper file copies, and prevents their inadvertent destruction. ERMS may be used for any application in various healthcare organizations however, this paper covers medical ERMS more extensively.

XI. CHALLENGES OF CONVERSION TO EMR

However, there are some challenges while transitioning to EMR, it takes time to convert records on paper to EMR because standardization of the office procedures is required to make sure all staff adheres to the identical process while doing each task. The transition period of a clinic might be the maximum amount of 12 to 18 months that the productivity of the staff could even be affected during that point. Transferring of knowledge and value involved within and different healthcare groups are other challenges for paper records conversion.

XII. EMR IMPLEMENTATION CHALLENGES

Implementation of EMR during a healthcare system isn't as easy because it sounds. There are numerous potential challenges in implementing an electronic health records system. Being tuned in to the challenges earlier will help the providers to avoid them and make the transition process smoother. Here goes an inventory of major hurdles that providers should bear in mind while implementing EMR.

12.1 Cost of Implementation

It is no surprise that EMR implementation is a fashionable affair. the choice, implementation, and optimization of EMR will remove the lion's share of the planned capital budget investment. As per a study report, the price of buying and installing an EMR system ranges from \$15,000 to \$70,000 per provider. On a general note, the implementation process is often classified into five components viz. fitting the hardware, software costs, implementation assistance, training for the staff, ongoing network fees, and maintenance. There may well be unplanned expenses yet during the implementation. Finding financial resources for EMR implementation is one of the most important hurdles, especially for smaller establishments.

12.2 Staff Resistance

Not everyone within the medical staff would be receptive to the thought of technological implementation within the establishment. additionally, there are health practitioners who are doubtful about the efficacy of electronic health records. they will show reluctance to convey up the documentation process. In some cases, the staff lacks awareness about the present technological advancements and therefore the comprehensive benefits. It results in the delayed implementation of EMR.

12.3 Training is time-consuming

Before deploying the EMR system, the staff has to be thorough in training about the new workflow. The physicians and therefore the medical team must spend time beyond regulation and put in extra effort to grasp the new system. It's a time-consuming process and a hassle for both the staff and also the management. Small and mid-sized organizations fear the loss of business during the training phase. Also, the staff may, at times, consider it an unnecessary effort.

12.4 Lack of usability

If the EMR system is insufficient to suit the present workflow, physicians find it difficult to adapt to that. The one-size-fits-all rule doesn't suit the EMR system because the workflow of a dentist differs from that of a cardiologist and likewise. The failings within the design or the inadequacy of coaching decrease the convenience of using the software.

12.5 Data Privacy

Another major EMR implementation challenge is that the data privacy concerns of the patient community furthermore because of the provider. The stakeholders often voice concerns over the chance of knowledge leakage thanks to a natural disaster or a cyber attack. The federal rule has imposed a national policy to shield the confidentiality of non-public health data. Just in case of a security breach, the organization may get into a legal hassle and need to spend various dollars to settle the dispute. Hence, it becomes a serious responsibility of the provider to make sure the info security of the EMR.

12.6 Data Migration

It is a logistical nightmare for the staff to export paper-based documents to this point to the digital records. There'll be large chunks of documents about the anamnesis of many patients and data entry might become a tedious and time-consuming task for the staff. This is a serious EMR implementation challenge for hospitals and energy is doubled if there's no proper format within the former system.

12.7 Limitation of Technical Resources

This is one of the EMR implementation challenges often faced by small clinical establishments and personal health practitioners. They rarely own an in-house technical team. Moreover, they could not have the specified hardware to equip the EMR solution. It's a large expense to make an in-house technical team and buy hardware, which could be a common reason for little and mid-sized healthcare providers for delaying the EMR implementation process.

12.8 Interoperability

Interoperability refers to the power of various EMR systems or software to exchange information so different providers can make use of it. In EMR, interoperability may be a necessity to induce an entire picture of the patient's health. It remains an enormous challenge for healthcare providers to make an interoperable system that permits the transfer of data among multiple providers do not mention, for better health outcomes for the patient, there should be proper care coordination among multiple providers.

12.9 Lack of Proper Planning

More or less, EMR implementation brings in an exceedingly cultural change within the organization than a mere technological upgrade. Hence, the change management aspects of EMR implementation become a true challenge. It must be strategically planned and commitment is predicted from all stakeholders. The successful implementation and sustainability of the EMR system are a far-fetched dream without an excellent amount of designing involved.

12.10 Lack of Communication

Effective communication between the healthcare provider and also the IT vendor is crucial to make an EMR system that offers the required results. It's not a one-time activity but a continual process to make sure that the expectations of both parties are met. The concerns and feedback of the provider should be addressed appropriately and therefore the vendor should be ready to build effective tools as per the need of the provider. Without proper communication, the goals can't be met.

XIII. RESEARCH AND FINDINGS

13.1 Establishment of Bangladesh National Enterprise Architecture

To realize the vision and mission of creating "Digital Bangladesh" by the year 2021 through the establishment of transparent, efficient, and citizen-centric public services, termed as "e-services" through ICT, "National Enterprise Architecture" and "e-Government Interoperability Framework (e-GIF)" has been one of the key projects undertaken by the govt. of Bangladesh (GoB) (International Telecommunication Union (ITU) 2016). The project objective was to develop systems, structures, technologies, strategies and supply an enabling environment across the government. Improved management of assets increased interoperability, and reduced risks and procurement costs. The goal of the system is to enhance the standard of service delivery by health care providers. The rural citizens, who form a majority (around 76%) of Bangladesh's population, were first to be included in the system (Zishan et al. 2019). The project was initiated in the year 2014 and was completed by the year 2016. It was implemented by the Bangladesh Computer Council (BCC), an apex body of the GoB. The government of Bangladesh uses three types of software, namely DHIS-2 for public health services through health facilities all over the country, OpenMRS for hospital services, and HRM for human resource management (Additional Director General and Director of Management Information System (MIS), DGHS 2015). The government plans to develop electronic shared health records (SHR) systems which will integrate DHIS-2, OpenMRS, and HRM in national level eHealth enterprise architecture (HEA), to exchange data via eHIE (electronic health information exchange) (Additional Director General and Director of Management Information System (MIS), DGHS 2015).

13.2 Lifetime Health Record in Malaysia

Lifetime Health Record (LHR) and Services is an initiative by the Government of Malaysia (Zishan et al. 2019). Under this plan, records for each individual will be maintained throughout his lifetime, starting from the time of his/her first consultation with the service provider until each time he/she visits the service provider.

13.3 Research, development & education

Research & Development related to the use of EMRs should be promoted. This is needed to continuously improve the quality of EMRs, reduce their deployment cost, and also facilitate innovations. A well-trained human resource in the field of Health IT should be prepared. Developing e-courses to facilitate learning related to EMRs will be helpful. An agency is needed to collect and share information related to EMRs. Further, International collaborations and their expertise can be useful for the deployment of EMRs in India.

XIV. FUTURE SCOPE

Year 2020 was stuffed with surprises for the healthcare industry. The arrival of COVID-19 showed just how valuable digital solutions are for solving the myriad of challenges facing healthcare institutions. Digital technologies have taken center stage, and that they are here to remain. Since the Obama administration's emphasis on using technology to revitalize the economy in 2009, the govt. has backed software tools that give doctors easier access to patient data. Electronic medical records, managed with EMR software and electronic health records, handled by EHR software, have revolutionized the way patient records are entered and processed. Telehealth has become the norm instead of the exception. the long run of EHR holds lots of promise with better look after patients and easy providing superior care by physicians and medical facilities using digital technologies.

XV. CONCLUSION

It is important to focus on the following broad issues if this initiative has to succeed on the scale, proper training of doctors and other healthcare professionals to use EMR effectively, a much higher level of public-private partnerships is needed, appropriate Information Communication Technology (ICT) infrastructure should be in place, working towards standardizing EMRs, a National Health IT policy needs to be formulated, an efficient management structure to deploy EMR should be in place, efforts should be made to sensitize healthcare workers related to the importance of EMRs, the synergy between software development team and healthcare delivery team is required, incorporating voice-based and writing based inputs into the EMR System should be explored, and research & development related to the use of EMRs should be promoted.

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