

A Hybrid of Electronic Health Record (EHR) System and Health Maintenance Organizations (HMOs): A Sure Way to Improve Healthcare System in Nigeria

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Abstract

Despite so many contributions made by the advent and ever increasing growth of technology in the global scene today, many hospitals in Nigeria are still in manual system. The replacement of paper processes in our hospitals with EMR system has neither ended the problem of continued manual and repeated processes in gathering health history of patients, nor ended the security problem of patients' health information. This is because the design purpose of EMR system is to be a single health center application. Hence, the need to find a lasting solution. The objective of this work is to recommend the introduction of Electronic Health Record (EHR) technology, which is a multi-hospital application, into our Health Maintenance Organizations (HMOs) as the much needed solution. The result of this integration to provide a robust health system which would ensure that no physician needs to re-interrogate a patient over his or her health history each time they visit a new health center. All a doctor needs is to electronically access their patients' health background, including recent or last medications. Also, this is possible given that every hospital supposed to register under a HMO. Therefore, the hybrid of EHR system and HMOs implies that EHR system would aid in centrally storing the health history of everybody or patient in Nigeria according to their HMOs.

1. Introduction

It is no longer an over statement to say that the impact of computer technology has cut across every facet of human endeavor. It has permeated into systems like health, education, and legislation. Technology and human life cannot be separated; society has a cyclical co-dependence on technology. We use technology; depend on technology in our daily lives and our needs; and demands for technology keep on rising. Humans use technology to travel, to communicate, to learn, to do business and to live in comfort (Karehka, 2012). In our contemporary time, it serves as a boost to our social system by providing social platforms such as Facebook, Twitter, LinkedIn, WhatsApp etc; it serves as a veritable tool for good governance to our government today, like in publicity and election; it facilitates scientific processes and researches; also, it has become a learning and research tool in education. Computer technology has also improved the business transactions via apps and emails, and security in sectors such as banking and health. Taking a closer look at the health sector in the country, it is obvious that computer technology has made a remarkable positive impact on health services provided to the people. Today, computer technology is applied in X-rays, surgeries, and other diagnosis; thereby, generating and contributing to the increasing growth of medical information. Hence, the need for Medical Information Management in keeping records of an individual's entire health history. For instance, as pharmacists have continued to increase their involvement in patients care activities, locating vital pieces of information is critical to developing an appropriate assessment and plan for the individual patient. Additionally, collecting this data in a systematic way will permit the pharmacist to then synthesize it and create a comprehensive

list of healthcare needs and considerations for the patient, regardless of the practice setting, (Spooner and Pesaturo, 2014). Information here, may include any documented allergic reactions, surgeries, prescriptions and any medical advice that the patient may have received. However, research has shown that despite the afore mentioned impact of technology in health centers, it is common in Nigeria to notice that during a typical trip to the doctor, you will often see pile of folders and papers that contain medical records of diverse patients. Every time you visit, your records are created or modified, and often duplicate copies are generated throughout the course of a visit to the doctor or a hospital. The majority of medical records are currently paper-based, making these records very difficult to access and share (Laudon and Laudon, 2018). Imagine a situation where you visit another health center, this process would be repeated; and as you keep visiting different hospitals, may be, because your job often takes you to different places, the hospitals there would always repeat same processes of registration, health data or history collection, etc. This situation does not however, reflect our Information Technology (IT) age (Laudon and Laudon, 2018). Hence, there should be a technology-driven system that would ease and simplify this cyclic process. Less than 10% of Nigerian hospitals have embraced computer-based health services. And, there are two possible and major computer-based health service systems, the Electronic Medical Record (EMR) system and the Electronic Health Record (EHR) system. And what the 10% of Nigerian hospitals use is EMR. These two systems are slightly different, though the terms can be interchanged, sometimes. EMR is a generic term long used by providers to refer to a computerized patient record. For many years, doctors and hospitals have been deploying their own, discrete EMR systems to improve their practices, basically replacing paper charts with computerized records, (Ayandale, 2018). In other words, EMR is a single hospital dedicated system: every health center define and therefore, have their own mode of operation and service delivery quite different from other hospitals. And that has its own limitation as it does not bridge the gap between two different health service providers. Thus, a patient is bound to repeat similar process if he visits another hospital; thereby, having duplicate record. Contrary to EMR, EHR refers to an aggregate of a patient's EMR data that is generated over time by various institutions and can be shared among them, (Laudon and Laudon, 2018). EHR system cuts across hospitals, and thus, centralizes patients' health records for all hospitals.

A good EHR design, integrated into HMOs is a guaranteed solution to repetition of processes in our hospitals.

2. Review of Related Literature

Majority of hospitals in Nigeria still engage in manual record-keeping which is time consuming and keeps the patients waiting, and is very frustrating, especially in emergent conditions, (Ayandale, 2018). Paper-based medical record has unending limitation. The problem of finding folders make people spend a long time in the hospital before accessing care. Some patients are made to pay for another folder when theirs is missing, and at other times, they spend the whole day without being attended to. This causes chaos in hospitals sometimes, as many patients end up fighting health personnel because of delay in locating their folders, their names being skipped or missing folders. Patients who do not have doctor's appointments are often not attended to in some hospital units, even when their condition is critical because the record officers feel it is a herculean task locating their folders. The patients are sent away without the doctor's knowledge, (Akor and John-Mensah, 2016). Sometimes, the paper records are exposed to rodent attack, aging and the consequent fainting of the pen ink, little or no security of information, complications in updating and editing, etc.

An Electronic Medical Record (EMR) is a digital version of the traditional paper-based medical record for an individual. The EMR represents a medical record within a single facility, such as

a doctor's office or a clinic (Rouse, 2011). It contains only medical records of a doctor's patients. The design purpose of EMR is to provide health services solely to patients of a particular hospital. According to the Registrar/CEO, Health Records Officers Registration Board of Nigeria, Alhaji Mohammed Ibrahim Mami, "No public hospital in Nigeria fully utilizes the Electronic Medical Record, adding that while they may use it for some aspects of documentation, there is zero usage for consultation."

He said some hospitals have started using it for registration of patients, billing and stock taking but in the area of real consultation, only one or two federal establishments are using it. For instance Federal Medical Centre, Keffi, has gone a little bit far in the use of Electronic Medical Records, more than any other public hospital so far. The registration, consultation, laboratory investigation, pharmacy, stock and billing including inpatient consulting services are all electronic.

"But the National Hospital, Abuja only uses Electronic Medical Records for documentation that is in registering patients. Same with some teaching hospitals like University of Maiduguri Teaching Hospital, and Federal Medical Centre, Nguru. Other hospitals do more of paper work and talking about doing it than putting it into practice. As far as using the system for consultation in public health facilities either at state or federal level is concerned, it is zero", he explained.

He added that some private hospitals like Abuja Clinics and the Nigerian National Petroleum Corporation (NNPC) hospital have achieved almost 100 percent in Electronic Medical Records, (Akor and John-Mensah, 2016). The Agency for Healthcare and Research Quality within the U.S. Department of Health and Human Services (HHS), describes EMR generally as a record that draws from a set of databases that hold patient health information within one institution, such as one hospital or one physician's office (Holman, 2016). Electronic Medical Records (EMR) are therefore, key components of modern healthcare delivery. Furthermore, according to Paradigm InfoTech Inc ([Paradigm], 2018), "an Electronic Medical Record (EMR) is a computerized medical record created in an organization that delivers care, such as a hospital and doctor's surgery. Electronic Medical Records tend to be a part of a local stand-alone health information system that allows storage, retrieval and modification of records". It is a computer program that is used for the collection, processing, storage, analysis, and transfer of patient's medical data. It serves as a toolkit that enables clinical transformation becomes the source of truth for a patient's journey within hospitals and provides a framework for patient-centered healthcare delivery. This new system has been introduced as part of the innovation of the whole Information System for business and patient care processes at the hospitals (Hygeia, 2015). Hence, an EMR contains information that is used for diagnosis and treatment: It houses all of a person's vital medical data, including personal information, a full medical history, test results, diagnosis, treatments, prescription medications, and effects of those treatments (Laudon and Laudon, 2018). In this way, a physician would no longer need to peruse through log of paper files in order to access a patient's data but, would be able to instantaneously and directly access the required information via the EMR system.

2.1 Benefits of EMR in hospitals

EMR would offer faster service and a near medical error free health scheme by reducing the use of papers in our health centers. Most times, the problem of poor, and or wrong treatment, and overdose is rooted from inability of the nurses to read their doctor's handwriting; sometimes, as a result of the aging paper too. Also, when a patient regularly visits a hospital, his health file increases as a result of the volume of papers used for them. This consequently, affects the quality of health service offered, and much time is also spent.

More professional, timely, and accurate treatment decisions could be made with EMR system, free of human error from misinterpretation of poor handwritten medical records.

EMR system offers a ubiquitous platform; hence, physicians can access a patient's medical data anytime and anywhere. This scenario is possible because medical information are now digitized via EMR system.

EMR reduces, if not eliminates the time wasting and inefficiency by simplifying the workflow in the health centers and offering a quick and an easy access to a patient's record. EMR system provides patients with quick access to a more coordinated and efficient patient-centered health system. (MediFix, 2017).

Electronic Medical Records are better secured. Privacy protection, which is a big concern to patients is provided by EMR. Research has shown that patients are not comfortable with the idea of computerized health record because of their fear of insecurity.

EMR system also helps to reduce cost by reducing the repetition and duplication of laboratory tests and decreasing paperwork. It also enables safer and more reliable prescription of medication.

According to Laudon and Laudon (2018), by analyzing data extracted from Electronic patient records, Southeast Texas Medical Associates in Beaumont, Texas, improved patient care, reduced complications, and slashed its hospital readmission rate by 22 percent in 2010.

The Chief Operating Officer, (COO) of the Lagoon Hospital, Lagos, Nigeria, Dr. Naseem Mohammed said, "The Electronic Medical Record System (EMR) allows Lagoon Hospitals to create a unique record database of all patient's medical and critical information such as medical history, future appointments, current medications, allergies, etc. Using an EMR enables continuous improvement in healthcare delivery by capturing structured information, supporting interoperability across systems and by enabling active decision support through the ability to access and interrogate medical data." Dr. Jimi Coker, the Group Clinical Advisor and Chairman of the EMR Committee at Lagoon Hospitals also said that this EMR initiative has major benefits to all of Lagoon's esteemed clients some of which are:

- Easy access to patient records irrespective of where the patient is accessing care.
 - Reduced waiting time (time saved from retrieval of files, lab results, X-rays)
 - Legibility of handwriting, reducing errors in orders
 - Better management of the appointment system
 - More space in the hospital, which means a more conducive environment when visiting.
- (Hagyeia,2015)

There are many more benefits to both the medical service provider and consumer (patients) like Speed, Storage, Security, Support, Accessibility, Affordability, Technology, Infrastructure, Versatility, Efficiency, and Manageability.

2.2 Challenges of EMR in Nigeria

EMR has been faced with lots of setbacks. Despite its numerous benefits, its acceptance and application in Nigeria is limited by four major factors:

1. Interoperability issue: EMR is usually tailor made for one health service provider or hospital. All over the world, many providers have an EMR system in place, but they are not necessarily interoperable with other providers' EMR systems. In other words, an EMR does not follow a patient and cannot be shared digitally with other healthcare providers (Holman, 2016).
2. Epileptic Power supply: Over the years, Nigeria is known for the problem of steady power supply. The effort of the Federal Government has not been good enough to save the situation despite being known as the Giant of Africa. In a growing population such

as in Nigeria, health service providers work under pressure; therefore, there is need for steady power supply if EMR would be introduced and implemented in our hospitals. However, 97% of the respondents believed that improved power supply would aid its effectiveness. Thus, the key finding of this study is that erratic power supply is an important challenging factor in the introduction and implementation of EMRS in Nigeria. Over the past decades, healthcare providers have been under pressure to give medical services in a complex and bureaucratic settings with increasing population of patients. There is a need for constant power supply for effective running of any information system project like EMRS, (Ayandale, 2018).

3. Health Providers' and Patients' Poor Orientation: Many health providers and consumers (i.e. doctors and patients) have become too conversant and comfortable with manual paper-based health service delivery such that they have phobia for technology.
4. Patients' concern on the security of their records given the possible surreptitious access by unauthorized persons.
5. High cost of installation and maintenance of equipment: Most health service providers think that it is costly to introduce and maintain EMR system.

2.3 Sure Way to Improve Health Care System

Considering the above stated bottlenecks of EMR system, all of them are external factors except the first point. Interoperability problem is the system's limitation. That is to say, other factors can be managed but not interoperability issues. Therefore, this paper presents two key entities and their integration as a sure bet solution to the interoperability issue of EMR system – The Electronic Health Record (EHR) system and Health Maintenance Organizations or Health Management Organizations (HMOs).

Recall the words of Holman (2016), "The terms, EMR and EHR are mostly interchangeable in the health industry but, mean different things at the regulatory arena. EMR is a generic term long used by providers to refer to a computerized patient record. For many years, doctors and hospitals have been deploying their own discrete EMR systems to improve their practices, basically replacing paper charts with computerized records. Also, the Agency for Healthcare and Research Quality within the U.S. Department of Health and Human Services (HHS) describes an EMR generally as a record that draws from a set of databases that hold patient health information within one institution, such as one hospital or one physician's office". Hence, EMRs interoperability issue.

Electronic Health Records (EHR) are digitized and stored for efficient patient management in hospitals or clinics. (IEEE, 2015). Based on the findings of World Health Organization ([WHO], 2012) on eHealth, EHR is thus, a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. The EHR automates and streamlines the clinician's workflow. It has the ability to generate a complete record of a clinical patient encounter – as well as supporting other care-related activities directly or indirectly via an interface – including evidence-based decision support, quality management, and outcomes reporting. It is a digital version of an individual's medical data. It is collected and managed by multiple authorized healthcare providers, and can be exchanged electronically among them. It consists of information gathered by organizations over a period of time -- it's often referred to as a longitudinal record -- rather than information from a single visit to a doctor or hospital. An EHR, as stated, refers to an aggregate of a patient's EMR data that is generated over time by various institutions and can be shared among them. An institution can

use EHR technology only if it has an EMR system that is capable of interoperating with other EMR systems, Holman (2016).

2.4 The Advantage of EHR OVER EMR

Unlike EMR, has a wider coverage of every patient's health history; diagnoses and results inclusive.

EHR is interoperable from its architectural design. In other words, it solves the problem of interoperability in EMR system. Therefore, EHR system can follow a patient if he or she switches providers.

EHR system is a system that is usually sponsored by government. Its financial requirement is huge, and design purpose is such that it can only be driven successfully by the Federal Government. Otherwise, individual hospitals can make do with EMR system. As a result, EHR system has a better advantage over EMR system because of the presence of government.

Unlike EMRs, EHRs represent a government-backed initiative to link medical data nationwide and make it easier to collect, share and report on. This data-sharing component of EHR technology raises additional privacy and security issues beyond those created by EMR systems, Holman (2016).

EHR systems are complex applications which have demonstrated benefits. Their complexity makes it imperative to have good application design, training, and implementation. Studies have evaluated EHR systems and reported on various benefits of the system. Benefits included increase in immunization rates, improved data collection, increased staff productivity, increased visitor satisfaction with services, improved communication, quality of care, access to data, reduced medical errors, and more efficient use of staff time. Some of the disadvantages noted were: time-consuming data entry, slow access of data and decreased quality of patient-doctor interaction, WHO (2012).

2.5 The place of HMOs

According to eHealth Insurance (2016), the Nigerian Health Insurance sector has grown and expanded since the National health insurance scheme became operational in 2004. In 2012, there were 66 accredited Health Maintenance Organizations in Nigeria, but today, they are around 77 accredited HMOs operating in Nigeria. Although there have been lots of recent mergers, acquisitions and re-accreditations, below are some of the top list of accredited HMOs in Nigeria (Health Maintenance Organizations):

UNIC Insurance, Premium Health Limited, Zenith Medicare Limited, United Health Care, International limited, Mediplan Healthcare Limited, Healthcare International Limited, Active Health Managers Limited, Prepaid Medical Services Limited, Integrated Healthcare Limited, Clearline International Limited, Zuma Health Trust, MetroHealth HMO Limited, Hygenia HMO Limited.

Therefore, a Health Maintenance Organization (HMO) is a private or public incorporated company that is registered by the National Health Insurance scheme to only manage the provision of health care services via the health care facilities that are accredited by the scheme, (eHealth Insurance, 2016). According to Investopedia, an HMO is a network of physicians under same coverage. It is a group of medical insurance providers that limit coverage to medical aid provided from doctors that are under the contract of "HMO". These contracts allow for premiums to be lower since the health providers have the advantage of having patients directed to them; but these contracts also add additional restrictions to HMO's members. Hence, it provides health coverage for a monthly or annual fee ("Health Maintenance Organization – HMO" n.d., "What is a 'Health Maintenance Organization - HMO'"). Take for instance, a situation where hospital A, B, C, and D, which may or not be all

private or public health providers, are registered under a Health Maintenance Organization X (i.e. HMO X); and a patient has secured his or her health insurance with same HMO X. by the provisions of HMOs, the patient has the privilege of being treated by any member health service provider such as the afore mentioned hospitals A, B, C, and D anytime, anywhere.

However, it is sad to state that same repeated - and paper process is what we get with these member hospitals: When a patient happens to visit another physician within same HMO, virtually same basic health data and history are collected manually.

2.6 What is the solution? – Hybrid of EHR system and HMOs

Due to the earlier discussed limitations we have with the replacement of paper processes in our hospitals with EMR system, and the continued manual and repeated processes in our HMOs, it is now critical to consider a hybrid of EHR system and HMO. For Nigeria state to enjoy eHealth, the government must harness the strength of computer technology. And such strength is in EHR technology for our health service providers. Since, EHR system is a project that can comfortably be sponsored by the Federal Government, research has shown that the integration of the technology into HMOs would impact tremendously positively to our society. The synergy can bring about the following,

1. A maximum reduction of paper processes in hospitals: Hospitals can no longer depend on pen and paper in their day to day delivery of health services.
2. Unified and progressive growth of the health history of patients
3. Overall Improvement of the quality of the health system in general
4. Cost effectiveness in the long run
5. Provision of important health data for monitoring and evaluation of current hospital policies
6. Help to the Federal Government in planning policies based on accurate data and not mere estimates
7. Confidence boost to consumers/patients in their healthcare provider

However, the bane of the success of this hybrid are as follows:

1. Unawareness of government of the economic and social impact of the implementation of EHR in HMOs.
2. Inconsistent electricity supply
3. High cost of installation and maintenance of EHR equipment
4. Low level of awareness of the advantages of EHR
5. Abysmally low government funding of healthcare. Most of the healthcare facilities in Nigeria are government owned and the 2017 budgetary allocation for healthcare was about 50billion naira which is about \$150million. That is less than \$1 per individual!
6. Reluctance of the health providers cum workers themselves to change their modus operandi.

3. Summary

Paper-based health service delivery has served its purpose in the past. Now, there is need to move on. Hence, computer technology has been introduced into the health system all over the world. Such technology includes the EMR (Electronic Medical Record) system and EHR (Electronic Health Record) System. These two systems involve the use of computer software to gather, collate, analyze and store health data. The only difference is their scope: the EMR system is a custom made computer application that can only be used by one health service provider or hospital. Thus, patients need to be re-interviewed by a doctor each time they visit a different hospital. This however, has a major setback, which is the continuous repetition of this same basic process. EHR system, on the other hand is a robust application that can be used

by two or more hospitals. In other words, it is a collection of EMRs from different hospitals. And when EHR system is implemented in an HMO environment, it therefore ends the repetition of the first principle of health care service (i.e. registration and collection of health history). Hence, all physicians need do is to electronically access each patient's health record in order to know every necessary detail required for the present health service delivery. However, this implementation can be realized if the government would intervene, given that it is a huge and capital intensive project.

4. Conclusion

Computer technology plays a pivotal role in virtually every aspect of human endeavor, such as in health. Though EMR and EHR are terms interchangeably used today, they do have a slim difference, which is in their design purposes: EMR system is tailor made for each health center while, EHR system is robust and for any possible number of health centers that come together and unite their modus operandi (MO). And given that HMOs are a platform that bring together health centers under one health group or scheme, the Federal Government can sponsor implementation of EHR system in HMO scheme. If this is done, the synergy would surely be a solution to the obvious and prevalent setback doctors and patients have in our health centers.

5. Recommendation

I recommend that the Nigerian government adopt and introduce this hybrid of EHR system and HMOs into our Health system for a better and secured health service delivery. The synergy of these two 'systems' would impact positively on Nigeria Health system.

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