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21ST CENTURY MEDICAL RECORDS

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ABSTRACT: *Computer science, information technology and Engineering are changing the face of Medicine in our generation. The dividing line between Computer science, information technology and Engineering as per medicine/biology and medicine is becoming thinner and thinner by the day (will be minimal in the nearest future). Computer science and engineering, information technology and biology are bridging this gap. Bioinformatics, comes in to do the magic in combining biological sciences with informatics; aimed at bringing out basic life features with successful computational medicines, information technology and skills in applying vast amount of biological information in genomics, proteomics , molecular medicine, clinical decision support and informatics, predicting functional structures (DNA,-RNA-proteins-lipids-carbohydrates), medical records or electronics health records or health care information systems, Bio-identification or identity management, Biomedical intelligence, Clinical Data Analysis, forensic analysis, crop improvement, veterinary science, diagnostics and drug designing /new pharmacology techniques. This has helped to reduce time of medical diagnosis, treatment and healing/cure. It's already reviewing new ways of looking at medical sciences. This paperwill focus on 21stCentury medical records with the hope of a better and professional management of patient's medical information/history; compared with present realities, integrated with cloud computing/distributed systems (to make treatment to be more efficient for the good of man). This will help reduce error in treatment to the barest minimum; bringing out the best in our healthcare providers.*

KEYWORDS: Cloud computing, Medical Records, Bioinformatics

INTRODUCTION

Man has always looked for a better way to help humanity survive the world he lives in. Medical Sciences to a very great extent for many generations to date have helped in human health survival - healing, proffering solutions and preventing diseases that have found their way to Homo sapiens. Lots of work done by individuals and teams are recorded for us in history in line with this for generations to read and be grateful for what God has used man to achieve in field of medical sciences till date. The fact remains that no individual or even the present medical sciences world has been able to proffer all the solutions needed for man's medical survivals. There are new discovering all the time of one form of disease or the other that has not been studied or discovered before. Therefore, man is always researching on better ways to help man survive health wise in the present and for the future generations to come. Medical Sciences only have been doing this in the past. While I must confess that Medical Sciences have tried their best possible in achieving all that is necessary to bringing about solutions needed for man's medical survivals vis-à-vis healing,

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proffering solutions and preventing diseases that have found their way to Homo sapiens, there are still lots to be discovered in the area of medical sciences from other fields like Bioinformatics, Medical Electronics, Biotechnology, Medical Engineering, etc, particularly in healing, proffering solutions and preventing diseases that have found their way to Homo sapiens. I will say here that Medical field personnel need helping hands to improve on what they already have or discover new methods cum faster ways on how to go about healing, proffering solutions and preventing diseases that have found their way to Homo sapiens.

Information Technologists, Computer Scientists, Engineers, Psychologist, Safety Professions, Government Agencies, Non-Governmental Organizations (NGO'S), United Nations (UN), Organization of African Unity (OAU), European Union (EU), Common Wealth Countries, World Health Organization (WHO), UNICEF, Universities, other international and local bodies around the World etc, now have great concerns on how to improve on what medical sciences already have or discovering new methods cum faster ways on how to go about healing, proffering solutions and preventing diseases that have found their way or still finding their ways to Homo sapiens.

Bioinformatics also sometimes known as "computational Medicine" or Life Sciences, BIG Data, life/living data (a word I coined as I research more into Bioinformatics) comes in to do the magic in combining biological sciences with informatics; aimed at bringing our basic life features with successful computational medicines. Bioinformatics again is a very wide field of study. I will in this paper look at 21st century medical records in line with available computational tools; with the view of taking patient care to the next level–transforming the next generation of medical care in the 21st century and explores if not already trending, introduction of healthcare information system.

MemorialCare said when physicians have all the latest information on their hospitalized patient's status or outdoor patient or even home medical services tests and condition, the patient receives better care. Jim Burress says the state of Georgia is well on its way toward implementing an electronic system where patients, doctors, hospitals and other healthcare providers across Georgia can access medical records.The goal is to improve efficiency and deliver better patient care.Hospitals/health centers are expected to think in this direction – to remain in business or to continue providing health care services and not to go out of competition. Since papers/files or stacks of alphabetized folders will likely go away as more healthcare providers' transition to electronic medical records.

Statement of the Problem

Information Science/ Technology (IT) has been able to revolutionized the banking sector, online shopping and stores, e-ticketing, booking in transport sector/systems, hotel, automobile, aircraft, design, movies/cartoons, sports, computer game, artificial, intelligence, etc and still excelling.Information Science/IThas tried in making its input in health care delivering, yet the number of success stories are few and the frustrations many (Marc Berg,2004). Technology like cloud computing has been around for some time now. Why have IT scientists and Engineers not able to overcome the frustration in contributing their parts and making health care delivering safe and better; thereby overcome human errors and deaths caused by few health care providers? This is still a puzzle. Medical records, helps in better treatments, yet it's still a problem in getting

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accurate medical records for Patients treatment because, most hospitals, especially in Nigeria still depend on paper/file type of medical records even in the midst of cloud computing and distributed system; that is used in many other sectors for better productivity and efficiency. The present electronics medical records can still be enhanced with proper deployment of cloud computing and distributed systems.

Objectives

The Objective of this paper is to enhance medical record with available computing tools. To assist medical personnel,improve on what they already have or introduce faster ways on how to go about healing, proffering solutions and preventing diseases that have found their way to Homo sapiens; with proper medical records by introducing already known cloud computing to the present Electronics Health Records (EHR) or Patient Care information System (PCSI).

Scope of the Study

A few hospitals in Abuja were used to research into the possibility of employing cloud computing as a starting point for EHR/PCSI.

LITERATURE REVIEW

Merg Berg et al (2004) said in almost all the Western countries, concerted efforts are made to stimulate the use of information technology (IT) in health care. Yet the number of success stories are few and the frustrations many. In his book, he induced readers to challenges, the lessons and insights of health information management at the start of twenty-first century. He was able to highlight how technical (especially information Technology (IT) –Electronic Patient Record - PCSI) in health management affects both clinical and patients in decision support techniques.
Marc Berg et al (2004) also said IT, it is hoped, can help reduce medical errors and increase the quality of health care delivery through optimization communication. It could provide government, tax payers and patient organizations with comparable information on the performance of individual professionals and organizations.

The New York journal published by the Washington Institute of Medicine, the BBC Radio 4 medical programme, saysthe terms medical record, health record, Electronic Patient Records (Marg Berg et al 2004), Electronics Health Record (EHR) and medical chart are used somewhat interchangeably to describe the systematic documentation of a single patient's medical history and care across time within one particular health care provider's jurisdiction. The medical record includes a variety of types of "notes" entered over time by health care professionals, recording observations and administration of drugs and therapies, orders for the administration of drugs and therapies, test results, x-rays, reports, etc. The maintenance of complete and accurate medical records is a requirement of health care providers and is generally enforced as a licensing or certification prerequisite.Public Citizen Health Letter (March, 2008) also says medical record is a compilation of your medical history; your family medical history; information about your lifestyle; physical examination and laboratory results; medications prescribed; diagnoses and prognoses; results of treatment and procedures undergone; allergies and other risk factors; disabilities and limitations; and participation in research projects. Medical records may also include results of

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genetic testing used to predict future health. As a result of the private, personal nature of this information, access to medical records is restricted.

Advance for Health Informatics Executives says medical care is getting more and more complex and new information is already overwhelming Physician's capacity to treat patients with the latest information, Physicians need new technologies to help them cope. Medical records are important because, it enhance patience safety and quality of treatment (thePhysician is better off with medical history of a patient). Denise Van Fleet (Dec. 2010) traced the root of health information management history and says Health information management (HIM) history may have officially started in 1928 when the American College of Surgeons (ACOS) sought to improve the standards of records being created in clinical settings. He further says HIM trends review that more improvement is still be expected in as it's making news today in the new implementation of electronic health records (EHR) with robust data base management systems.

In line with lots of discussions with Health care personnel and readings in healthcare journals, it's observed that it's more comfortable to treat patients with good medical record/history because, it benefits both the health care provider and the patient. Denise Van Fleet (Dec. 2010) again, said the earliest medical records/history were recorded on paper … that brought about the name record librarians.

Denise Van Fleet (Dec. 2010), Carolyn McClanahan (2012) say one quality of a good medical doctor or health care practitioners is to collect patient's history with good physical and laboratory test for effective or correct diagnosis and treatment. This started with Paper medical records (1920s), marriage of computer and medical records ('60 and '70). As volume of healthcare data increase, universities got involved in the 1980s to enhance patient information generated and electronically recorded at specific facilities; accessible only at the specific healthcare location (restricting usage). The 1980s and '90s produced huge leaps in healthcare development with computerized patient's electronic check-in process. That introduced master patient index (MPI), a database of patient information used across all the departments of a healthcare organization …limited to individual department only. A wave of medical errors and patient deaths caused by healthcare providers renewed search for viable EHR system in 2000. This was in an attempt to reduce health care providers errors that led to preventable deaths and able to provide better health care and improved on treatment accuracy. It was supported by President George W. Bush in 2004,President Obama in 2009 and received a bust in 2014(Denise Van Fleet 2010). There is need to fine turn in 2016 and beyond. I'm of the hope that Babcock University will help with this breakthrough.

DISTRIBUTED SYSTEMS

The trend is for lots ofapplications designed to run on rebuts networks of associated computers. The world has been said to be a global village, it's even more a global village with the internet and cluster of computing, with broad band or high band-width and wireless data communications, the availability of ever cheaper, small and more sophisticated computers are enabling a new generation of distributed applications in information technology word.

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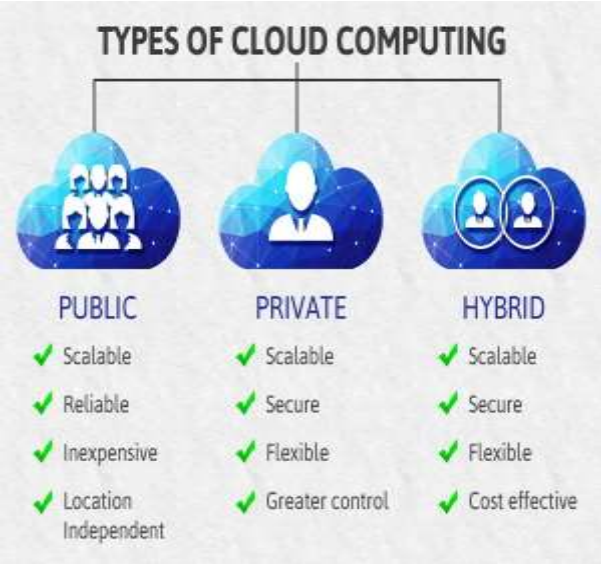
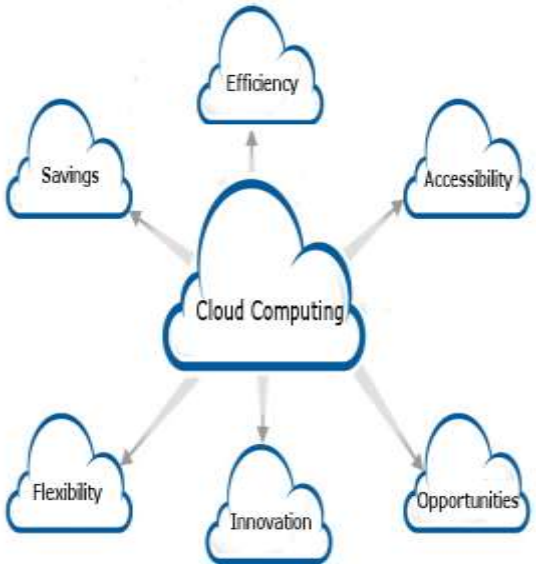
There are widespread deployments of autonomous computers working cooperatively over data communications networks developed over a cloud system to optimize their usage in the Healthcare industries. These have brought about major changes in the industry for safe and better ways of healthcare delivering. The demand and increasing use of the internet and the World Wide Web in every area of life is evidence of this trend.

CLOUD COMPUTING

Cloud computing is internet-based computer, whereby shared resources, software and information are provided to computers and other devices on-demand, like a public utility (On-demand computing, Pay-as-you-use computing). Service model include: infrastructure as a service (IaaS). That is capacity to provide processing, storage, networks and other fundamental computing resources. Platform as a Service (Paas) … capacity to deploy onto the cloud customer created or acquired applications. Software as a Service (SaaS) … Capacity to use the provider's applications running on cloud infrastructure.





Figures 1. Showing Cloud Computing (Cloud Computing, retrieved from the internet, 2016)

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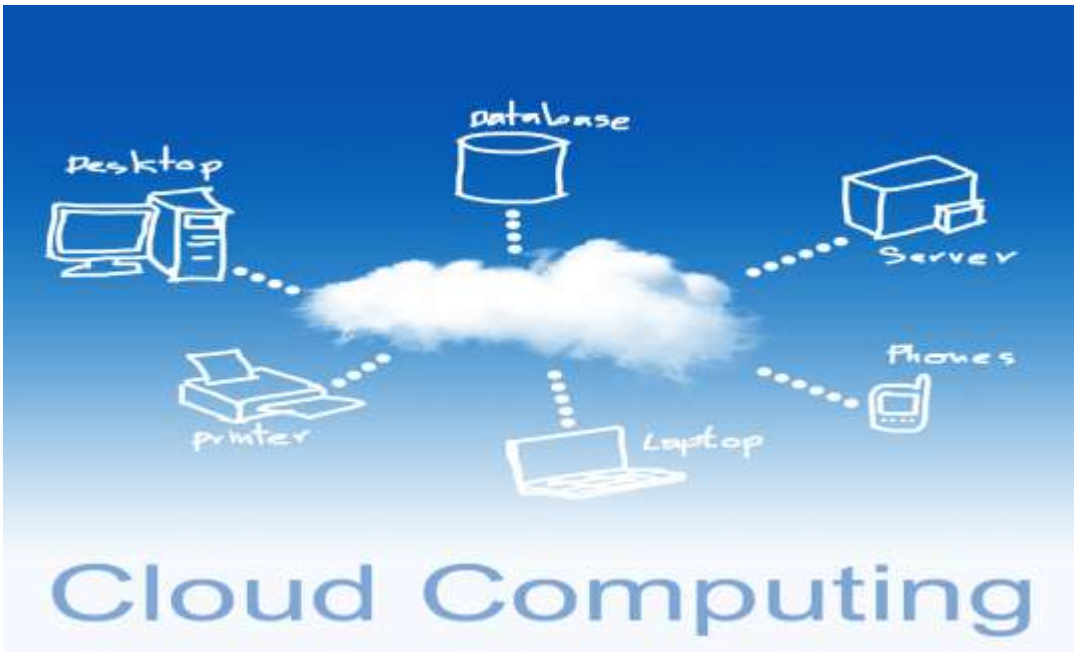
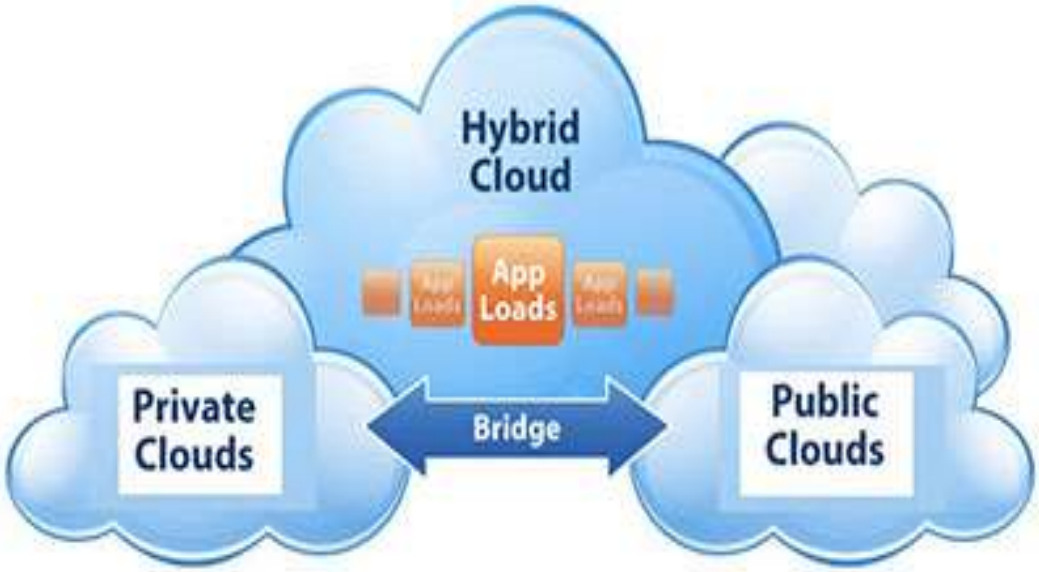


Figures 2. Showing Cloud Computing (Cloud Computing, retrieved from the internet, 2016)



Figures 3. Showing Cloud Computing (Cloud Computing, retrieved from the internet, 2016)

Cloud could be a private cloud operated by solely for an organization, community cloud shared by several organizations, public cloud made available to the general public by an organization selling cloud services or hybrid cloud composing of two or more clouds.
Cloud basically has five essential characteristics: On-demand self-service, broad network access, resource pooling, rapid elasticity and measured service.

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DATABASE MANAGEMENT SYSTEM (DBMS)

Database management system is a software system designed to maintain a data base. Database is any collection of date like medical records. DBMS is used when:

- ✓ there are large amount of data
- ✓ Security and integrity of the data are important
- ✓ Many users access the database concurrently.

With the above technologies described, we are ready to deploy our online electronic medical records.

METHODOLOGY

Electronic health records is an ongoing process. In other words, there is still room for improvement to assist out medical personnel give safe and better treatment; avoiding preventable error in health care delivering. The Department of computer Science and information technology of the school of computing and engineering sciences of Babcock University is interested in contributing its part in assisting our colleagues in the medical sciences in safer and better health care delivering services. This research therefore, looked at the present electronic health records with a view to improving it for the good of man. The research employs available cloud computing, distributed systems/networking and database technology to solve healthcare delivering issues as it relates to medical records.

I'm aware of the interoperability gap between the hospitals or health centers. Cloud computing was used as a bridge between this hospitals and health centers for better and easier accessibility of Patients medical records, that will in turn improve the efficiency of health care delivering.

RESULT AND DICUSSION

In other to reduce fatal errors in health care delivering, the present medical records system has to be reviewed. We are happy that there are hospitals that presently use EHR. Though lots of hospitals visited in Nigeria (Abuja) still use the paper/shelve medical records system. That is, you still have to present your paper card and the attendant or medical records expert then takes time (lots of time) to look for yourrecords card where your medical history is recorded. It was discovered in one of the hospitals that some patients had more than one cards in different shelves (creating redundancy) in the filing systems that can lead to fata errors. The time to look for the records card is also very important. A sick person taken to the hospital maypsychologically give up waiting while searching for the medical file records from the shelves. Let me say about half of the hospitals have been able to network their hospitals to use EHR … laboratory Scientists, Pharmacists, Medical Doctors, Nurses are able to network their departments and share resources. It's working in such individual hospitals. The problem still exits that referrals and traveling/holiday makers that are far from their locations are not able to get their medical history; hence the gap in EHR. To close this gap in the EHR system, there is need to explore the use of our cloud computing, distributed systems and database management system (DBMS).

ISSN 2054-0957 (Print), ISSN 2054-0965 (Online)

THE DESIGN

✓ Every hospital needs to be upgraded to electronic medical records management system (MRMS), using a LAN, MAN; with their distributed systems properly networked.

✓ With local database if hospitals or health centerscan afford it or hooked up to a cloud (cheaper) that can manage a DBMS for such a hospital.

✓ The hospital should also be network on the World Wide Web (WWW).

✓ information about individual patients (gathered in the patient record (marc Barg 2004).

✓ Every Patient medical history stored electronically.

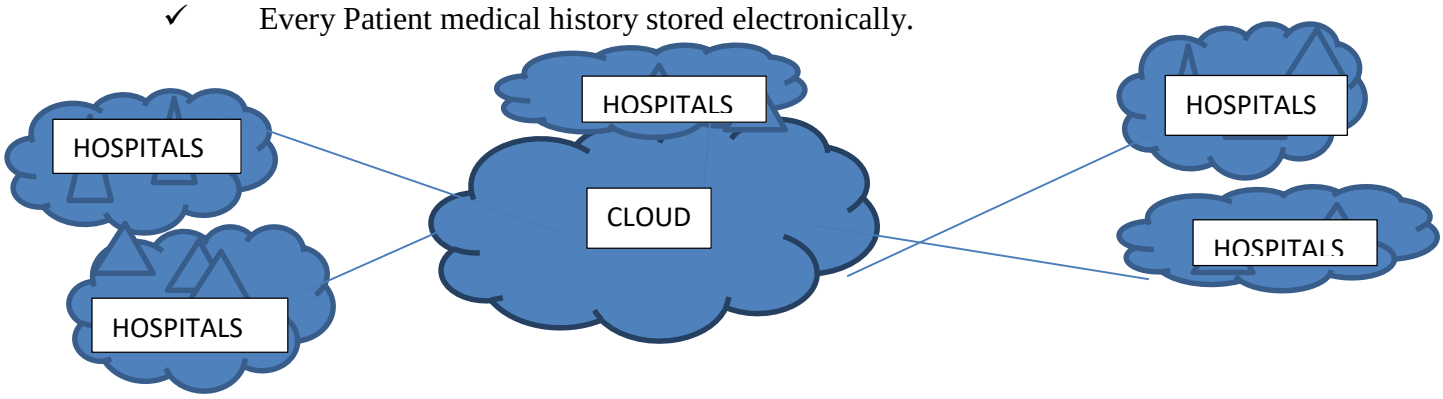

Fig. 4 showing networked hospitals in countries/towns using cloud computing facility. Source: Author

✓ Hospitals or health centers to have network/database administrators/network Engineers.

✓ Patient's medical records should only be released on demand by Health Practitioners. Levels of database authentications can be introduced in such a way that only administrators have the right to make change(s) entered into/query the database. While medical personnel are allowed to populate a Patient's records.

✓ Patient's only to authorize their medical records to be access by a given or a group of medical personnel.

✓ Information security to be taken as an important part of electronic medical records.

✓ Patients to have next of kin with phone/e-mail contacts that can be reached in case of emergencies when Patients are unable to speak or unconscious situations … operated like a bank account.

✓ EHR to be made intelligent/smart to allow for privacy and accessibility.

✓ EHR to be integrated to available smart cities, where they already exist.

✓ Countriesto set up legal groups/bodies to review international laws on patient's medical information right and access. This is for inter-state/international travelers/holiday makers.

✓ Health provide also to be educated (from time to time) in the area of electronics health records ethics and be abreast with legal frame work on electronics health records.

Information Security

One problem online EHR will face is cybercrime. Intruders are most times able to access hidden information from a system(s) in a form that they can read and comprehend. They could reveal the information to others, modify it to misrepresent an individual or organization, or use it to launch an attack/blackmail. This can be resolved throughencryption. The use of steganography is one of encrypting information. Steganography is a technique use in hiding information in digital media.

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It's a little different from the general cryptography.Cryptography in a way will make other know a message is encrypted. Steganography on other hand is to keep others from thinking that the information even exists. This is very important in modern communications … with security of computer systems at the topmost of our mind. Information security is on the increase and becoming very important as the number of data being exchanged on the internet increases daily. For online EHR to be very successful, the confidentiality and data integrity of patients must be held very secret and of top priority. These is required to protect against unauthorized access and modification.

Steganography is an art of concealing/hiding information in ways that prevent the detection of hidden messages (making the message invisible). Steganography objectiveis to avoid any suspicion to the existence of a hidden message.Steganography uses as least significant bit (LSB) insertion, masking and filtering and Transform techniques. Many patient pictures or passport are part of their medical records, the images can be used to mask the information and can only be opened with authorization from patients or next of kin.

A robust networked system will eliminate intruders. Introduction of firewalls, trust domain and good antiviruses may also do a lot in security of information. The Cloud service providers could also be of help is information security in the areas of patient's medical records.

CONCLUSION

Our world is advancing in technology. Computer Scientists and Engineers are always in the process of working silently to improve and make life more comfortable for man in all works of life. There is need to tap into this rich technology to make life a little better for man in healthcare delivering. Rick Kulkarni et al (2003) said the use of computer systems and communication tools to enhance and improve medical practice, education, and research has increased exponentially in the past three decades. Yet it is only recently that clinicians have begun to accept information technology as a means of improving patient care. This is due in part to substantial advances in component technologies: processors and memory, networks, and software. Therefore, clinicians need to apply these tools. Rick Kulkarni et al (2003) further said modern medicine is very information-intensive.

There was a time in Nigeria that people go to the banks with sleeping mats. The banking system was on card/paper system. You are expected to be given a tally number. Then you wait for your turn; that can take the entire day. In short, you are expected to take special permission from your office the day you are to go to bank … stating why you may not be able to return back to work that very day. Alternatively, you wait for when you are on leave or off duty. Then you can go to the bank. Information Scientists and Engineers looked at the situation and came out with a better option of banking that will help man reduce his/her stress. It's time to look into the medical field and see what we as information Scientists and Engineers can do to stop the errors and deaths that can be prevented in healthcare delivering. We can employ same technology we deployed into the banking sector that has made life a bit easier for humanity to the health care delivering section; to make treatment safe and better … human errors will be minimized to the barest minimum in providing health care to man.

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This is important because, lots of errors and preventable deaths occur in our hospitals and healthcare system because of no or wrong medical records of Patients before treatments are provider to Patients.

A friend of mine during our seminary training days, lost her few days old son because ofwrong treatment. She is a Nurse; a mother of two girls, the husband is a Medical Doctor (medical Director) of a Federal hospital. She gave birth to a healthy boy; full of life and took him to their hospital where she and her husband work as Nurse and medical Doctor for post-natal immunization. The co-worker, a Nurse that administers the injection, gave the little boy an overdose of the immunization drug. The boy passed out immediately the drug was administered to him.

One of my friends suffered a death of her husband in an international Hospital. The husband drove her to the office … dropped her off and proceeded to the hospital for treatment because, he was feeling feverish. The wife, my friend in the office had not even finished login into her computer that she was called from the hospital to come to the hospital. She rushed there and discovered her husband was being rolled to the morgue. There were no proper medical records in both cases. Little things can cause a life to be lost.
Proper medical records may have save the situation in both cases.

RECOMMENDATION

We are all aware of the huge investment in training a medical Doctor, Nurse and other health personnel. The health personnel are willing to put in their best to provide health care in line with their trainings and ethics. This is true but human errors at times negate the good work our medical personnel do. The way God created man, life is given just ones (from my Christian belief).Lifeones lostcannot be repaired or replaced. Therefore, computer scientists and Engineers are to think out of the box in our usual way of helping saliently and help with available technology to help man survive his environment … online EHR is necessary for the sake of man.

Drugs and quantity should be populated into Patients medical records before they are administered. This is to allow Patients and Next of Kin know what is used for Patients treatment. If one is on transit and had a form of medical crisis, the Doctor at that point of crisis should be able to know the person's medical history. Know if a particular drug given before is to be given just ones or continue from where the previous treatment stopped. So, as not to start all over; of which may cause more damage to the patient than healing. Since nobody can be rushed to the hospital without treatment administered to him or her. Information is power and can save a life.

"Please allow me to say here that information is life"
Good information or medical history is the first treatment; drugs, laboratory test and others are secondary. I'm calling on information Technology Scientists and Engineering to joint forces together in this trend of information technology. This is for the safety of man; in line with his health care.

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Every human being can be blank at times - even if you are a genius and the best brain around. Electronic medical record will help reactivate such a brain.
Legal laws on Medical Records privacy be introduced to safeguard the proposed distributed system/networked EHR.

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