CLOUD BASED MODEL FOR SHARING PATIENT’S HEALTH INFORMATION ACROSS HOSPITALS & ANALYSIS USING MACHINE LEARNING

Dr. Dinesh Goyal¹, Dr. Harish Sharma², Dr. Ruchi Goyal³

¹Professor Department of CSE, Poornima Institute of Engineering & Technology, Jaipur.
²Associate Professor, Department of CSE, Rajasthan Technical University, Kota.
³Associate Professor, Department of Management, JECRC University, Jaipur.

ABSTRACT:

With nationwide efforts to improve the quality, safety and efficiency of medical services, the demand for electronic health information exchange between medical professionals is growing. Medical Facility in our country has grown leaps and bounds in past 3 decades, especially with the availability of private hospitals and efforts of Government. In these past decades the cost of medical facility has also grown 100 times in this duration, every time a patient is referred to a particular hospital, he has to again go on for new test along with medical prescriptions, Such actions are repeated for every hospital visit, which involves time and cost both. In this work we are propose a model to deploy Hospital Management ERP over cloud, with storage of all the records of patient including his prescriptions & Lab reports, for any time accessibility of the same. So that can reduce the cost of treatment for the patient and accessibility of the same across all hospitals. We also implement Machine Learning as a tool to analyze the health improvement of the patients, tracking their medical history and also to analyze the performance of hospitals & doctors. By accomplishing this work, we aim at providing a solution to Indian Medical Industry and Government of India, in line with HIPAA act of USA, which reduces cost of treatment, Ease of access and regulation & monitoring of health care.

Key Words: Electronic Health Records, Machine Learning, IT in health care, Cloud Computing, Health Monitoring

I. BACKGROUND

This work is proposed to counter the issues of loss of life, or to reduce cost of medical treatment, due to not having the medical report on time. When patient is in critical condition but due to some conditions hospital has to do the same medical diagnosis test again, for knowing Important information about patient like diabetes test, blood test, Chest X-ray, Blood Pressure, Urinalysis, Electrocardiogram (ECG), WBC, Potassium, Coagulation studies etc. So in doing this important diagnosis, the patient who is in critical condition, will face death or turn into worst case or has to spend lot of money for the same.

So to save this precious time, cost and critical condition of patient, our work will be a great asset. In this the hospitals will be connected/ Sync with cloud, whenever any patient come to their hospital or Lab, their information must be updated. If the patient is new then their information must share over the cloud with the help of using unique id like AADHAR number etc. So whenever any patient is in critical condition then by using the patient’s unique number, any hospital will generate the patient’s re-port and start the treatment/ Surgery. This will be similar to HIPAA act of USA, which is implemented in USA in 1996. This was designed to modernize the flow of information of healthcare amongst all the peers of the system Predict/Analyze the health record of the personal using a specific common ID like SSID in USA. To track the medical records of document, transcripts etc and avoid theft. It also tracks Insurance and other information of patient; this ensures 100% packaged healthcare solution for the Nation.

With the growth in healthcare attention of Government in India and technology in the health care system, there is increasing interest in information and communication technologies to support health services. How-ever, despite extensive discussions and investments in information technology, communications systems have received very little attention, and clinical adoption of even simpler services such as voice mail or email is still uncommon in
many medical services. There is still a huge gap in our broad understanding of the role of communications services in health care delivery.

II. REVIEW OF LITERATURE

These days many, healthcare tools such as, mobile biometric sensors, and Smartphone apps are in use & lot of data is being generated by them. Therefore, it is important for us to that IT can be a great asset in healthcare For example; the analysis of such data can provide further insights on procedures, technology, medical and other types of healthcare. Also healthcare process of patient & service providers can be rated & improved. [4]

In paper [5] the authors illustrate the importance of data analysis in healthcare. Various aspects of data analysis have been investigated and their effectiveness in improving health care services

In discussion paper by Niti Aayog, 2018 [6], Government of India realizes the importance of Artificial Intelligence in healthcare in India, wherein it also illustrates Combining diagnosis services through AI, but at the same time misses to illustrate, how Cloud & ML can integrate complete medical system of the nation

The paper [7] reviewed machine learning and its potential applications in unsolved problems in suicide research. Although few studies have implemented machine learning for suicide predictions, the results so far indicate that accuracy and positive predictive value have greatly improved.

The work of the paper [8] is to develop a semi-automated framework based on machine learning as a pilot study to relax the filtering criteria to improve the recall rate while maintaining a low false alarm rate.

The authors in [9] developed and validated a machine learning model that predicts incident risk based on electronic health data available at admission

Authors in [10] show the healthcare models which were built using EHR data are more 11% more accurate, with the conventional models. They also demonstrate that new predictive markers when incorporated into EHR give 8% improvement in accuracy.

Author in [13] a review of different application zones in social insurance that influence such methods from security and protection perspective and present related difficulties. Moreover, author presented strategies to secure and protection safeguarding ML for medicinal services applications. At last, we give knowledge into the ebb and flow research difficulties and promising bearings for future exploration.

Author in [14] suggest a recommendation model for health information storage that can accommodate affected person choices and make garage choices unexpectedly, in real-time, in spite of streamed statistics.

Author in [15] a synthetic intelligence-based totally heuristic fitness management gadget has been designed and evolved. Author presented near upgrade the security and protection of the live datasets of patients and the connection of therapeutic contributions over its select perspectives. These administrations incorporate the limit with respect to specialists, experts, chaperoons, and group of laborers to go to choice higher choices snappier. The test results show promising impacts in expressions of different in general execution components

Author in [16] Set of rules grouped the dispensed data into clinically significant networks that caught practically identical analyses and geological areas, and scholarly one model for every network. All through the acing method, the information got put away close by at medical clinics, while privately figured results had been collected on a server.

Author in [17] the usefulness of making use of supervised Learning to analyses precise organizations of patients that revel in excessive levels of mortality submit inter hospital switch.

III. NEED OF THIS WORK

Digital technology has revolutionized our world of Smartphone’s, tablets and web-enabled devices, and it has changed the way we live and communicate. Medicine is an information-rich industry. The system enables medical professionals to quickly enter information about new patients and create digital records so they can be updated with each new encounter. Records show detailed information, including family history, cause of initial complaint,
diagnosis and treatment, prescription drugs, laboratory tests, and other important information needed to help each patient.

Medical diagnosis is the process of determining which disease or condition can explain a person’s symptoms and signs. It is often called a diagnosis, where the medical background is hidden. The information needed for a diagnosis is usually collected from the medical history and physical examination of a person seeking medical care. In the process, one or more diagnostic procedures, such as diagnostic tests, are also often performed. Sometimes a post-mortem diagnosis is considered a medical diagnosis.

According to 2013 civil registration data released by the Census Bureau, almost 27% of deaths in India occurred without medical care at the time of death. Data from 27 states and alliance regions also indicate that only 43% of total deaths occurred in institutions and the remaining 3.9% occurred under the care of a qualified homeopathic physician. As for the number of deaths, 71% of the total births occurred in institutions, and other births required the care of doctors, nurses, midwives, etc. Experts say that most of the deaths occur without medical treatment due to high costs and difficulty in accessing medical services. Care in rural and hilly areas

IV. RESEARCH METHODOLOGY:

Step 1: literature review

Step 2: Design of Proposed Model over Cloud

Step 3: Testing of above model in association with 2 Hospitals & fetching required information

Step 4. Testing with real time data and analysis of historic data of patients.

Step 5: Performance analysis of developed model

V. WORK PLAN

In this, the hospitals must connected/ Sync with cloud, whenever any patient come to their hospital or Lab, their information must be updated if the patient is new then their information must share over the cloud with the help of using unique id like AADHAR card number or any other Number which is unique to every person. So, whenever
any patient is in critical condition then by using the patient’s unique number, any hospital will generate the patient’s report and start the treatment/Surgery.

VI. PROPOSED ARCHITECTURE:

This work is designed to adopt model of maintaining health records electronically by use of technology.

Apart from providing ERP based solution for medical Information of the patients, the proposed architecture will also generate Health Analysis Report (HAR) system. Health Analysis Report (HAR) is an electronic document which maintains all the health record of individual person that will be shared with all the hospital and medical institutions. The today world is going to change on paper work to digital so the HAR will help to individual maintain all the medical information on one platform. Any person can digitally access his data and shared the information to his Consultation doctors on his own consent.

Our project mainly intended to the people who are belongs to poor level or the person who does not keep his or her documents safe. From our project he or she can maintain the file electronically. The proposed project includes the following information of patient as follows:

- Personal information
- All the prescription of all doctors
- Any Allergies
- Family information or their medical information
- Insurance Policies
- Complete body information
- Any Surgical information
- Information about regular medication
- Hospitalization information

Fig 3: Proposed Architecture

Fig 4: Modules in the Application
ALGORITHM
Step 1: Patient Visits nearest Hospital
Step 2: Medical team conduct diagnosis
Step 3: Generate reports of medical tests
Step 4: Advice prescription for treatment
Step 5 Hospital team create digital records of all prescription/reports of each patient
Step 6 Using their Aadhar ID /UID, hospital uploads the records in cloud
Step 7 the records are stored in archives for future
Step 8 Assuming patient relapse existing ailment/new ailment occurs
Step 9 Patient may visit the same hospital or another hospital
Step 10 the concern hospital may refer his / her achieve records (using cloud) from step 7 along with new desired diagnosis using cloud.

FLOWCHART

Fig 5: Flow Chart of working Model

VII. BENEFITS TO STAKE HOLDERS & THE MEDICAL CARE IN THE NATION

HOSPITALS:
- User Friendly System Administration.
- Easy Management of Doctor and staff.
- Helps Manages finances better.
- Easy billing system.
- Accessible from anywhere.
- Reduce 70% of paper cost.
- Maximize the resource utilization.
- Auto Generated SMS

DOCTORS
- E-prescription facility.
Check patients old test reports.
Appointment Scheduler.
Meeting Calendar.
Auto generated format of reports.

PATIENTS

Access prescription and reports from anywhere.
Schedule Appointment.
Get reports on mail and SMS.
Check billing details.

VIII. HEALTHCARE IN THE NATION

As our proposed HAR System will also be shared with medical agency. So whenever any patient will go for his or her diagnosis he/she need not to be carrying all the documents. It will be directly access of medical agencies.
As HAR have complete record of patient then it will be easy to diagnose him/her in well directions.
As HAR have complete medical report of patient then the medical agency will not go for unnecessary testing report, Which may lead to economical beneficial for a patients. So the cost constraint will also minimize.
From HAR the medical agency has found complete record then it may be diagnose to in proper time. So time constraint will also be minimized.

IX. IMPLEMENTATION

This section carries a summary of how data is collected and manage in the database and stored over the cloud and techniques have been implemented during the project work hours.

X. PLATFORM AND SOFTWARE SYSTEM

This section is describing a brief outlook of the main software programming language, the environment, the policy library and the platform which is used to implement this project.

10.1 AWS Cloud (Amazon Web Services): An Amazon web service provides the services and resources to require implementing the server on cloud. The class of services depends upon the as pay by customers. AWS enable an environment that a server which is configured by you will be on cloud but it seems to end user that he/she is sitting on main server. It also provides the secure policy to configure the server.

AWS resources provide the facility to implement the server on cloud. It provides all the process which is required by the server implementer. For example we have an electricity connection and we are paying to electricity board as per our requirement and payment the electricity board will transfer the electricity to our home which satisfy all the need like power voltage and load etc. Also we are not going for purchasing the electric wire and power generator to produce the electricity; it will be managed by electric board. In such manner the AWS services provide all the functionality to configure the server on cloud without any own enrollment.AWS provides a number of core services including Amazon VPC, Elastic Load Balancing, Auto Scaling, Amazon Route 53, AWS Lambda, Amazon ECS, and the backbone of all it, Amazon Elastic Compute or Amazon EC2.

10.2 AWS Database:

AWS offers the large scale of database which is mostly designed for explicit circumstances of an application. The AWS database services includes all types of complex or simple rational database implemented for transaction management, non-rational database intended for large scale of internet applications, a data warehouse for store the data and performing the analyzing of data. The AWS database stores the data in cache and works on real time mode. It also have graphics database to manage the connected data base application. The existing server can also migrated on AWS easily with the minimal cost. So from the perspective as discussed above it is decided that the AWS database will be used to implement the data base for developing the project.

Python: The work is being implemented in python 2.7.6 because it is more powerful language, advanced and multipurpose. The Machine Learning applications are easily implemented on python. So as our project will develop
with the concept of Machine Learning. The Python use the interpreter for debugging the program. So the debugging in python is very fast because it does not have the compilation. The version of Python is also open source which will also the cost effective for proposed project. Other programming language like R and MATLAB does not provide a flexible and freedom environment to work as Python. The C programs which is lower level of programming which have higher computation time to implement the results. So it may include overheads to any project. So from these points are taking in to the consideration and decided that the Python will be used as software programming language for developing the project.

XI. HIGHLIGHTS & BENEFITS OF THE SYSTEM (TECHNICAL NOVELTY)

There are some more technical aspects for the proposed project as follows:

1. The proposed architecture use the Cloud based architecture in implementation which provides migration of information and effortless access of information.
2. The proposed architecture will be implemented with the concept of machine learning. The Machine learning is powerful concept of data analytics which may leads to real time monitoring of patient health analysis.
3. The proposed architecture is cloud base then any patient and medical agencies can easily access the data from cloud within a very short duration.
4. The proposed architecture have all the information on cloud like prescription and medical report which may lead cost saving of any patient.
5. The proposed architecture will also reduce the cost and time of medical agency.
6. The patient can be diagnosed in proper time by medical agency.
7. The proposed architecture will also save the papers because all the information will be digitally saved.
8. The proposed architecture will have the data in the form of digital so it will have the beneficial that all the reports and prescriptions will be in readable form and accurate.

XII. PROPOSED OUTCOME:

The proposed architecture implemented on cloud based approach with the Machine learning Concept which maintains the complete record of patient in form of digital, secure and easily availability form. The proposed architecture will changed the conventional clinical data preserved in a provider’s office to global.

12. A. The proposed architecture will have following positive outcomes

1. The Health Analysis Report (HAR) system contains Personal information, All the prescription of all doctors, Any Allergies, Family information or their medical information, Insurance Policies, Complete body information, Any Surgical information, Information about regular medication, Hospitalization information.
2. It provides all the information in one platform then it will be easy to medical agency for diagnosing and make decision on a patient.
3. It also very beneficial for patients who are belongs to rural background that does not so much concern to maintain all the medical history.
4. It also saves the money and time of patient as well as medical agency.
5. It also provides all the information then it is easy to analyze medical history of patient for the medical agency.
6. All the data is electronically maintained so the more saving of papers.

12. B. Some of the future will be included in our research work:

Our work will also give the analysis or monitor of patient’s health and performance of hospitals and doctors in longer run. It will also reduce cost for patients for repetitive medical analysis by doctors before commencement of treatment. Also it will maintain record of all the patients for the access of poor people in the nation.

XIII. ANALYSIS OF PATIENT INFORMATION USING MACHINE LEARNING

The implementation of Machine Learning in the medical will improve the health care diagnosis. The machine learning is powerful platform to analyze the data in the entire manner [6]. So that patient diagnosis can go in the positive direction without wasting of time as conventional system used in medical history. The machine learning algorithm which are used to analyze the data performed over the medical minds of doctors are having less risk but increase the ethical concern, which are challenges for medical agency.
XIV. CONCLUSION

In India, where 70% population is middle or lower middle class and 40% are deprived of basic needs of the life. Health of the population & Healthcare system becomes quite significant. In past 3 decades, healthcare in India has grown leaps of bound and have reached to 40% of the population but has also become 1000% times costlier. Private players in this business use this need of society to extract maximum of poor, because of less literacy and dearth of resources as their bread & butter.

In our work we propose a model for making an integration model for smooth health in- formation flow of the patients across hospitals & this EHR system benefits the doctors to expedite the process of treatment and also reduces cost of treatment of patient.

We also propose a machine learning model which will evolve the model for analysis of healthcare of patients, performance of doctors & hospitals. This analytical model also can monitor medical history and health improvement of the patients

By implementing the both the system we will be able to request government of India to implement the same under Ayushman- Bharat- Scheme and facilitate the poor patients.

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