Design of healthcare system to find correlation between socio-economic parameters that effect health of individuals

[1] Ms. Seemab Nadaf, [2] Ms. Pranita Patil, [3] Prof.Y.V.Dongre , [4] Dr.M.S.Karyakarte

[1]PG Student, [2]PG Student, [3]Assistant Professor, [4]Professor

COMPUTER ENGINEERING

Vishwakarma Institute Of Information Technology, Pune.

Abstract : The past decade has seen associate degree explosion within the quantity of digital data hold on in electronic health records (EHR).While primarily designed to record patient data and health activity healthcare tasks like cost of the treatment, several researchers have found secondary use of those records for varied clinical analytics applications. Over a similar amount, machine learning community has seen widespread advances within the field of data analytics.Here in this work,we propose the design of unique ER-diagram of electronic health record (EHR) with respect to spine and orthopaedic ailments.After categorizing the schemas it helped out to design the ER diagram of proposed system.From the ER diagram it defined correlation between socio-economic parameters with diseases.

IndexTerms - **:** Electronic Health Record,Schemas, ER Diagram.

I. INTRODUCTION

Big Data Analytics has been a subject of current interest within scientific, industrial and therefore the business worlds. The care and medicine sciences have speedily become data-intensive, generating and putting on massive, complex, high dimensional and various domain specific datasets.With progress in the medical informatics, it is possible to avail better means to process the records of patient, hence speeding up the treatment and reducing the overall cost.The analysis of human assignments, one of the foremost promising medical associated health areas as an example and application of massive information science, is mentioned to demonstrate. However the adjustive advanced procedure analytical tools can be utilized for reproducing vast information points into predictions and medical speciality for exactitude drugs and customized care. Many tools exist for facilitating patient record processing: from assisting data entry to manipulating records, from generating output in required form to transferring it to other medical expert for further examination to predict the disease at early stage or save it digitally for future use. The importance of this work relies on the fact that we bring a software engineering oriented systematic approach to design and develop an electronic health record system.Our scheme is fundamentally a computer based patient record (CPR)system. Especially, this work extends system by incorporating a software system engineering, throughout development and incorporates several aspects approach from database design internet preparation, and security.Whereas to develop our design, we have a tendency to follow formal patient privacy needs for proposed. This health care system is far difficult and comprehensive because it involves several aspects from hospital management to workers staff.We have a tendency to focus significantly on patient record manipulation, as even this concentration is sufficiently complicated to supply a comprehensive analysis of knowledge, designing database and implementation steps.

The aggregation of individual EHRs into large datasets allows usage of specialized software tools and applications for predictive analytics, data mining,text mining, forecasting and data optimization.By analyzing large sets of data, meaningful patterns can be derived to treat patients.Such meaningful patterns can be derived to treat patients, such meaningful patterns can be viewed as evidence-based medicine, which helps to treat patients with different diseases. Qualitative EHR data from single clinic/hospital or a small sets of clinics/hospitals can be difficult to interpret as the data can vary in format and size from one health care facility to another .In other to arrive at meaningful patterns for practicing evidence-based medicine, it is better to aggregate large sets of data from multiple healthcare facilities. Aggregation of patient data from multiple hospitals, clinic and patient poses a significant challenge because of two main reasons: (a)Patient data can be in multiple digital formats at different locations; (b) HIPAA rules and regulations make it difficult for healthcare facilities to share patient data.

Thus we focus to design a novel ER diagram which derived from sorted schemas which helped us out not only to design ER diagram also store patient data and find the correlation between the lifestyle of the people and spine or orthopaedic diseases.So proposing this healthcare system with respect to socio economic parameters effecting the lifestyle of people.

II. LITERATURE REVIEW

While referring the existing research studies,which aim at proposing a complete big health data system for storing,processing health data,we noted a remarkable shortfall in inspecting analytics integration to real EHRs.The need for comprehensive electronic health record (EHR) system is pervasive, explaining the reason why there are many implementations as mentioned in there works.Yet,every implementation focuses chiefly on sure aspects whereas no matter the others think of such factors as time,

performance, number of users, user acceptance and state or nationwide policies. Actually, considering an EHR with respect to each issue listed higher then can be subject of analysis itself and is on the far side the scope of this paper.

Here in [1] a similar system like our work designed but mainly focus on to integrate security to the EHR system by incorporating cryptology and to limited only to general outlook.Here they have produced a simple ER diagram mostly focusing on the security and access control within the entities of the system.Entities and the schemas are at very less in number giving a generalized view.

This work[2] defines a unified system in order to manage, search, and display patient information more efficiently, by defining a patient information package (PIP) as a concise data set of a patient's medical information as per his each visit.By use of PIP's, both patient-oriented and problem-oriented query strategies, that are most frequently used in daily clinical practice and medical education, can be accommodated.Here they give a unified methodology for accessing varied forms of patient medical records further two types of design i.e. user interfaces, high-quality information display and web-based interface, for different medical service purposes.Though it gives up way to apply in rural places it did not help in providing information regarding designing of system and the database formation.And also deal with different format of data.

In [3] Hospital Information System (HIS) provides a system that avails the directors,medical workers with data which will improve there work efficiency and relieve the workload.According[3]it focus on models to establish the use case diagram,class diagram, sequence chart and collaboration diagram, and satisfying the demands of the daily patient visit, inpatient,drug management and other relevant operations by use unified modeling language (UML).As the referred work does not provide the exact designing of database.The relationship between entities and possible values are not produced here.

Here [4]provides the process of overall health records merged into a single document and use of this data to predict risk.In[4] real and synthetic two types of data are used.The real data was the data received from the hospital records and synthetic data which was collected authors, by examining personally patient's health records.Synthetic data was called unlabeled as they had no exact records. Reference paper predicts of risk for the patient, whether the patient is good in health or they require some precaution.In[4] they have not mentioned any data collection format nor the sample of data collected by the authors.

Here in [5]they have presented PHISP: a Public-oriented Health care Information Service Platform.They have presented a platform that supports personal health information management and health risk assessment along with guidance.Real-time early warning also dynamic personal health monitoring as well as active recommendation of personalized medical treatment, warning regarding active seasonal disease and other health care services to the individuals.It moreover focuses, PHISP providing remote medical and care services with respect to some specific diseases. Especially with the help of service-oriented technologies, they had designed and implemented the healthcare platform based on SOA Web service technologies so that there development is of higher reuseability and flexibility.

III. SYSTEM DESIGN

There are essential components in our design: The User interface provides a GUI based interaction with the end user who is either a Doctor or a nurse.But Admin will do the registration of employee and assign role as doctor, nurse.The Doctor and Nurse have further have access to update the records and details of the patient.While all the above process is connected to database which will also contain data such as user login data, disease categories,doctor information, and patient records for visits and treatment.Record is of the essential component as is stores visit history of patient,treatment to be given,treatment given till date,its effect on problem of patient and its relation with the specific spine or orthopaedic diseases.

The formal categories and definition of the entities in our design are as follows:

1. Medical Office Staff: The staff of the healthcare center that help manage and maintain information regarding doctors and patients.
2. Healthcare provider: The Doctor,who has access to patients health data.Nurse is the other provider can access it.
3. Patient: Subject of medical records.
4. Patient health data: Data about patient medical history, area of problem, treatment enabling identification of patient.

The above entities are the main as the most important entity is patients health data which is of two types his ailments and other one is his medical and life style history.This entity is most important as it provides complete correlation between the parameters.

III.i. DATA GATHERING AND ANALYSIS

As we started with designing our EHR system,we identified the requirements of our proposed system that was basic real time data of patient entity.According to HIPAA patients data cannot be shared thus the datasets to study and test with where unavailable.Our work began with collection of real time data by conversation with patients having aliments of spine and orthopaedics.Thus the data was to be collected from Spine and orthopaedic clinic and hospital also.It was must to do observation at spine clinic as our proposed system will show the correlation between socio-economic parameters which would lead to spine or orthopaedic aliments.When began with data collection there was no guidelines for which instances or entities a were important.At the clinic we found that pen paper method to store the changes in patient before operation and after operation.It also indicate the effect of operation on the patient.

Hence this gave us idea of which attributes should be considered while designing the ER diagram.On start of collection of data with reference to clinic form,we was tried entering it digitally and storing using google forms.As the patients were studied it was found that data to be collected was in unstructured format.So google forms did not help it out as it created many drawbacks.Drawbacks were like way to store the two option at one question etc. Hence the data had to be collected in pen and

paper method.And to make it digitized it was stored in excel in unstructured format.The data collected excel sheet is shown in the fig no.1.

Fig no 1. Real time data stored in excel

Fig no 2. Real time Data in excel

From the data gathered it helped us to find out the schemas and what could be there respective possible values.The schemas stored in excel format are shown below in the fig no 3 and fig no 4

Fig no 3.Schemas of the database

nerve suppresser(injection)

	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH
1													medication			if follow up	
2																	
3	nerve sup	effect if g	walking(a	time of w	physiothe	exercise	to be ope	X-ray loca	Xray posit	MRI	MRI area	pain kille	nerve calr	suppleme	duration c	xray appr	any other xr
4	yes	yes	increased	10-20 min	yes	neck	yes	Neck	standing	Yes	full spine	required	gabapetin	calcium	1 month	Yes	standing
5	no	no	decrease	20-30min	no	knees	no	Waist	sitting	No	back	not requi	etc	vit D	3 months	no	sleeping
6			no effect			waist		Hip	sleeping		waist			vit B12			bending for
7								knees	bending forward		hip						bending bac
8									bending backward								
9																	
10																	

Fig no 4.Schemas of the database

After the schemas were sorted out it gave us the idea of entities for the proposed system which would show the flow of data and correlation between the entities and the possible parameters which effect the life of the patient.

From a software engineering perspective, a patient record differentiated by a unique patient id, address phone number, age, gender, blood group and many special field to add remarks about the patient.Thus the same observed in case of doctor and the nurse with there identification through there id, name, qualification, specialization and many other fields will be presented in ER diagram.

III.ii DESIGN

After the initial facts were gathering and requirements were adequate in Section 3.1 further the collected data was analyzed so as to formally define the database tables, fields of each table, relationship and functional dependency in them.For a formal software engineering approach design a phase is carried out. This design approach is carried out in below subsection.

ER DIAGRAM

The Entity-relationship (ER) diagram defines and constructs the entities and relationships in the system, then bringing them together with as specified relationships. From the schemas identified there are more than 52 entities making the system complex. Though the ER diagram is formed whole here in fig 5 and fig 6 it is drawn in parts. In fig no 5 it presents Registration either as employer or patient which is done by the admin.
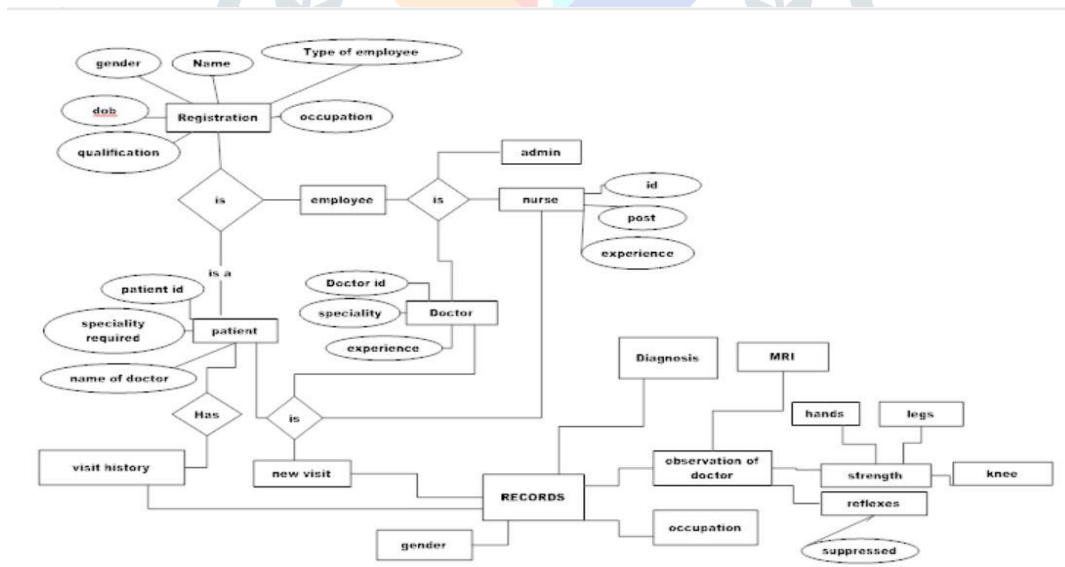

Fig no 5. ER diagram for EHR proposed system.

In order to acquire the patients EHR, three main entities are defined i.e. Doctor, nurse and staff member(if required).The staff member can add, modify or delete registration of any employee and patient on permission of admin.While doctor as well as nurse can view treatment update and also history as per the requirement.Here each entity can access the records of patients as per required by them to.Mostly a nurse should be able to add health related treatment record for a patient as per suggested by the doctor i.e. basic information and basic medical history.The third could be either extra staff or nurse depending upon rush at the hospital can be decided who could be able track only the basic identity related information,visit time and date, cost of the treatment.

With this three important role there will be an addition role i.e. an admin role, who is responsible for introducing role, to assign users to these roles.
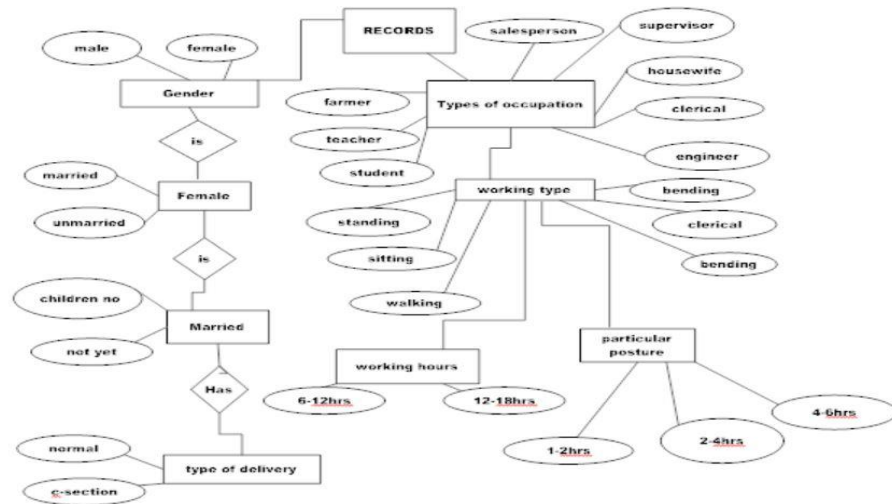
Fig no 6. Part of main ER diagram of proposed system

In fig no 6 is extented part of fig no 5 contains the entities that feed record with the values. The major entities are types of occupation ,working type, particular posture time and working hour are interrelated helping in predicting the root cause of medical problem related to spine or orthopaedic.Hence gender which specifies with Female can also bring aliment due to type of delivery thus considered.In the main design of ER diagram there are many other entities like hobbies, day activities which affect the life of patient.

IV. CONCLUSION

We present the design of unique electronic health record system considering spine and orthopaedic problems by following development methods as per software development requirements which would lead together to effective database for proposed system.This work we categorize the schemas as per the demand of the proposed system from the collected real-time data.Thus the using this schemas we design a novel ER diagram which will help us in building of database and finding the correlation between the socio-economic parameters which leads to aliments.The design of ER diagram will provide an idea to define dependenceies between the parameters.In future this ER diagram will provide guidance for development of proposed system not only in spine and orthopaedic domain but also other similar medical domains.Considering the future work, we can plan apply the design to extend the system which would be web based and could provide better healthcare and doctor treatment suggestions at rural places as no appropriate medical experts are available.

REFERENCES

1. Ebru Celikel Cankaya, Than Kywe"A Secure Healthcare System: From Design to Implementation" The 2015 International Conference on Soft Computing and Software Engineering (SCSE 2015)

2. Chung-Chih Lin, Jeng-Ren Duann, Chien-Tsai Liu, Heng-Shuen Chen, Jenn-Lung Su, Jyh-Horng Chen,"A Unified Multimedia Database System to Support Telemedicine",IEEE transactions on information technology in biomedicine, vol. 2, no. 3, september 1998.

3. Lin Ma, Huifang Zhao, ShiJun You and Wenyong AT,"Design of Hospital Management Information System Based on UML",6th International Conference on Computer-Aided Design, Manufacturing, Modeling and Simulation (CDMMS 2018)

4. G. Thippa Reddy, Aparna Srivatsava, Kuruva Lakshmanna,Rajesh Kaluri, Sudheer Karnam And G. Nagaraja" Risk prediction to Examine Health Status with Real and Synthetic Datasets", Biomedical & Pharmacology Journal Vol. 10(4), 1897-1903 (2017)

5. Pengwei Wang, Zhijun Ding, Changjun Jiang, And Mengchu Zhou," Design And Implementation Of A Web-Service-Based Public-Oriented Personalized Health Care Platform", 5 IEEE Transactions On Systems, Man, And Cybernetics: Systems, Vol. 43, No. 4, July 2013

6. Flora Amatoa, Giuseppe De Pietrob, Massimo Espositob, Nicola Mazzoccaa", An Integrated Framework for Securing Semi-Structured Health Records", a.Dipartimento di Ingegneria Elettrica e delle Tecnologie dell'Informazione B.National Research Council of Italy – Institute for High Performance Computing and Networking (ICAR)

7. Manuel Grana, Konrad lackwoski", Electronic Health Record: A review", 2015 IEEE International Conference on Bioinformatics and Biomedicine (BTBM)

8. Sunil Kumar,Maninder Singh," Big Data Analytics for Healthcare Industry:Impact, Applications, and Tools", Big Data Mining And Analytics ISSN 2096-0654 05/06 pp48–57 Volume 2, Number 1, March 2019.

9. Benjamin Shickel, Patrick J. Tighe, Azra Bihorac, And Parisa Rashidi", Deep EHR: A Survey Of Recent Advances In Deep Learning Techniques For Electronic Health Record", Deep EHR: A Survey Of Recent Advances In Deep Learning Techniques For Electronic Health Record (EHR) Analysis.

10. Dharavath Ramesh,Pranshu Suraj, and Lokendra Saini",Big data Analytics in Healthcare: A Survey Approach", 978-1-4673-6621-2/16/$31.00 © 2016 IEEE