

A Preliminary Study of Real-time Capturing and Sharing of Routine Health Data among the Public Health Professionals

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Abstract

Context: Electronic health record (EHR) has the potential to make available the real-time data of the patient to the healthcare professionals by connecting all levels of the public health system, irrespective of their geographical boundaries. **Aim:** This study aims to test the capturing and sharing of real-time patient data at primary, secondary, and the tertiary level. **Settings and Design:** The cloud-based EHR system developed earlier was used to capture real-time data of the patient visiting a primary health center (PHC) in Udupi District of Karnataka. **Subjects and Methods:** About 100 patient records including laboratory and pharmacy data have been captured into the EHR system. The confidentiality of patient data is assured. **Results:** The result of the study indicated no errors while capturing and sharing the patient data in real time. The system also evidenced the availability of vital statistics about the patient visiting PHCs. The system also allowed the professionals at referral level to view patient data for providing quality healthcare. **Conclusion:** EHR plays a vital role in capturing, storing, and sharing patient data for providing quality healthcare and it should be made mandatory by the central health agencies in the provision of patient care and reporting of notifiable communicable diseases at all levels.

Keyword: Electronic health record, primary health center, public health professionals, real-time capturing, routine health data

INTRODUCTION

Indian healthcare system follows a diverse system which consists of hospitals of various size and units run by the central and state government.^[1,2] In this system, patient care is mainly delivered through primary healthcare center (PHC), community health center (CHC), district hospital (as secondary level center), state, regional, and national level tertiary healthcare facility. These systems largely depend on the information about the health status of population in reaching out to them and providing quality healthcare.^[3] The capturing and sharing of such information becomes a challenge for the healthcare professionals and providers, as most of these healthcare data gets documented on paper. The manual documentation not only consumes time in capturing but also makes it difficult to share patient data in an instant and real-time manner. The Information and Communication Technology (ICT) can be considered as a solution in overcoming such issues, but the present level of ICT development in the healthcare sector in India has been lower in comparison to others. Technology adoption^[4]

in healthcare is a necessity to reach out to the outreach in providing preventive, curative, and rehabilitative services.

With the Government of India,^[4,5] “Digital Health Mission” has led to the development of new methods and tools in maintaining the patient data in the digital form. The electronic health record (EHR) is one such solution to support the healthcare facility, irrespective of levels and sizes to improve patient care by enabling functions that paper medical records cannot deliver. The EHR standards published by Ministry of Health and Family Welfare (MoHFW),^[6,7] Government of India in September 2013 and consequently revised and published in December 2016, suggest the healthcare facility to implement EHR including the standards such as Systematized Nomenclature

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of Medicine – Clinical Terms^[7] (SNOMED CT), International Classification of Diseases (ICD 10), Logical Observation Identifiers Names and Codes (LOINC), and DICOM and encourage the exchange of information among healthcare levels.

These initiatives by MoHFW have guided the healthcare institution to develop EHR to streamline the process of managing health information and support the healthcare system in improving population health. One such initiative was taken in this study to develop an EHR for all levels of public health system.^[8,9] This EHR will allow the healthcare facility from primary up to tertiary level to capture and share patient data without any restriction and in a secure manner.^[10] Figure 1 represents the flowchart and functioning of the developed EHR.

This study focuses on testing the capturing and sharing of real-time patient data using the developed EHR as it is needed to make the patient data secure and reliable. The result of the test would assist in understanding if any issues need to be addressed before the actual implementation of it in large scale.

SUBJECTS AND METHODS

The present study is carried out in the public health facility

of Udupi district of Karnataka. The observation of public health facility evidenced that the medical documentation at the facility is paper based and they maintain registration book, examination book, and the treatment book. The 5-year-old active patient records are maintained in the front desk of the medical record department for faster access. All other records are maintained in the repository which is still available for future reference. This is a cumbersome process and takes a huge amount of time and effort by the healthcare facility staff. The solution could be to maintain an automated electronic system, preferably EHR, to capture patient and community health data to improve public health surveillance and assist in controlling communicable and chronic diseases. The EHRs can facilitate clinical alerts to guide the primary care physicians about the diagnosis and treatment of the patients in real time.

To test the capturing and sharing of the developed EHR, the PHC, Secondary Level Healthcare Facility, and Tertiary Healthcare Facility in Udupi district, Karnataka were visited. The permission has been received from the District Health Officer to capture anonymized patient data and test the system. The process followed in this research is no way compromises the privacy of the patient and their health data. The permission

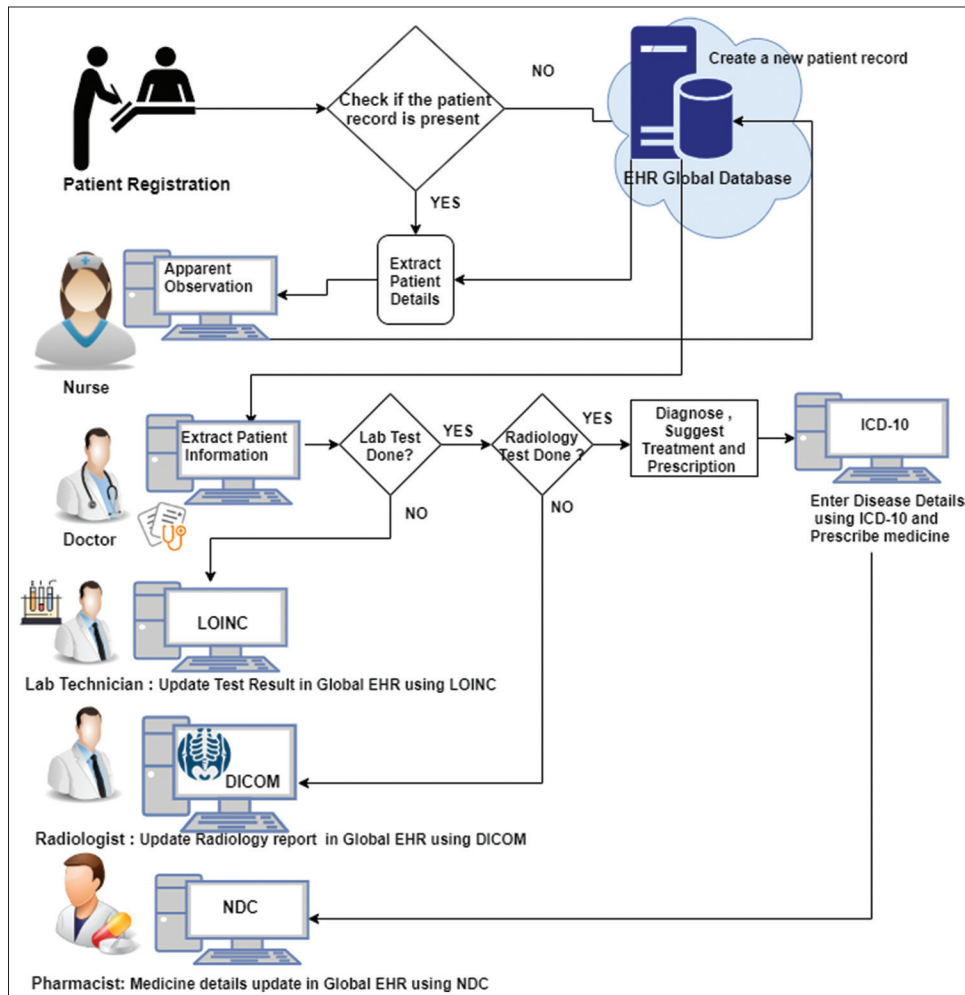


Figure 1: Electronic health record generation process

was granted for three healthcare centers, including sub-centre, PHC, and CHC. About 100 patient records including 60 from PHC and 40 from CHC are entered into the EHR system with the help of healthcare professionals. The confidentiality of the patient data has been ensured while entering the data into the system. The investigator has ensured the healthcare professionals at the healthcare facility that the data captured will be not be disclosed to any third party without getting the prior consent from the patient. The laboratory and pharmacy data were entered using the prescription written by the healthcare professionals at the respective primary health center (PHC).

RESULTS

The EHR used in this study is developed with an understanding of the patient flow between the three levels of the healthcare system (primary, secondary, and tertiary). When the EHR is tested in the real-time environment, the result indicated no errors while capturing and generation of patient information. The system also evidenced the availability and generation of statistical report about the patient visited to the PHCs and CHCs. This arrangement allowed the healthcare professionals of other levels of the healthcare system to view the patient data and provide quality healthcare to those who reported to them for receiving care. The information stored in the system is made accessible to the healthcare professionals through a secure login.

The system allows healthcare professionals to generate various statistical reports. These reports are presented in terms of the graph and assisted the professional to have a better view and in taking quality decision and appropriate action. The sample graphical representation of collected data from PHC is presented in Figure 2.

The system also generates the patient health summary and BMI (Body Mass Index) graph to view the progress of care provided and take necessary action, if the patient reflects any

unexpected condition. The patient health summary sheet assists the healthcare professionals at the referral level to understand the earlier history and treatment. The sample summary sheet is presented as Figure 3.

About 100 patient records including 60 from PHC and 40 from CHC are entered into EHR system. The four patients out of 60 from PHC have been referred for their advanced treatment to the secondary and tertiary care facility. Their data have been shared on real-time and tested. The role-based access feature of the EHR allows only authorized healthcare professionals with valid authentication to access patient data without any difficulty. At primary level, the system allows the healthcare professionals to login with secure and valid authentication to enter patient data into the system. When the patient gets referred from primary to secondary or tertiary level for second opinion or consultation and treatment, the healthcare professionals at the referral level will have access to patient’s health summary sheet. If the healthcare professional at the referral level wish to see the patient complete record, an instant transfer request is sent to the level from where the patient is referred, and on receiving the authorization, he/she will have access to patient data. This record transfer approach allows the doctors at the referral level to get access to the complete patient demographic data, patient history, diagnostic, and pharmaceutical information. Here, the referral doctor can update the diagnostic and therapeutic details of the patient.

Figure 4 depicts the complete sharing of patient data from primary level healthcare facility [as depicted as Hospital A in the Figure 4] to secondary and tertiary level healthcare facility [as depicted as Hospital B and C in the Figure 4]. At every level, the doctors authenticate the access using the digital signature. This feature enables and enhances the secure capturing and sharing of patient data as the EHR does not allow the doctors to approve any documents without the authorized digital signature.

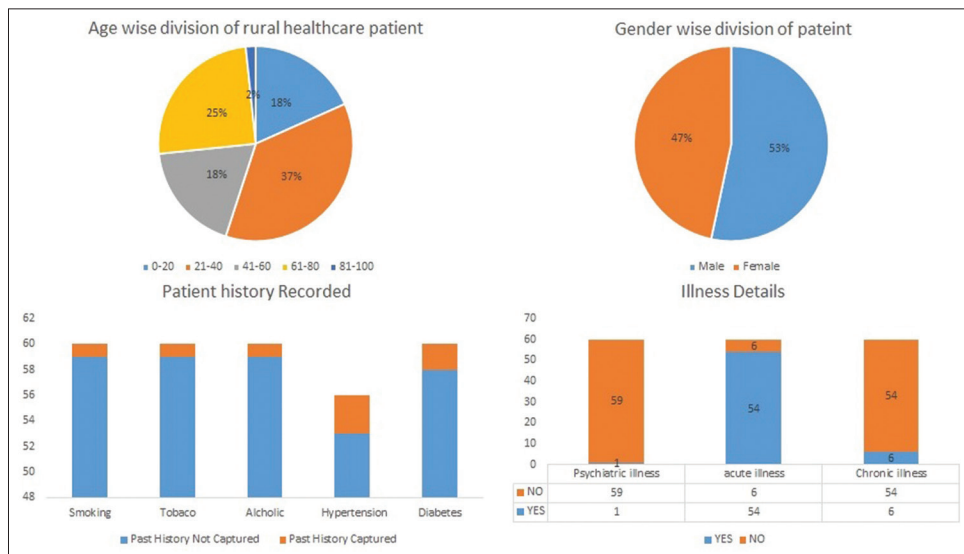


Figure 2: Basic demographic details and illness status of patient in PHC

During the entire episode of capturing to sharing of patient data, the developed EHR has proven to be successful with no errors or bugs.

DISCUSSION

The Indian Healthcare System is diverse in terms of many levels and a multitude of services provided at each level. These services are provided with an aim to achieve greater good to the society and uplift their health status to the satisfactory level. To provide services and reach out to the population, healthcare providers always expect the health information of the population at their fingertip. This scenario demands for an EHR at levels of a healthcare system where data can be captured and shared at any point of care without any boundaries and obstacles. The implementation of the EHR should be a national goal rather than local or regional. This study was an attempt to understand the capturing and sharing of electronic patient data at all levels of the healthcare system.

Similar initiative has been taken by different countries, and their implementation has become a great success in terms of improving the healthcare services by minimizing the errors in documentation and patient care. In 2001, Canada initiated to modernize its ICT infrastructure in healthcare sector.^[11] In 2015, EHRs were created for 91% of Canadians, and 91,000

clinicians were using the EHR system in their work. The EHR has benefited them in the exchange of clinical information, minimizing the errors, and improving the patient safety and overall quality of healthcare.

England initiated to modernize its healthcare system by launching the national initiative called National Plan for IT^[12,13] to provide connectivity between different levels of health records across primary, secondary, and social care by 2020. With this initiative, summary of health records were created for 54 million persons, i.e. 96% of the England population. Using this system, healthcare professionals are allowed to monitor patient data digitally and could improve patient safety and outcomes.

About 90% of the private practice physicians in Germany are using EHR system.^[14] With the modernization of the healthcare system, the patient data safety has been considered as the first priority by the healthcare provider during the point of care. For this specific purpose, secure health network setup is created by Federal Ministry of health Germany for transmitting sensitive medical data over the private link. In case, if the patient is connected with the public network, the patient can decide to hide or block any entry in their health record. However, during emergency situation, the doctors can get direct access to the patient data using the secret pin provided by Federal Ministry of Health.^[15] The developed EHR focuses to improve the quality of services with reduced cost and enables better data for healthcare management.

The survey among 501 hospitals and about 20,000 clinics of Taiwan indicated^[16,17] that the Ministry of Health and Welfare of Taiwan has initiated the National Electronic Medical Record (EMR) Exchange Center for sharing of record between different healthcare levels to ease the capturing and sharing imaging reports, laboratory reports, discharge summaries, outpatient records, and outpatient medication records among health professionals and providers.

To modernize the healthcare system in Korea, nationwide^[18] health information exchange platform is being built. With this initiation, most of the tertiary hospitals have started using EHRs to exchange among the healthcare facilities. The

1	Discharge Summary
2	
3	
4	Patient Name: ██████████
5	Patient Aadhar Number: ██████████
6	Admission Date: 2018-12-07 07:01:53.147631
7	Discharge Date: 2018-12-08 07:31:39.878685
8	Attending Physician: ██████████
9	Dictated By: ██████████
10	
11	Condition on Discharge Stable
12	Final Diagnosis Pneumonia
13	Procedures None
14	History of Past Illness Admitted on ██████████ with shortness of breath ...
15	Discharge Medication ██████████, ██████████, ██████████
16	Discharge Instructions Follow up after 3 weeks
17	Primary care Nurse ██████████

Figure 3: Sample format of patient health summary

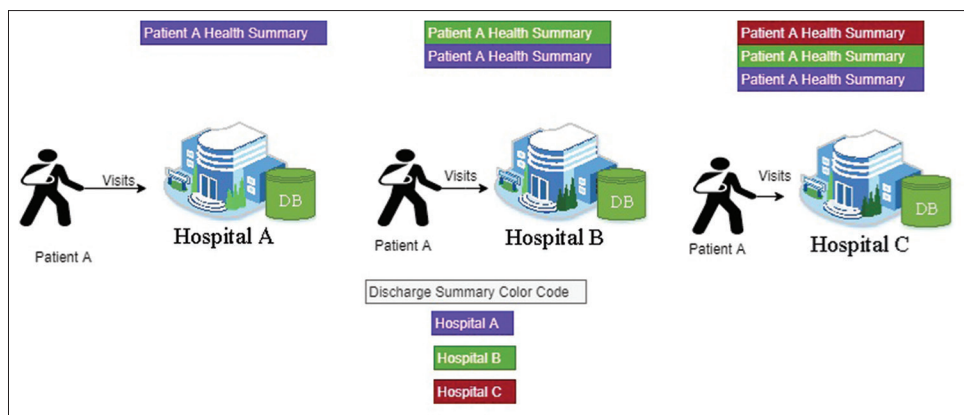


Figure 4: Patient record transfer from one healthcare level to other

platform connected with application program interfaces to add different services, including document registry and repository, and a master patient index.

Indian Healthcare System has also evidenced the development of ICT application but mainly at the private hospitals but limited to only a few such as Max Health,^[19] Apollo,^[20] Sankara Nethralaya,^[21] and Fortis. The major public hospitals, such as the All India Institute of Medical Sciences and the Postgraduate Institute of Medical Education and Research, have EMR in place to share the patient data with other department of the same group of hospital.^[22] The implementation cover all aspects, i.e. registration and billing as well as laboratory and clinical data. In all the hospitals, the developed EMR is rarely exchanged between hospitals. When the patient refers to the other hospital, the patient data remain in the same hospital. The need of the hour would be to implement the EHR and integrate all the levels of the public health system, where the movement of patient data becomes easier and safer during and after the point of care.

CONCLUSION

The objective of the present study is to test the real-time capturing and sharing of patient data in a cloud-based EHR system. The test result indicated error-free capturing and sharing of patient data at all levels of the healthcare system. As the testing is successfully completed in one district, the feasibility of implementation will be further tested with a large number of a healthcare facility with a large sample of patient data at various levels, to make it more acceptable and sustainable. The present EHR includes the minimum datasets suggested by MoHFW, India. The features will be added and enhanced further, to make it more secure and adaptable EHR system. These features of EHR system would allow the planner and manager at all levels of the public health system to plan and conduct various preventive, curative, and rehabilitative programs and ultimately support them in achieving national and international goals set for public healthcare.

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Conflicts of interest

There are no conflicts of interest.

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