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Aadhar Arogya: Integrated Electronic Health Record as an Aid in Bridging the Gap between Individual Health and Public Health in India – A Review

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Abstract

Aadhar card is an Indian Government ID card that is issued to all Indian residents. It is one of the largest biometric databases in the world with over 1.28 billion enrollments thereby constituting the most ubiquitous ID card in India. With the additional features of QR code and biometric scanning, it forms an ideal database to be linked with the electronic health record. The health records of an individual currently in India is being maintained by the individuals. But most often they are misplaced, disorganized, incomplete or lost. This would force the clinician to assume or ascertain the current medical status by subjecting the individual to tests. Improving the quality of the medical and dental services rendered paves way for an integrated electronic health record. The common concerns arising from such a linkage is data management and data security. Big data management provides a systematic approach to maintaining such large data. The data security concerns can be addressed by employing a data controller in every hospital and a cell to inform the security breach, who can further take up legal penalties. Pseudonymisation, cryptography, audit trail, firewall, antivirus software, and cloud computing are some techniques that can be incorporated.

Keywords: *Electronic health record, Aadhar card, Data security*

Introduction

Patients seeking dental care often visit a clinic with a disorganized or incomplete set of medical records and sometimes without any past records. Most often the dental clinicians rely on patients' recall to reveal their past medical illness, which often incomplete. This could result in the clinician taking one of the two possible

approaches. Firstly, he/she could assume the medical history given by the patient as complete and true and initiate treatment. Secondly, the clinician could subject the patient to the required tests to ascertain the existing medical condition, which sometimes could be repetition as the patient could not produce the recent reports of the tests, he/she underwent. Moreover, most often these conditions are misreported and this significantly increases with an increase in age^[1] and some individuals who don't deem their medical history important either due to a lack of awareness or just negligence might not report accurately.

Migrant workers and people from low socioeconomic backgrounds face practical difficulty in maintaining such records. Most often they do not seek treatment and if they do seek treatment it is for acute health issues.

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[2] Integrated medical and dental records can help close these misreporting gaps and improve the quality of dental services rendered especially to individuals with underlying medical conditions minimize the duplication of resources. [1] The word 'Aadhar' means foundation or base while 'Arogya' means health. Why the concept of 'Aadhar Arogya' could be a one-stop solution to finally bridging the gap between public health and individual health is the objective of this review.

Why the Aadhar Card?

Aadhar card is the Indian Government-issued ID and is fast becoming the Central and State Government's base for public welfare and citizen services. It assigns a unique 12 digit number to all the Indian residents. It is invariable i.e., it doesn't change in the lifetime of the individual. [3] It is one of the largest biometric databases in the world with over 1.28 billion enrollments. [4] Linking the medical records with the Aadhar card could improve the quality, accuracy, efficiency of diagnosis & treatment planning and reduce ambiguity in the process. Unique patient identification is a technique for linking patients to their electronic medical records that exist globally in a domain.

1. UNIQUE PATIENT IDENTIFIER (UPI)

The American Society for Testing and Materials (ASTM, 2000) Standard Guide lists desirable attributes of a UPI: unique, non-disclosing, invariable, canonical, and ubiquitous. Unique i.e., one UPI for one individual which cannot be shared, non-disclosing such that it maintains the confidentiality of the individual, and the number does not indicate aspects like name, address or phone number. Invariable as it doesn't change in the lifetime of the individual; Canonical i.e., an individual is entitled to only one UPI; Ubiquitous i.e., all the individuals have one. [5] Out of all the Indian government-issued IDs, a passport complies with all the desirable attributes except being ubiquitous, since it is voluntary. The other government-issued ID cards like Driver's license, Voter's ID require the individual to have a certain set of skills or be of a certain age. The Aadhar card additionally also has biometric and QR

scanning options making it an ideal option for linking with the electronic health record. [6]

PAST EXPERIENCES

Since 2013, Aadhar has been linked to several health-related schemes like Janani Suraksha Yojna wherein pregnant women are encouraged to undergo institutional deliveries for a direct cash transfer benefit. [7] Linking of Aadhar card ensures that the right person is benefited from it. [8]

Revised National Tuberculosis Control Programme mandated those who are eligible for financial benefits under the scheme to get their Aadhar authenticated or furnish proof of Aadhar. [9] This is done to ensure validated services via Aadhar enabled direct benefit transfer and improve the scope of surveillance. [10] However, the remaining elements of the scheme like free diagnosis and treatment would continue without interruption. [11] Aadhar linked smart cards are assigned to all the tuberculosis patients undergoing treatment. It acts as a single unique identifier for the patients availing various public & private sector services, social, state & central services to which the patient is entitled during treatment. [10]

Other National health programs, such as the National AIDS Control Program, have started linking their databases with Aadhar as a pilot project in Delhi Reference. This would allow people living with HIV (PLHIV) to have access to various state, central and social schemes ensuing financial benefits transferred to their accounts obviating the need to produce life certificates periodically. [12] However, the intended benefit wasn't realized as the patients quit the treatment program fearing privacy issues. [8] Recently, the CoWIN app for COVID-19 vaccine registration has started linking the Aadhar card for its registration process. Beneficiary registration, beneficiary verification, Aadhar authentication, vaccination status and reporting of adverse events following vaccination can be carried out with the aid of the app, which helps to keep track without concerns of duplication. [13]

WHAT CAN BE EXPECTED FROM LINKING THE HEALTH RECORD WITH THE AADHAR CARD

It aids in easier delivery & monitoring of primary health care services. Once a patient visits a PHC or any screening camps his/her Aadhar no. can be noted and relevant medical and dental history could be uploaded to the database. The patient can then be counselled & monitored to see if he/she has undergone treatments further - which provides a valuable tool to assess the patient's health-seeking behaviour and serves as reliable feedback for the services rendered. Hence it bridges the gap between public health & individual health.^[14] It can aid in fulfilling the three core functions of public health that is the assessment, policy development and assurance.^[15] Public health surveillance is the data collection, analysis and dissemination of data at the appropriate time for preventing and controlling the disease or condition. Establishing public health surveillance classically involves 6 steps that are to establish goals, develop case definition, select appropriate personnel, acquire tools and clearances for collection, analysis and dissemination, implement surveillance system, and evaluate surveillance activities.^[16] It can also aid in the development of evidence-based medicine and dentistry which is the intersection of individual clinical expertise, external evidence and value to the patient.^[17]

CLINICAL IMPLICATIONS

During times like road traffic accidents & other emergencies wherein the patient is not in a position to relay the medical history, the clinician can gain access to unambiguous & reliable information by scanning the patient's retina or fingerprint. Inter department coordination could be strengthened, for example, cleft palate surgery in childhood requiring further orthodontic treatment. Tailored diagnosis & treatment planning based on the treatment outcomes, existing health conditions etc. and lifelong monitoring could be made possible.

India is a diverse country with an internal migration of 450 million as per the 2011 census.^[14] There is a lack of continuity of treatment, repetition of treatment to be

sure, higher recurrence rate due to missed appointments, language & literacy level barriers.^[18] All this hinder the migrant population's wellbeing, who form a significant portion of the population who are often overlooked by state government schemes.

HOW CAN THIS BE ACHIEVED?

1. PILOT QUESTIONNAIRE SURVEY

A pilot questionnaire survey in the maintenance of health record showed that 80% of people have misplaced some or all of their records previously and 70% of people have been asked to repeat a test which was taken elsewhere. This clearly shows that there is a fragmentation of manual health record and an array of scope for Aadhar Arogya to bloom. Furthermore, the questionnaire was framed to assess the willingness to accept a digitalized health record. It showed that only 40% of people were willing to link their medical record to the Aadhar card and the common concerns expressed were issues of security.

2. BIG DATA MANAGEMENT

In India, health data are not digitalized and when digitalized they are not standardized. Big data management offers a systematic approach to this. Big data analysis challenges include capturing data, data storage, data analysis search, sharing, transfer, visualization, querying, updating, information privacy & data source.^[19] The data lifecycle involves – plan, collect, assure, describe, preserve, discover, integrate, analyze.^[20] It is used in healthcare to deal effectively with a large volume of data both from internal and external sources i.e., from the providers, payers, researchers, consumers & marketers, government and developers. Big data management tools and technologies are either available as open-source or commercial products. Some of the open-source products are the Apache Hadoop framework, NoSQL databases etc. The commercial products include the Hadoop distributed file system.^[17] The Hadoop distributed file system breaks down large data into multiple small folders and while performing a task, a big task is divided into multiple smaller tasks and runs

simultaneously. This is known as parallel processing.^[21] Big data analytics in healthcare are of three types, they are predictive, descriptive and prescriptive. Predictive analytics is used to predict treatment outcomes, descriptive analytics deals with current and past data to make evidence-based decisions. Prescriptive analytics is used to showcase to the policymakers the things to be acted upon.^[17]

3. DATA SECURITY

To address the data security concerns of the general public the centralized electronic health record maintenance security regulations of developed nations were considered. Based on these and other electronic health record maintenance suggests that - proper informed consent be taken explaining in simple language regarding the whereabouts of the data shared and for what purpose.^[24] A data controller should be assigned to every 250 bedded institutions, who are governed by a data supervisor. Whenever there is a data breach it needs to be informed by the data controller to the supervisor and/ or the legal panel within 72 hours. Based on the scale of breach legal penalties are sentenced. Access to all the sensitive information should be on a need to know basis.

Pseudonymisation or partial anonymization can be done so that with the data as a sole reference one cannot be able to identify a patient. It can be achieved in two ways i.e., encryption and tokenization. Encryption involves the need for a decryption key to access the information. While tokenization is the replacement of sensitive information with non-sensitive substitutes.^[22] The GDPR also keeps track of the records of processing activities.

The Health Insurance Portability and Accountability Act 1996 (HIPAA) suggests the use of access control to the patients like passwords and PINs. An individual can ask for an audit trail at any point in time, wherein who, when and what information is accessed can be checked.^[25]

The Personal Information Protection and Electronic Documents Act (PIPEDA) uses technological tools which are constantly changed to be up to date like firewalls and security patches. Organizational controls like security clearances, limiting access, staff training and agreements are ensured. Sensitive information can only be accessed on a need to know basis.^[23]

Cryptography involves techniques like passwords and digital signature. Other simple techniques involve cloud computing and antivirus software. It is cheap and effective, additionally, cloud computing reduces the burden of maintenance.

Conclusion

The current review suggests that linking the Aadhar card with an electronic health record has the potential to improve the quality and continuity of the treatment. The potential of the Aadhar card has been realized in the recent past and has been linked with various National-level health-related schemes. To expand this comprehensively to cover all the health data under one roof, the current review suggests the need to emphasize data safety laws and regulation before they can be implemented on a large scale. A brief look at the data safety regulation in developed nations suggests many techniques like pseudonymisation, cryptography, audit trail, firewalls, cloud computing, antivirus software and legal penalties. Further research on the implementation in the Indian scenario and addressing problems therein are suggested.

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