Original Article

A Survey on Electronic Health Care Card System

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Abstract

One of the most essential challenges for developing countries is their healthcare system, hence information technology is becoming increasingly significant today. Smart card systems play an important role during unexpected incidents like accidents and medical practitioners assessed appropriate immediate medical attention in complex cases. When an infant is born a record is formed with details like blood group, vaccination date, complications involving anaphylaxis, and much other crucial information. One of the most essential challenges for developing countries is their healthcare system, hence information technology is becoming increasingly significant today. Increasing social health coverage expenses has induced an expansion in queries for methodologies to decrease the cost of health treatment. In the middle of the civil debate over the best way to cut costs in the human service framework, one of the few members of both parties purchasing is the necessity to coordinate current advancements in the ability and transfer of therapy data. Health care is an essential category for emerging economies' development. The healthcare industry's utilization and obligation are determined by the quality of offerings and maintainability. Healthcare data include a comprehensive background on the patient, but still, the attributes associated with it are unpredictable and complicated to establish.

Keywords: E-healthcare card, Security, Cloud, Smart card, RFID, Biometric.

I. INTRODUCTION

The states and territories that make up India's federal government manage the country's universal healthcare system. Every state is required by the constitution to "raise the level of among its main responsibilities is the enhancement of public health, the level of living of its citizens, and nutrition. The E – Healthcare Card is a type of Many players in the health sector believe that technology utilization is essential to the growth of the health industry. Healthcare is a significant and complicated industry, with stakeholder interactions that might produce data and objectives that are in conflict. Nowadays, health awareness is not only a growing trend among nations but also among individuals.

The E – Healthcare Card is a Card based are employed in digital technologies as a lightweight, comprehensive gadget with data collection and storage capabilities to log into the system and access patient cards data, healthcare practitioners utilise their own smart cards. One of every person's fundamental human right is access to health care. The World Health Organization categorizes a health system as any group, individual, or activity whose main objective is to enhance, rebuild, or prevent diseases. This covers both initiatives to change health-related determinant factors and far more public demonstrations to amplify well-being. Any government has a responsibility to provide its people with improved health services. It is crucial to have enhanced health services to guarantee the quality of life. A nation's success can be measured by its better and upgraded health services. Therefore, it is critical for the government to take the appropriate actions to make improvements and enhance the healthcare care for the residents of all classes if it hopes to develop a prosperous country.

The high cost of medical care prevents many rural residents from receiving the right medical care even though health is among humankind's basic needs. Particularly, the impoverished in rural areas are most impacted by this issue. Because of a discrepancy between anticipated advantages and actual results, the effectiveness of eHealth technology has occasionally been called into question. There is a lack of evidence regarding the specific impacts of eHealth technology on health and medical care. Because technology does not appear to be working for them or for the welfare of their patients, healthcare professionals are frequently dubious and offer little support for eHealth. As a result, integration issues with eHealth technologies are common.

Meanwhile, health awareness is not only a growing trend among nations but also among individuals. Smart cards are handheld embedded equipment for the processing and storage of data capabilities that are employed in telecommunications. Healthcare

is a large and complicated industry, with stakeholder interactions that can result in conflicting data and objectives. E-Healthcare cards make use of a patient's previous medical viewing history, as well as allergies, vaccination dates and dose information, and so on. This data can be used by the patient to find all of their medical information, which they will use to make prior decisions.

According to the Times of India team, following the pandemic of Covid-19, some of the most common problems have arisen, causing the healthcare system to suffer. Simply because of healthcare debt, 7% of Indians live below the poverty line. Over 75% of healthcare infrastructure is concentrated throughout metro cities, which have only 27% of the overall population remaining 73% of Indians lack even basic medical facilities. Over 3,000 doctors are sought in primary healthcare facilities, and the scarcity has also enhanced by 200 percent in the last decade. Due to the patient's inadequate healthcare record, evaluation and treatment takes a long time.

eHealth ensures the secure and affordable use of innovative data and communications in assist of well-being and fields of science connected to this now. allow fast access to patient data and records for effective healthcare. Reduces the amount of paperwork, duplication of expenses, etc., which brings down the cost of healthcare. Smart cards can indeed be understood as standalone integrated portable electronics that process and store data. These compact computers, which have their own computers and storage, are extensively utilized, especially in public transit and communications systems. Smart cards do have speed, security, and portability attributes that might be beneficial in healthcare systems.

The goal of automated systems at medical facilities and hospitals is to give healthcare personnel an effective workplace environment. One of the key purposes of these systems is to swiftly provide access to reliable health data. These systems should include a communications system that gathers, processes, and saves patient data to achieve these goals.

The primary aim of clinical treatment is to take the right steps in achieving the highest standards of living. To maintain their fair value and maintain their existence private corporations emphasize turning a profit. Medical insurance must prioritize generating social profit if it is to fulfill its responsibility to society.

Healthcare businesses transitioning to more reliable electronic identity authentication of patients and providers have three options: biometrics alone, smart cards alone, and a combination of smart cards plus biometrics.

II. LITERATURE SURVEY

A rigorous survey will always cover the examined literature completely and objectively. This paper considered 20 Research papers from a range of respected journals and conferences in the literature review. This methodology primarily sources our papers from IEEE, Elsevier, and springer. To enhance the questionnaires and the statistics, investigate various medical journals, symposia, and freely accessible materials.

This survey paper focuses on several important key points including security-based records, biometric and fingerprint-based records, cloud-based electronic health records, and IC or RFID-based portable electronic health records. This paper describes how a substantial amount of electronic health records are kept private and secure as well as how specialists are employed to collect patient data for the healthcare card. The 20 papers cited are from the years 2015 to 2022.

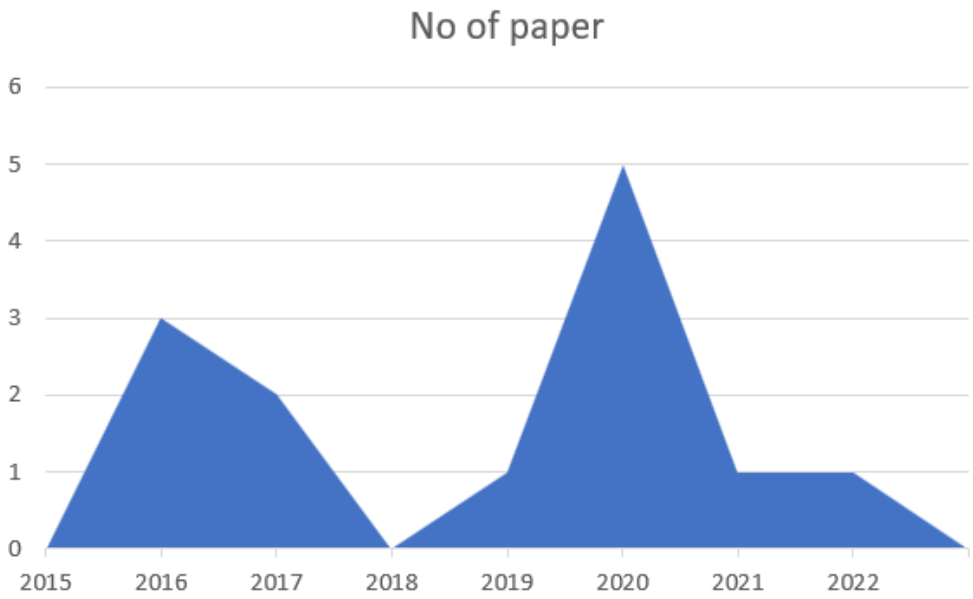

Fig 1. Graph illustrating the number of papers published yearly

In [1], the author proposed a system based on cloud infrastructure. In this paper, RFID is used as a reader to read patient data or to allow patients to access their own data via RFID Reader. They offer a complete end-to-end hospital management system. They designed a system to manage all health-related data. However, proper data maintenance is required as well as the prevention of data from spoofing attacks, forging attacks, replay attacks, and denial of service attacks the drawbacks. According to their findings, their project reduces complexity and makes it easier to retrieve information, reduces manpower requirements and it pays for itself quickly after implementation.

In [2], the author developed a Healthcare system based on the Internet of Things and proposed their technologies, challenges, and opportunities. The developed system is based on an IOT that analyses data from wearable sensors. They are primarily Sensors for monitoring different health specifications, long-range and short-range communications protocols, and cloud techniques are all being made a priority. They approach certified suitability of standards, such as NB-IoT, for smart healthcare, especially in comparison to competing for non-licensed criteria. They enable Bluetooth low-energy and long-range communications, in addition, to provide diagnoses based on vital and other significant information, our future study will examine clustering and logistic regression algorithms. In the future, they will have to establish an Internet - of - things system for delivering emergency treatment that uses LPWANs for long-distance networking to alert local emergency operators when a patient is receiving immediate assistance, as well as learning algorithms for treatments and diagnosis.

In [3], the author developed a Smart card with an integrated central gateway in wellness. The system's goal is to create and install an ATM-based mobile healthcare monitoring system. After wiping the person's smart card, the card’s reader's connectivity also with a processor can be found there, this allows an individual to verify healthcare specifications using detectors. They use sensor nodes like the Blood Pressure Sensor, the Blood Glucose Sensor, the Heartbeat Sensor, and the Temperature Sensor. In the future, they will include the equipment design for this health observance system, in addition to the integration of each sensor to determine medical indicators. The unit is composed of a device for wellness tracking and diagnosis in addition to an internet system for an in-depth wellness evaluation and reporting.

In [4], the author proposed a system that uses Biometric-Hash based Authentication scheme as Their methodology. This paper discusses and demonstrates various security attacks against the Das et al scheme's security vulnerabilities. Their cryptanalysis demonstrates the scheme's weakness against the login and authentication phases. They provide biometric template-based authentication schemes, that also add an additional layer of protection by recognizing and approving legal visitors. They are collaborating on extensive verification of security schemes in PI calculus using the Reliable and secure security analyzer tool. Its own objective is to assist medical doctors and health professionals in trying to make rapid and precise medical judgments.

In [5], The author utilizes Tell-us Card which is a potential tool to increase patient involvement while in the hospital. The Tell-us Card is a paper card the size of a postcard that is regularly handed to patients. Patients are encouraged to list any priorities they have for that day or before discharge in writing. The information on the card is discussed at a mutually convenient time and any potential follow-up activities are organized and recorded in the patient's file. The Tell-us program adheres to the MRC paradigm for complex intervention. Successfully communicating with patients about their unique needs and talents. This pilot study came up with favorable. This Tell-us Card communication tool had an early impact on patient engagement, yet integration into everyday nursing care seemed challenging and an ideal match has not yet been found. Patients expressed appreciation for the intervention and provided thoughtful feedback on the Tell-us Cards. More study is required to determine the best ways to effectively incorporate patient participation in complex hospital care.

In [6], the author developed a Sustainable healthcare control system based on RFID. They offer a secure and confidential system for managing patient data with the RFID-based conceptual framework for hospital management systems. Radio waves are used by a system known as RFID System to apathetically recognize targets that have been marked. There are numerous commercial and industrial uses for it, including the E-healthcare supply chain and the management of library checkouts. On the basis of their model for future system implementation, they have created a functional prototype application for the RFID architecture for hospital information systems. The drawback is that if an RFID device has a fault, the frequency identification will be wrong. The Information gets from RFID that is Reliable, Accurate, and Current.

In [7], the author proposed Blockchain technology application in the healthcare system and their overview. So that no record involved may be changed retrospectively without changing any blocks subsequently, they employ Blockchain and a public digital ledger to record transactions on multiple computers. They provide public and private blockchain architecture and the blockchain's operational processes for the electronic healthcare sector. However, it has the advantage of being able to quickly analyze data, confirm it for greater security and maintain all statements. According to Conclude, if blockchain is implemented in the healthcare system, then the E-healthcare system can rapidly increase.

In [8], the author developed a mobile medical card for medical data maintenance. The introduction of this technology into our daily lives has profoundly changed how information is gathered, analyzed, stored, and used analyzed. Healthcare systems in poor countries have benefited greatly from data networks. Additionally, a growing population would make it extremely difficult to track, collect, and analyze medical data when a patient travelled through the healthcare system's various pathways. It is crucial to create a model for collecting patient medical data from various settings in which care is provided and this model needs more storage space to accommodate all patient data. This application can be implemented effectively using the cloud database. In our nation, medical blunders and patient deaths may result from a patient's prior medical history not being available at a specific moment. So, to lessen medical mistakes The implementation of a personal smart health card application with each user's own medical data on it has been decided. All of the user's personal and medical information must be kept up to date in the cloud database. In any emergency, it is crucial to quickly identify the person because they require immediate medical attention. This can be done by scanning the QR code printed on the smart card to access previous medical records. Due to the user's simple requirement to present their smart card to the clinic or pharmacy, this strategy will be adaptable and effective for all users, clinics, and Pharmacies.

The [9], the author developed smart cards using Lightweight Cipher Algorithms. They discussed Applications for smart cards, along with security risks. The authentication and data encryption protocols for smart cards have been studied, which has resulted in a comparison of the numerous works that have been proposed in this field. They discuss various vulnerabilities in their paper, including malicious programs, active attacks, and eavesdropping attacks. The result is shown in the encryption and decryption of the key format. The benefits involve the fact that such knowledge cannot be extracted due to their ECC modeling, making it the preferred method for smart card authentication. Advanced encryption and data Encryption are a few examples of symmetric ciphers used for smart card data encryption. Implementing stream ciphers for the processing of short data lengths is one of the future research priorities. Smart cards use cryptography methods to address security issues. To address these attacks, this paper examines several security risks, including active attacks, insider, and eavesdropping attacks. They have suggested cryptography algorithms. As a result of the modeling of ECC making challenging to extrapolate the data, it is thought to be the best for smart card authentication. Smart cards use symmetric ciphers like AES, DES, and T-DES and present to encrypt data. Implementing stream ciphers for the processing of short data lengths is one of the directions for future research.

In [10], the author proposed a Handheld NFC Smartphone Integrated Health History Framework. They provide an extensive review of the security framework design concerns for the S-MAPLE (Secure Mobile Access Point with Protected Element) mobile device, which is a new NFC and Secure Element-based health card. RBAC is implemented using the proxy-based method which offers anonymity and allows the proxy-based CP-ABE to be utilized for limited both read and write accessibility. Their system offers confidentiality laws, authenticity, and anonymity and therefore is utilized for RBAC enabling limited

reading and writing to various sections of the health card. They can offer very accessible and trustworthy medical records for effective care. According to the testing findings, the durations of key exchange, connection, and decryption are acceptable for a secure exchange of information between a patient and a medical expert. By encrypting the health card using the proxy-based CP-ABE technique enabling selective recovery here on the host and implementing straight renunciation & representatives, all anonymity of the medical card is maintained.

In [11], the author utilized expanded chaotic sequences with encryption key establishment for smart cards. According to the Using a smart card and a weak password, a legitimate user can access a virtual access point by logging in distant utilizing smart card authentication method across public Wi-Fi key agreement mechanism. Lin most recently demonstrated an enhanced chaotic Smartcards were employed passwords based on the map Key identification contract technique to eliminate the flaws of the scheme, which does not offer session key security breaches and robust user anonymity. Lin's revised method still lacks the freshness characteristic and message validity, making it vulnerable to attacks by credentialed individuals with denial-of-service. Furthermore, the session key could be predetermined by a single malevolent player, preventing the enhanced system from displaying the cooperative assets of important contracts. This paper study examines the flaws as well as suggests a strengthened smart card-based password-authenticated crucial agreement system that makes use of expanded chaotic maps. This study improved the scheme's session security. They developed the enhanced chaotic map-based genuine and sequencing of games models, which are the Diffie-Hellman problem. Additionally, the improved system eliminates the flaws in the earlier schemes by ensuring the recentness of communicating messages by inserting timestamps.

In [12], the author created smart cards for handling health records in telemedicine. However, employ Virtual User Mutual Authentication with Fingerprint Authentication. They address the shortcomings of existing approaches, and an improved efficient multimodal remote authentication system that is recyclable, undetectable, and secure has been developed. An extensive security assessment and performance comparison of the proposed plan serves to highlight its benefits over these other schemes. To execute new studies in multiple-based remote user authentication methods using smart cards for TMIS, more computing processes are required. Then it is astronomical. This research created a simple and powerful biometric-based remote user authentication method using smart cards for TMIS. By using extremely secure user authentication procedures, the drawbacks of these conventional authentication mechanisms can be lessened. To create a secure and effective biometric-based remote user authentication strategy using smart cards for Telecare Medicine Information System, they mix biometrics, passwords, and cryptography.

In [13], the author implemented a strategy for Improving antimicrobial stewardship in an Acute Medical Unit (AMU) during patient discharge following the introduction of an antimicrobial information card with the intention of lowering 30-day reattendance/readmission rates and providing patients with better antibiotic education, a quality improvement project added a new AIC to the AMU ward. Element of responsible use of antibiotics. A significant improvement in patients' knowledge of their antibiotic prescription and management at discharge was demonstrated, with additional benefits including increased knowledge of adverse drug effects and safety netting advice. Although there was no improvement in the reduction of hospital readmissions. The AIC could be reproduced in other wards or settings that have a high percentage of patients treated for infections, such as the ED and primary care settings, as it is an easily sustainable intervention with low financial expenses. To build the AIC, additional staff engagement initiatives are needed. Along with antimicrobial stewardship programs that seek to promote optimal antibiotic use, patient education can assist increase antibiotic compliance and decrease hospital readmission rates. Limit the emergence of antibiotic resistance and improve patient outcomes. Most antibiotic courses are frequently finished after discharge for common infections, even though antimicrobial stewardship initiatives have mostly concentrated on antibiotic usage in the hospital context. According to a prior study, providing patients with written information on antibiotic use together with spoken instructions from a trained healthcare professional increased their understanding of the drugs and their willingness to follow through with their antibiotic therapy.

In [14], the author created a privacy-aware smart card using biometric authentication. They use Pro Verify to demonstrate our system's mutual authentication and session key security. The primary keywords in their paper are big data, biometrics, privacy preservation, and authentication. The thorough analysis and comparison demonstrate the security and usability of their scheme. To address this issue, many authentication techniques have been proposed, though most of them have safety constraints in terms of security flaws and features. They created a privacy-aware smart card-based biometric authentication (PSBA) scheme for e-health that provides more desired security features and protects against a wide range of potential attacks.

In [15], the author purposed Inferring transit-based health-seeking tendencies. This study suggests a technique for bridging this gap that involves mining large datasets of smart transit cards with spatiotemporal limitations. The estimated visits are highly consistent in both space and time with surveys' experimentally observed excursions. The inferred journeys are additionally utilized to pinpoint geographic inequities in transit-based healthcare access that health policymakers may have missed. It

employs the methodology of removing transfer stations from trips as well as the spatiotemporal constraints of transit-based health-seeking visits.

In [16], the author proposed International Health Card in Healthcare Information System. The "International Medical Card" is a portable, USB-based smart health card that may store a person's complete medical history. This could serve as the people's health passports as their move from one location to another. it uses biometric algorithms as well as Images and videos as its dataset. The objective of this project is to establish a physician "International Medical Card" that really can function as a "Health Passport" by safely transferring the patient's extensive medical file. A very user-friendly interface was used in the development of the International Medical Card application. Analysis of the health card's performance has been done using the fundamental prerequisite for a health card to guarantee that it functions adequately. Equipment for managing health records has adopted USB-based smart cards. In their card Additional features have also been successfully created and implemented, including a web browser for the international health card, an E-Immunization card, a visual presentation of treatment data leveraging a skeleton image, and biometric technologies.

In [17], the author proposed South Africa issues computerized vaccination cards to schoolchildren. Nations are implementing electronic health record efforts as a component of the eHealth programs. Strategies for (electronic health). Their main aim is to create Health EHR strategies. For further than thirty years, immunization data for minors in Southern Africa have indeed been maintained on the card. Their primary areas of focus include the quality of the data, electronic documents, digital notifications, and immunization rates. For keeping vaccination records, employing only a physical storage device like a card presented three major obstacles. Their target is to gather a minimum of 100 replies, with 25 responses on average for each category of stakeholder. They are utilizing Health's EHR strategy, which was built using data from a matrix. They created a digital vaccination card that receives all pertinent information on vaccinations in order to get around the issue of physical vaccination card susceptibility in the event of a fire, flooding, or other natural disasters. Future updates should include information about current immunization records and identity cards.

In [18], the author developed Antenatal Medicare Card Adoption and OpenMRS Platform Integration the Antenatal and Immunization Coverage scheme and antenatal smartphone app recognized the crucial data just on a mother's ANC card and created a system with essential features such as patient identification, the disclaimer of a risky symbol to a physician center console, trying to report, and sharing of information through a smartphone app. Extensible Mark - up Languages (XML) component, reporting control unit, SQL database framework, the OpenMRS console electronic ACH platform development, and design. Android, MySQL, Java, and Agile development technologies were used to create mobile applications. Functional and non-functional requirements were analyzed as part of the system requirements specification. their research created a digital ACH system to take the place of the manual one. Although the technology has been tested in medical centers, governmental clinics need to be tested too. They propose the Minister of Social and Health Welfare investigate implementing the electronic ACH system in healthcare facilities for pregnant women's ANC visits after the system has been demonstrated in medical centers to boost the service of maternal health care.

In [19], the author developed E-Health Card Information System. The writers of this research will present an enhancement of the authors of this research having a brand-new IS model for the Montenegrin Health Insurance Fund. The introduction of the SMART card and the innovative IS architecture, which places a strong emphasis on usability and security improvement, are two of the proposed system's primary advantages. With this approach, the major flaws in Montenegro's current healthcare system are resolved, and HIFM is given a platform to offer clients unique services. Another method the recommended IS may be enhanced is by using smart devices like mobile phones, wearable electronics, and NFC tokens. the incorporation of smart devices, including smartwatches, NFC cards and credentials, cellphones, for the authentication process, and cloud-based infrastructure for the IS of the HIFM, are two primary directions in which the proposed IS can be improved further. Montenegro's system of health insurance. Information systems are an essential component of any business-oriented organization; thus, the health insurance fund can use the same paradigm. The integration of Smartcards is the primary goal, to enhance and make easier the process of validating insurance users and increase the system's overall security.

In [20], author look at how parts of e-wellbeing frameworks, like data quality, framework quality, saw convenience, and saw value, influence clinical staff execution in clinics, patient consideration, and specialist patient connections in Jordan. They want to survey an incorporated single model that incorporates the innovation acknowledgment model. The coherent exploration procedure and system were applied in this review. The data was accumulated from 212 clinical faculty who worked in 19 medical care offices around Jordan. A somewhat square/underlying condition displaying approach has been utilized to look at the information accumulated and test the examination's speculations. Their review found that the nature of the wellbeing data framework's (HIS) data has both immediate and roundabout beneficial outcomes on staff execution and beneficial outcomes on understanding consideration. This study utilized data framework models to inspect what e-wellbeing frameworks

meant for the presentation of clinical staff, patient consideration, and specialist patient connections. The e-wellbeing frameworks effect on specialist patient connections, patient consideration, and client execution were concentrated on in the review that followed utilizing essential information accumulated from Jordanian medical clinics utilizing multilinear investigation. The e-wellbeing framework straightforwardly affected the reliant factors, as per the examination. As per the review, information on patients' collaborations with medical care experts could assist specialists with settling on better therapy choices. These are advantageous on the off chance that they are exact, commonsense, coordinated, and simple to utilize. To lead momentum medical services and business research and give top notch clinical consideration, having exact and cutting-edge information is essential.

III. CONCLUSION

The objective is to make an E-medical services framework that is a decent work environment climate for any consideration community and to beat the deficiencies of the ongoing medical services the board framework. Medical care is progressively moving into the home, including a different scope of individuals, undertakings, and gear and mechanical advances; it is likewise occurring in a wide assortment of private settings. Rising medical services costs, an ascent in the quantity of more seasoned grown-ups, an expansion in the pervasiveness of persistent sickness, improved conservation rates for different diseases, occurrences, as well as different conditions countless veterans having gotten back from battle to serious wounds, as well as a wide scope of developments are driving this relocation.

Wellbeing is an elating innovation with the possibility to be very effective as far as medical care dispatch for the gainful of all. As the populace keeps on expanding quicker than that of the speed of monetary development, no matter what the quantity of accessible qualified clinicians and offices (institutional beds, examination labs, day-care focuses, and so forth) this innovation should be ideally tackled to guarantee that every one of those needing care are taken care of basically at OK levels, on the off chance that not the most ideal.

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