

Optimization of National ID Numbers in Electronic Medical Records Among Hospitals in Semarang City: A Society Digital Literature Perspective

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Abstract. Electronic Medical Record (EMR) is an information technology that is integrated with services in hospital. Health information system is computerized with demographic data, medical data, and equipped with a decision support system. Semarang city, Indonesia has a health information system that is not integrated among hospitals. This condition causes redundancy of medical record data in a hospital and has an impact on efficiency, because referral health facilities need to do a medical record again. Therefore an integrated information system is needed for all hospitals to accommodate the patient's medical record data because it can be read by all hospitals in Semarang. The development of an integrated information system for EMR can utilize the Single Identity Number (SIN) in the national ID Number. National ID Number is one of the identities that every citizen have. Through National ID Number, all health care units can access or enter patient record data.

Keywords: Electronic Medical Record (EMR), Single Identity Number (SIN), National ID Number

1. Introduction

One of the services in health service facilities that can be integrated with information technology is medical records [1]. In addition, the application of information technology in Electronic Medical Records (EMR) is becoming a global trend. EMR is a health information sub-system that has started to be applied in Indonesia. This information technology is believed to improve overall quality of care and contribute to patient safety [2–4].

Hospital is one of public facilities that provide health services. Hospitals implement EMR as a support for management to manage health problems. EMR is used as an effort to improve service quality, improve cost efficiency, improve patient satisfaction, improve documentation accuracy, reduce clinical errors, and speed up access to patient data [1,2,4,5]. This can be realized because all files can be computerized so it will facilitate the process of searching, retrieving and processing the data. The process can be done quickly and accurately, so that medical actions that require a history of patient health data can be quickly carried out [6].

Integrated hospitals are the key to improve the patient's condition [4]. This can be supported through a tiered referral system to improve health services to the community. This system brings together all potential health services from the smallest unit to the last unit. In this case, hospital as the main referral hospital becomes an integrated health service network so the central referral hospital gets a history of patient's medical record from the first to the last treatment the patient gets health services [7].

To realize a tiered referral system, an integrated information system is needed. Thus, all integrated hospitals can carry out health services in detail through a tiered system. An integrated information system will make all hospital units to read the patient's medical record history easier [4–7]. Disintegration in health services occur when information system are not integrated among hospitals. This has an impact on several things, namely the use of large amounts of drugs, side effects of unwanted drugs (adverse drug events), and unnecessary hospitalization [4].

One of the technologies that can be utilized in developing Electronic Medical Record (EMR) is a Single Identity Number. The use of SIN is carried out by using NIK or Nomor Induk Kependudukan (National ID Number) [7]. Through National ID Number, SIN will regulate all residents identities that are secure, privacy, trust, and integrated [8]. National ID Number which is integrated with EMR is used to store all population data and also as a storage of medical record data so it will improve the efficiency of services in hospitals [6,7,9].

2. Literature Perspective

Electronic Medical Record (EMR) is a computerized health information system that facilitate the storage of patient data and clinical information containing demographic data, medical data, and can be equipped with a decision support system [1,2]. EMR use information technology tools for collecting, storing, processing and accessing data stored in patients' medical records in a database management system that collects various medical data sources [1,3,4,6].

As a system, functions of EMR are to know patient's condition effectively, support patient safety, facilitate administration and reporting of data [4]. In addition, EMR is used to record demographic data, disease history, treatment, actions, until payment at the registration department, polyclinic, inpatient ward, support unit, and cashier [1,4]. At present, EMR is still under development to fit the needs [1,5,6].

The implementation of EMR in Indonesia is protected by law to ensure the stored data to protect elements of privacy, confidentiality and information security in general [4,6]. The legal basis for the implementation of Electronic Medical Records in a health service institution is protected by Undang-Undang Nomor 11 Tahun 2008 concerning Information and Electronic Transactions, Peraturan Menteri Kesehatan Nomor 269 Tahun 2008 concerning Medical Records and Keputusan Menteri Kesehatan Nomor 55 Tahun 2013 concerning the Implementation of Medical Recorder Works. This legal basis can be used as a basis for the use of Electronic Medical Records in Indonesia [4].

Medical record is one of the health services that can be integrated with information technology into Electronic Medical Records (EMR) [1,2,4]. The functions of EMR have the potential to improve integration of services, improve cost efficiency, increase patient data access, improve patient satisfaction, improve documentation accuracy, and reduce clinical errors [1,2]. Integrated health services are the key to improving the patient's condition so it can avoid disintegration effects of patient services including the use of large amounts of drugs, unwanted drug side effects (adverse drug events), and unnecessary hospitalization. This can be a threat to aspects of patient safety. These effects have potential hazards because they increase the risk of illness, high medical costs, even death [4].

In this current time, there are 29 identity documents issued by 24 different agencies in Indonesia [9]. The government seeks to integrate 29 identity numbers managed by 24 agencies into a single number

or Single Identity Number (SIN). The Government then issued INPRES 3 Tahun 2003 concerning the National Policy and Strategy for e-Gov Development and Keputusan Presiden Nomor 72 Tahun 2004 concerning Single Identity Number (SIN) which is planned to be effective in 2006. Single Identity Number (SIN) is designed to regulate all Indonesian residents identities in order to be secure, privacy, trust and integrated . The final goal of SIN design is to build a single identity data center that integrates all government and private offices, educational institutions, police, health, and population [8].

By using IT development, Single Identity can be used in various sectors by users [8,9]. Development of Electronic Medical Record integrated with Single Identity Number (SIN) can provide health services efficiently. The use of SIN through National ID Number integrated with EMR will make patients to obtain health services with a tiered referral system easily [7]. The integrated tiered referral system can be realized through an integrated patient medical record between health service facilities using a Single Identity Number (SIN) so patient's medical record history can be read by all health service units [4,7,9].

3. Method

The literature review was conducted by reviewing search sources as electronic databases: PubMed, Medline, and NLM Catalog. Keywords used in searching reviews are, "electronic health record", "single identity number", "efficiency of hospitals", "utilization of national ID number". Inclusion criteria are needed to include research in a literature review. Inclusion criteria used: 1) research conducted to measure efficiency, 2) materials including patient records, 3) EMR, which is defined as integrated information technology with health services, accessed by several health service providers, 4) research focus on utilization of ID number. To exclude certain criteria for the study from the literature review, exclusion criteria were used: 1) studies that did not meet the inclusion criteria used, and 2) studies on personal health records. A total of ... articles were identified through 5 databases. After the articles are filtered using inclusion and exclusion criteria, ... articles are included in the review. To resolve differences in findings, discussions were conducted between authors. A summary of the literary review process is shown in Figure. 1.

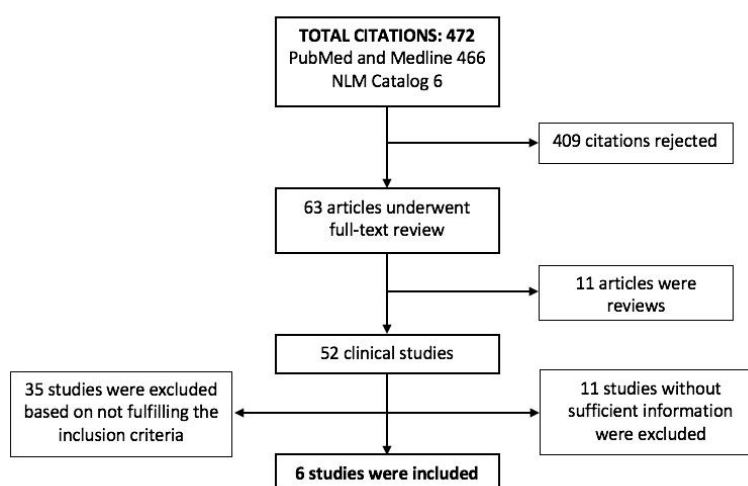


Fig 1. Summary of the literature review process

4. Findings and Discussion

4.1 Findings

A total of 6 articles were found through a search on the topic "National ID Number for the integration of medical records among hospitals". The research was conducted in several countries: Taiwan, Sweden, Kingdom of Saudi Arabia, Rwanda, Burundi, and Canada with various methods used. In a study conducted in Taiwan, medical records of patients between hospitals were implemented and integrated using cloud computing platforms [10–12]. However, all other studies developed instruments that were in accordance with the research conducted.

Personal identification number as a unique ID consists of an identity number consisting of several digits [13]. This ID number is owned by every resident, where it contains data about the identity of the population. Several studies reported that National ID Number has been integrated with several public service facilities, which one is health services [14–17].

In Indonesia, the unique ID of each resident is called NIK or Nomor Induk Kependudukan (National ID Number). This National ID Number is a unique code consisting of 16 digits while each resident has a different code. The use of population database consists of NIK in various information systems in district or city governments is still minimal [18]. Health is one of the fields that must be able to utilize the National ID Number to improve service efficiency [12].

Service efficiency is a condition that referral hospital does not need a repeat health check on the patient. This condition will reduce the cost and time spent by the patient when going to the hospital. Referral hospitals only need to enter the patient's National ID Number to the server to find a medical record. Hospitals equipped with information technology have 47% effectiveness compared to traditional hospitals 27% [12,19].

Based on previous research conducted in Taiwan, utilization of health information system through electronic health records is used to integrate health services among hospitals. This electronic health record contains medical imaging reports, laboratory test reports, return summaries, outpatient records, and outpatient medication records [10]. This will increase the time and cost efficiency because the referral hospital does not need to re-check the patient health.

Integration of patient medical record data among hospitals can use cloud computing platforms [10,12]. This platform was developed in order to manage and secure confidential patient medical record information. Cloud computing is a technology that can run computing simultaneously so has fast file search capabilities. With dynamic configuration capabilities, this technology usually requires low configuration costs and economical resources [11].

Hospitals in Semarang city, Indonesia, have their own database in managing electronic medical records. Unavailability of a relevant server will complicate the transfer of electronic medical records among hospitals. Through cloud computing platform, patients only need one interface to find a complete medical history of various hospitals that have been visited [11,20]. Patient's National ID Number is required to access the history of the patient's medical record [12].

Optimization the use of National ID Number will make patients easier to get health services that are appropriate to their medical needs. Based on studies conducted in Korea, one interface through National ID Number will facilitate the Central Bureau of Statistics in collecting data so it can be used for research and planning [17].

Table 1. Studies of EMR by National ID Number on Efficiency

Authors/ Year	Topic/ Focus	Country	Paradigm/ Method	Sample/ Materials	Findings	Future Research
Wu et al. / 2017	Cloud-based EMR exchange prototyping system	Taiwan	Implementation of the EEC gateways of hospital A, B, and others on the Microsoft Azure cloud -computing platform by using visualization technologies and dynamic resources	The five types of actors and six types of transactions designed and implemented in this study comply with the XDS and ITI TF.	<ul style="list-style-type: none"> EMR can be transferred on Microsoft Azure, Google, Amazon, and other cloud platforms XDS integration profile is more flexible than VPN. 	The security mechanism of EMR during exchange
Li et al./ 2011	Cloud computing to secure electronic medical record	Taiwan	Establish a cloud platform to allow each hospital to apply for its own cloud server without having to do its own setup, to allow the hospital to manage and save its electronic medical record information., exchange and share electronic medical record through this latform	Health patient information	<ul style="list-style-type: none"> P2P method is unable to collect the entire information of a patient in one go from all the hospitals the patient has visited to construct a full medical record The connection relation between patient and medical record is still present to a certain extent in some methods 	Review medical records in mobile devices using cloud platform
Ludvigsson et al./ 2009	Swedish Personal Identity Number (PIN)	Sweden	Examine and explore ethical issues PIN on its use in Swedish health care and medical research	PIN in the total population register at statistics Sweden	<ul style="list-style-type: none"> Swedish PIN serves as a unique identifier in Swedish health care and Swedish society The medical project is reviewed by an Ethics review- board. 	Structure of the PIN
El-Sofany et al./ 2012	Retrieve the patient medical records from different health information system	Kingdom of Saudi Arabia	Use web services and XML documents as a generic language to communicate and exchange data	Patient records	Cloud computing model can be used to save the patient medical cost, time, and helps patient to get its medical record history from any location by simply using a web client	Enhance the model, develop, and implement various solutions to specific problems
Verbekee et al./ 2012	Patient identification system	Rwanda and Burundi	Develop and apply the patient identification metric	Pre and post HIS implementation samples of out patient consultations	<ul style="list-style-type: none"> A unique facility wide identification number was generated for every patient coming to the hospital. Hospital information management system provide biometric identification instruments (fingerprint and recognition) for support 	Other patient identification methods that is more effective and efficient
Mohammed et al./ 2019	Unique ID patient	Canada	Message digest-5 (MD5) and secure hashing algorithm (SHA)	1,205,973 patient records	The composite message can be used to create a unique one-way encrypted ID per patient record that can be used for data sharing.	

4.2 Discussion

In this article, based on the results of the literature review, suggestions that can be given to improve the efficiency of health services are through the use of NIK. NIK is used as a Single Identity Number (SIN) in the development of integrated SIK in electronic medical records between health service units. Context Diagram in Electronic Medical Record are shown in Fig 2.

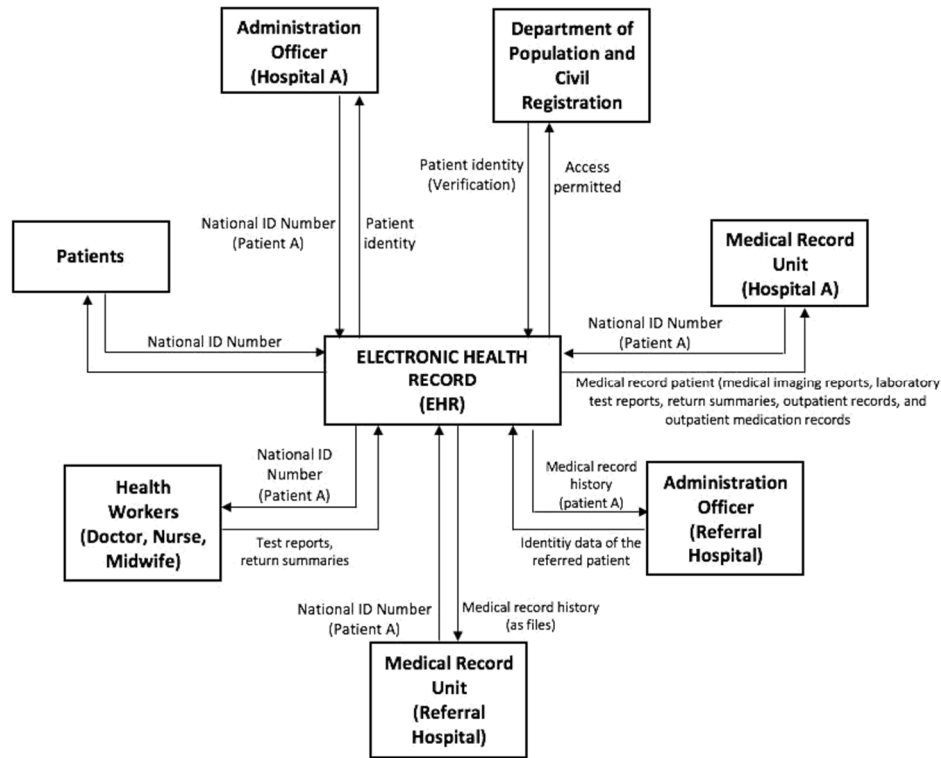


Fig 2. Context Diagram in Electronic Medical Record

The mechanism for utilizing National ID Number in Electronic Medical Record is categorized into 3 stages, which can be described as follows:

- **Application Stage**

- Patient

Patients are required to show an identity that lists the National ID Number. This aims to bring out the patient's identity.

- Administration Officer

The Administration Officer will enter the National ID Number patient that integrated into a cloud server. The data entered will be connected directly to the Department of Population and Civil Registration to verify whether the patient's identity entered is in accordance with population data.

- **Treatment Stage**

At this stage, patients bring the National ID Number to the hospital for treatment.

Step 1 : The patient goes to the hospital to get treatment by showing National ID Number.

Step 2 : The Administration Officer will verify the patient's National ID Number to the Department of Population and Civil Registration.

Step 3 : Doctors or medical personnel log to a cloud server through the patient's National ID Number to view the patient's medical record history. Medical services that provided to patient is according to the history of the medical record. After treatment, doctor will input data on what treatment is given, type of medication, and other medical histories.

- **Electronic Medical Number Recovery Stage**

If the patient needs to be referred to another hospital, transferring the history of the patient's medical record does not need to be done manually.

Step 1 : The Administration Officer at the referral hospital receives patient data referred to in accordance with the National ID Number.

Step 2 : The doctor in the referral hospital will take action according to the input history of action on the patient who has been done in the hospital before.

Fig. 3 shows how the system is applied in this study. Electronic Medical Records (EMR) as a system will contain the patient's identity and medical record history. To integrate electronic medical records of patients among hospitals, cloud platform as a server is needed. With the patient's medical record data stored on this server, patients who are referred to a hospital do not need to do a medical record again. This condition will improve the efficiency of health services in other cases.

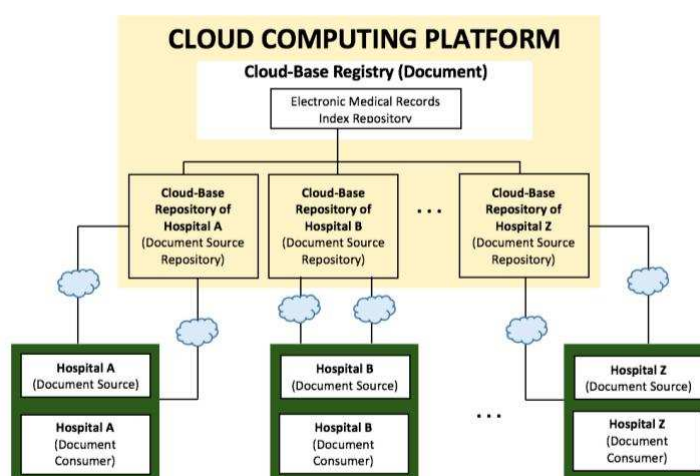


Fig 3. Architecture of Cloud Platform as a Server in Electronic Medical Record

5. Conclusion

The development of Electronic Medical Records (EMR) using a Single Identity Number (SIN) will help in integrating medical record data among hospitals. This development uses a cloud computing platform that speeds up data search and has the ability to use computing simultaneously. Through cloud computing, the platform of all hospitals can be accessed by medical record data centered on a medical record database server. In addition, to access the medical record data, simply using patient's National ID Number because it can make patient easier to get health services that are appropriate to their medical needs. Thus, optimizing the use of National ID Number in EMR development can improve service efficiency and reduce costs incurred by patients when admitted to the hospital.

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