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EVALUATION OF THE IMPLEMENTATION OF ELECTRONIC MEDICAL RECORDS IN THE INTENSIVE CARE UNIT OF SUNAN KUDUS ISLAMIC HOSPITAL

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Abstract

An electronic medical record (RME) is a real-time, patient-centered medical record that provides information directly and securely to authorized users. With the novelty of RME in the health world, there are still not many studies that address the evaluation of RME in various aspects. This study is to determine the results of the evaluation of RME implementation in terms of roles, programs, regulations obj, objectives/ideal conditions, and hospital income. This study is a qualitative descriptive study. The method used is the interview—data processing with data reduction, organization, and interpretation. The data processing process is processed descriptively. The research was conducted in the Intensive Care Unit (ICU) of Sunan Kudus Islamic Hospital for 4 months from February to June 2024. Sampling technique with purposive sampling to officers related to medical records as many as 4 participants. Inclusion criteria are officers who manage medical records, patient service managers, and case mix. Exclusion criteria: refused to participate in the study. The results showed that RME is running well and has a positive influence in the ICU in terms of roles/functions, programs, regulations, expected goals, and income generation. In the role/function aspect, the informants have carried out their duties well in supporting RME. In the aspect of the program, it has been running well in accordance with the provisions; in the aspect of regulations, there is an SPO RME; in the aspect of goals, RME is beneficial for improving services even though several ideal conditions have not been achieved. In terms of revenue, implementing RME plays a role in increasing hospital revenue. The ideal conditions expected are continuous improvement and socialization through RME and health technology development.

I. INTRODUCTION

Information technology in the health sector can improve service quality, reduce costs, and improve efficiency in the world of health. Some studies state that the use of information technology can reduce errors due to *human error*, improve drug safety, improve clinical *outcomes*, improve service coordination, improve service efficiency, increase patient satisfaction, and track data based on time (Bisrat *et al* .., 2021)

At the international level, Electronic Medical Records (RME) originated from the initiation of the *World Health Organization* (WHO) in May 2005 at the 58th *World Health Assembly* meeting gave birth to a joint commitment to using *electronic health* (eHealth). This agreement was outlined in the *eHealth* resolution (WHA58.28) approved by 192 *WHO* member health ministers *(World Health Organization, 2016)*. According to WHO, RME is a digitized version of all the information usually found in hospital medical data: medical history, diagnosis, medications, immunizations, allergies, laboratory results, and physician notes (Oufkir & Oufkir, 2023).

In its development, RME has proven to be an important resource in improving health services, increasing the efficiency of time and queuing processes in medical records. RME is well accepted in Western and European

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countries but still challenging for developing and poor countries. This is related to the readiness of human resources and infrastructure. RME is not only a central data storage and *sharing* system but also a complement to other modern technology trends such as m-Health, health surveillance, telemedicine, and e-pharmacy (Afzal *et al* .., 2021)

The Ministry of Health of the Republic of Indonesia issued Minister of Health Regulation Number 24 Year 2022 on Medical Records. This Permenkes is a manifestation of the sixth pillar of health transformation, namely health transformation. This Permenkes also updates the previous regulation, Permenkes number 269 of 2008, with adjustments to the development of science and technology, service interests, policies, and laws in the health sector for the people of Indonesia (Permenkes Number 24, 2022).

Menkes Number 24 of 2022 article 45 st states health service facilities must organize electronic medical records according to applicable regulations no later than December 31, 2023. With this provision, hospitals are gradually transitioning from paper-based medical records to electronic ones.

Based on the results of research from Indrawati, *et.al*., 2020 in a journal entitled "Evaluation of Electronic Medical Records in the Inpatient *Coding* section at K.R.M.T

Wongsonegoro Hospital, Semarang City" it was found that RME in Inpatient *Coding* was good enough in terms of *performance, information, economic, control, efficiency* and *service* (PIECES) (Indrawati *et al* .., 2020)

Research by Surani *et al.,* 2023 entitled "Implementation of Electronic Medical Records on Increasing Operational Costs at Surakarta General Hospital" found that implementing RME increased total operational costs by 56%. Respondents consider the implementation of RME to save paper usage, but there is a *lag effect*, namely the time lag for the benefits of technology implementation to be felt. Investment in RME itself requires a lot of money. Some literature states that it costs 46,000 dollars per Hospital in the first year, even when viewed from the potential for reduced income, can jump to 120,000 dollars. RME implementation in the United States reached 28 billion dollars per year in the United States (Surani *et al* .., 2023)

Based on research from Hayatunnisa *et al*., 2020 titled "Analysis of the implementation of the hospital management information system in the Intensive Care Unit of the Gatot Soebroto Army Hospital in 2018" it was stated that SIMRS was felt to be useful by employees in the ICU, both doctors, nurses, and other employees (>90%), but several obstacles were found related to difficulty accessing SIMRS (49.2%) where the most common cause was signal interference (23.73%). On the other hand, it was also found that there was insufficient manual data backup in case of power and *internet* failure (Hayatunnisa *et al* .., 2020)

Medical records are very influential on BPJS patient financing claims. Errors in coding patient diagnoses and actions can affect patient claims. According to research from Febriadi and Nurwahyuni 2024 in the research titled "Analysis of the completeness of medical resumes and the accuracy of coding for breast cancer surgery services at Dharmais Cancer Hospital in 2022," it was found that 11% of the coding was not appropriate even though the completeness of the contents of the medical resume was 100%. The inaccuracy of coding occurs due to a lack of knowledge of

Doctors, nurses, and other health workers so that routine evaluations and coding *reviews* between doctors and coders need to be carried out. Inaccuracy in coding causes a decrease in claims on BPJS patients (Febriadi *et al*., 2024).

Research by Novitasari *et al.* 2020 states that of the 114 medical record files in the ICCU studied, 65% of the diagnosis codes for the cause of death were incorrect, 32% were coded correctly, and 3% were not coded. Hospital losses due to the inaccuracy of the code reached nearly 600 million rupiah, so it was concluded that the inaccurate diagnosis

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of death increased hospital losses by more than 40% to 70% (Sari *et al* .., 2020)

February and Novitasari's research above links paper-based medical records with code accuracy. Using paper-based medical records requires a large role from the coder to complete the coding. However, there has been no research linking the use of electronic medical records with coding accuracy, which will ultimately affect hospital revenue. Electronic medical records themselves have a mechanism for filling out medical records from clinicians (doctors and nurses) to facilitate the performance of the Hospital's financial management *(case-mix)* section in summarizing and determining patient claim codes that affect hospital revenue.

Revenue generation in hospital operations is a very important thing to consider. Hospital financing efficiency refers to the ratio between the number of *outputs* produced and the number of *inputs* used to produce that number of outputs in the context of health services, especially in hospitals. Hospital revenue is important because it affects the quality of health services and influences financing policies.

Purwaningsih's research (2018) found a positive relationship between the number of JKN patients and hospital revenue. The greater the number of JKN patients, the more hospital revenue increases. Likewise, vice versa. However, no research has been found that discusses the relationship between the use of electronic medical records and hospital revenue (Purwaningsih, 2018).

Sunan Kudus Islamic Hospital (RSI-SK) is a class C private hospital that has been using electronic medical records in full and has no longer used paper-based medical records since May 2023.

The complexity of services in the ICU in the current era of national health insurance, plus the implementation of electronic medical records, whose use is still relatively new, makes researchers interested in conducting further research with the title "Evaluation of the implementation of electronic medical records in the ICU of RSI Sunan Kudus".

II. METHODS

The research design is descriptive qualitative research with *a purposive* sampling technique. The object of this research is electronic medical records for intensive care. This study involved several informants, consisting of 4 people: an electronic medical record officer, the head of the medical record, the patient service manager, *and a case mix*. Inclusion criteria are officers who manage medical records, patient service managers, and *case mix*. Exclusion criteria: refused to participate in the study.

In this study, the data collected from informants will be recorded in detail and carefully, then summarized and focused on important things, making it easier to provide an overview in concluding. After data reduction, the results are briefly delivered, and then conclusion verification is drawn. Conclusions and verification in this research are presented in the form of text that explains the evaluation of RME in the ICU of RSI Sunan Kudus in terms of several aspects for a period of 4 months from February 2024 to June 2024 conducted at Sunan Kudus Islamic Hospital in the *Intensive Care Unit* (ICU) room.

III. RESULTS AND DISCUSSION

A. Research Results

Data collection on informants was carried out through a structured interview method. The five aspects are the roles and duties of informants, programs, regulations, ideal conditions, and income at RSI Sunan Kudus.

1. Evaluation of Electronic Medical Records in terms of roles/duties

The first informant, as a patient service manager (MPP), oversees the suitability of clinical data and medical record data by the diagnosis and action; the MPP also sees the patient and how his condition is and oversees the electronic medical records filled out by doctors and nurses. Then, fill in the codes in ICD-9 and ICD-10, which the coder will verify later. "The MPP's job is to oversee the

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suitability of clinical data with diagnoses and actions" according to informant 1.

The second informant, as a coder in RME, code the diagnosis and actions written in the RME and then completes the necessary supporting data, for example, *flow sheets* that must be *scanned* and uploaded from the Hospital's claim to Eclaim, followed by *grouping* and submitting billing to BPJS.

A third informant in RME is an assistant to the information and technology (IT) division/head of medical records to coordinate the process of making this RME from any forms that used to be in manual form must be made into an RME form then the form format is made by the IT division staff, then submitted to the Information and Technology section.

Fourth, as SIMRS staff, the informant is tasked with creating various forms needed in electronic medical records and coordinating with the IT department.

RSI Sunan Kudus's RME implementation uses a third-party application with a *web-based* system and *server* by Medisine Med. This application has been connected to the BPJS application, although not fully. This is because *eValidation* in the RME system is being processed. If the *validation* is already in place, the application can be directly connected, and there is no need to upload the required supporting data because it is automatically connected. The tasks and roles of the informants in terms of RME are optimal and effective and very much support the implementation of RME at RSI Sunan Kudus.

According to the IT division, RME has greatly reduced the Hospital's expenditure on paper. When the medical records were still manual, one form could require 10 reams of paper. Whereas there are up to 100 types of forms. Likewise, storage does not take up much space. "In the past, before RME, costs were more wasteful because we spent more paper," according to the IT division.

The opinion of SIMRS staff is that RME reduces the waste of purchasing paper and *filling* medical records. Although it requires much initial capital, such as computers, laptops, internet networks, and applications, it is only the beginning. This is different from manual medical records, where routine monthly expenditures for paper are very large and troublesome.

Electronic medical record training has been obtained by informants, including MPP officers, coders, and medical record officers, both online and offline. This training is very helpful regarding work and as an administrative requirement fulfillment of individual Learning Credit Units (SKP).

According to the *coder*, training for MPP officers, coders, and medical records already exists. However, there is still a need for further socialization among clinicians (doctors and nurses) so that patient data *input* can be more detailed so that it is by the provisions and facts in the field.

2. Evaluation of Electronic Medical Records in terms of program aspects

The implementation of electronic medical records is mandatory for all healthcare facilities by December 31, 2023, as stated in Permenkes Number 24 of 2022. The implementation of RME in the outpatient department of RSI Sunan Kudus started in stages at the beginning of 2020. Implementation in the early stages used a *hybrid* system, namely partly using RME, but some forms still used a manual paper system.

The implementation of RME in outpatient care was then followed by implementation in inpatient care and finally in special units such as the ICU. RME began to be implemented in the ICU in May 2023 in stages, and currently, all initial assessments, medical assessments, nursing care, integrated sheets, drug prescription requests, and medical resumes. Electronic medical records started from outpatient care in October 2020 in stages, then continued to inpatient care and finally to specialized units, including the ICU, in May 2023. The flow of RME in hospitals includes registration, distribution of RME, filling in claim data, processing information, inputting claims and storage.

Future RME planning will continue to be comprehensively developed by the Hospital

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IT team. The current implementation of RME at RSI Sunan Kudus is very good and the development is very rapid. However, several things must be further developed in the future, namely related to signatures with a *barcode* system so that it will allow the implementation of revalidation by BPJS where supporting data that has not been accessible to BPJS must be uploaded manually in the future it will be accessible by BPJS and does not need to be uploaded manually anymore.

3. Evaluation of Electronic medical records in terms of regulations

Regulations on RME are needed in its implementation. RSI Sunan Kudus already has provisions/regulations in the form of RME Standard Operating Procedures (SPO). The purpose of issuing this SPO is to serve as a reference in providing RME services that can support optimal health services to the community in an adequate and digital-based manner. The medical record staff reinforced this.

RME SPOs include outpatient and inpatient registration SPOs, *downtime* SPOs, RME correction SPOs, BPJS claim submission SPOs, inpatient RME SPOs, outpatient RME SPOs, access and data *entry* policies on manual and electronic medical record documents and policies to protect the confidentiality of medical record documents.

Regarding RME confidentiality, the Hospital has a policy regarding using different *passwords* for each *user*. So, the access rights are limited to the *password* owner. However, there are still some *users* who have not changed *their passwords*, so it is hoped that in the future, there will be more socialization regarding changing *passwords* for those who have not.

4. Evaluation of Electronic medical records in terms of ideal conditions

The ideal condition starts from the benefits the informants felt about using RME. There are many benefits of RME because it makes it easier for coders to read the writing of doctors and nurses. This can reduce the wrong input of diagnoses and actions to minimize *human errors*. Another benefit is that the processing time becomes much shorter because there is no need to fill out the form individually. The RME has been directly *bridged* so that the system has automatically filled in its identity. Similarly, filling in the code becomes much easier and faster. The coder conveyed this.

According to the Head of Medical Records, RME is useful because access is easy and fast, reducing paper use and making the resulting data more complete. It also does not need a large storage area, and RME storage can last up to 25 years compared to manual storage, which can only last 5 years.

According to the *case mix* section, socialization with clinicians needs to be strengthened so that when *inputting* patient data, they can meet the rules for submitting claims and synchronize the BPJS billing system with the medical record sheets inputted by clinicians.

Constraints in the use of RME in terms of infrastructure such as signals, *server* interruptions, not all computers use power storage units; there is no.

Validation and human resources unfamiliar with RME need to continue to be developed in the future, considering that the implementation of RME is still relatively new, so it is still innovating.

5. Evaluation of Electronic medical records in terms of revenue

The informants agreed that electronic medical records could help increase hospital revenue in various ways. Namely, RME can reduce *human errors* in data input because writing is easier to read than manual writing; the data is also automatically *hybridized*. Accuracy in data input determines the correct diagnosis and prevents claims from being *pending* so that revenue is better, as stated.

RME greatly increases hospital revenue because the electronic system makes it easier for MPP to check the completeness of *assessments* and integrated sheets typed by doctors and nurses, so there is minimal *undercoating* or coding that exists but is missed, so it is not written. In addition, it also

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facilitates the monitoring of financing during treatment.

The billing mechanism with the RME system is that when the patient goes home/dies, the patient's medical resume is filled in the RME. The coder will code the ICD 9 and ICD 10 data, then *grouping* is carried out, and claims are submitted to BPJS. Supporting data that has not been connected to the BPJS system is uploaded using the TXT format and then uploaded to the *Vclaim* application. After that, it will be verified by the BPJS verifier within 10 days. If there is no shortage, the claim is approved and BPJS will make payments to the hospital account.

ICU revenue with ventilators before and after the implementation of RME was seen to increase when after the implementation of RME. Data collected before the RME in October to December 2022 recorded ICU revenue for 3 months increased 3 times with an average claim per patient of xx,505,663.

Primary data collection from the finance department *(case-mix)* obtained data on the number of patients in the ICU with ventilators, INA CBG rates, and hospital rates before RME in 2022 and after RME in 2023. Data collection was carried out in that month due to the gradual implementation of RME in the ICU since February 2022 and continued improvement until the last data was taken at the end of 2023.

The number of patients influences the monthly income in the ICU, ICD codes 9 and 10, and the *patient's severity* level. The more severe the diagnosis coded in ICD 10 that receives therapy and actions coded in ICD 9, the more the severity level will increase, and the claim will also increase according to the BPJS tariff at class C hospitals.

B. Discussion

1. Evaluation of RME in terms of informant tasks/roles

The task/role aspect, namely the institution, is called effective if it carries out its duties/roles (Latipah *et al*., 2021). From the results of the study, it was found that the officers interviewed had carried out their duties and roles well in supporting the implementation of RME in the ICU of RSI Sunan Kudus. The main task of the officers is to collect data and verify patient data, which is then matched with data in the RME and MPP, and then communicate with clinicians. The data is then coded and *grouped* by the coder. The coder section will bill the BPJS using the Eclaim system.

In the intensive care unit (ICU) RME, it is necessary to pay attention to the ability of the clinician to input the patient's history and physical examination. There are still anamnesis and physical examination data that are not appropriate and do not support the direction of the ICD-10 diagnosis, for example, the diagnosis of hypovolemic shock. Physical examination data is still obtained from inappropriate data, such as warm data.

Acral, normal pulse, and strong lifting. The appropriate diagnosis should be a small and weak pulse and cold acral. The mismatch is out of sync with the existing diagnosis. To overcome this, it is necessary to socialize more widely with clinicians in filling out the RME. Socialization aims to increase officers' understanding of the system being implemented. (Yulida, *et al*, 2021)

Training for officers at RSI Sunan Kudus has been implemented independently by participating in webinars, meetings, and socialization. External hospital training is organized by certified training institutions both *online* and *offline*. In contrast, internal training *(in-house training)* is carried out by the IT team in collaboration with the *case mix* and patient service manager aimed at officers, administration, and clinicians. Training aims to improve officers' attitudes, skills, and abilities so that employee shortcomings can be recognized properly and improvements can be made (Wirajaya *et al*., 2020).

The RME implementation trial process was carried out for more than 6 months. In addition, the RME upgrade process is still ongoing, which causes the data collection process to have a fairly wide range, namely from October to December 2022 with October to December 2023. RME technology upgrades were still being carried out in the Hospital from January to September.

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2. RME evaluation in terms of RME program aspects

Implementing the electronic medical record program is mandatory for all healthcare facilities by December 31, 2023, as stated in Permenkes Number 22 of 2024. Suppose the transition from manual medical records to RME is not immediately done. In that case, there will be administrative sanctions in the form of a written warning or revocation of the accreditation status of the health facility. The implementation of RME in the The outpatient department of RSI Sunan Kudus started in October 2021, marked by the Director's Decree Number 1701/57/SK/RSI.SK/X/2021 concerning the implementation of RME at RSI Sunan Kudus.

Implementation in the early stages used a *hybrid* system, partly using RME, but some forms still used a manual paper system. The implementation of RME in outpatient care is followed by implementation in inpatient care and, finally, in special units such as the ICU. RME was implemented in the ICU in May 2023 in stages. All initial assessments, medical assessments, nursing care, integrated sheets, prescription requests, and medical resumes use RME.

The implementation of RME in terms of plans and programs is very good and right on target, this can be seen from the sustainability of structured program planning, the existence of SK and SPO RME, and the achievement of timely RME programs according to the Ministry of Health standards, RME flow that is easy to follow by users and the integration of health data in RME. (Permenkes, 2022)

Future planning also requires completeness in terms of data security. Clinicians and RME *users* are expected to create confidential *passwords* that can only be accessed by those concerned. Currently, there is a password facility on the RME, but each user has not changed it.

3. Evaluation of RME in terms of regulations

The implementation of RME requires regulations governing the implementation of RME in hospitals. RSI Sunan Kudus already has these regulations in the form of the Director's Decree on RME Implementation issued on October 1, 2021. The Decree was followed up with policy guidelines, namely the policy on access and data entry in manual and electronic medical record documents, where the guidelines

Detailed the access rights of each hospital officer to the RME. Other Standard Operating Procedures issued are by the provisions, namely the SPO for inpatient and outpatient registration, SPO for RME *server downtime*, SPO for correction of RME writing, SPO for BPJS claims, and SPO for filling in inpatient and outpatient RME. The existence of decrees, guidelines, guidelines, and SPOs is very important in legality and in the implementation and evaluation of the RME implementation itself. SPO is important and vital in health service activities because it is written and standardized to explain the procedures to be carried out by officers (Ningsih *et al*., 2022).

Good standard operating procedures can improve health services' efficiency and service quality. Good service quality is expected to increase patient satisfaction. This is in accordance with research on the effect of quality on the quality of patient care (Sudjadi *et al.*, 2023).

4. Evaluation of RME in terms of goals/ideal conditions

The informants in the interviews said that the existence of RME is very helpful for services and has many benefits. With this RME, outpatient services can be faster because there is no need to wait for the search and delivery of medical record documents from the storage area to each clinic. This can reduce patient waiting time and increase patient and staff satisfaction. This is in accordance with previous research that good RME implementation can provide benefits for users in accessing patient information to help make clinical decisions (Alzedan, 2019). The efficiency aspect is an added value of this RME. According to previous research, RME has an impact on reducing operational costs (Erawantini, 2019).

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Anticipation of *server downtime* has been outlined in the *server downtime* SPO. *Server downtime* is a situation where the *server* cannot function properly. This can be caused by external factors (from BPJS) or internal factors (from the hospital IT system). *Downtime* can occur in a planned manner (planned power outages) or unplanned, namely problems with the network system. The existence of *downtime* events in the future is expected not to occur because it can cause scattered data and increase waiting time. The informant hopes that both the BPJS and the hospital IT system can improve the *server* infrastructure even better in order to prevent *server downtime*.

Downserver events that cause waiting times to increase can reduce patient satisfaction rates, where patient satisfaction can be influenced by the element of *responsiveness* or health service response obtained by patients (Yassir *et al*., 2023).

5. Evaluation of RME in terms of income

A medical record file has financial value because its contents can be used as material to determine the cost of payment for services such as treatment, therapy, and actions provided to patients while undergoing treatment at the Hospital. Payment cannot be accounted for without proof of action/service records. RME plays an important role in the revenue aspect of the Hospital as evidence of accountable health care actions.

Hospital revenue comes from operational and non-operational revenue. Operational income is obtained from health services, one of which is income from services in the ICU. The revenue process starts from the revenue generation process *(earning process)* and the revenue *realization process (realization process)* (Purwaningsih, 2018).

The interviews and data collection results found that the revenue generation process starts with registering patients in inpatient and outpatient care. Outpatient registration is equipped with a patient *fingerprint*, but the inpatient system is still in the process of developing a patient *fingerprint* system. The system helps aspects of user legality that can be accounted for and prevents fictitious claims so that the level of fraud in using BPJS can be prevented properly.

The SPO for submitting BPJS claims in the ICU of RSI Sunan Kudus has been running well and effectively. Submitting a claim starts with the registration officer registering the patient and issuing a Participant Eligibility Letter (SEP), which the cashier collects. Then, the finance department will combine the SEP file with the charge file based on the discharge date. The SEP file will be submitted to the National Social Security System (SJSN) section, which then the SJSN section will check and complete the file according to the needs of the claim; after the file is complete, the file will be scanned based on the SEP number. Officers will provide diagnosis and action codes according to ICD-10 and ICD-9CM, and then *grouping* is carried out in the INA-CBG Claim application.

The results of the study found that the existence of RME was able to reduce the workload of officers related to hospital claims. RME prevents errors in diagnosis and therapy *input* because the writing is easily legible compared to the manual handwriting of doctors and nurses. Checking the suitability of data by patient service managers is also faster and easier because RME data can be accessed from various places in the Hospital, and it is easier to monitor and supervise quality control and cost control in treated patients. The findings of the MPP will be communicated with clinicians and management to find solutions to existing problems. Quality and cost control will be easier to implement to reduce costs and indirectly increase hospital revenue.

The results of the above study are by research from Febriadi and Nurwahyuni, 2024 in the research title "Analysis of the completeness of medical resumes and the accuracy of coding for breast cancer surgery services at Dharmais Cancer Hospital in 2022," it was found that 11% of the coding was not appropriate even though the completeness of the contents of the medical resume was 100%. Coding inaccuracy occurs due to a lack of knowledge by doctors, nurses, and other health workers, so routine

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evaluations and coding *reviews* between doctors and coders need to be carried out. Inaccuracy in coding causes a decrease in claims on BPJS patients (Febriadi *et al*., 2024).

Secondary data from *case-mix* taken before RME compared to RME data after RME implementation found that the number of ICU patients with ventilators increased significantly, as well as revenue from INA-CBG tariffs due to several factors:

a. ICU services improved

According to the BPJS tariff system, claims will be given based on the diagnosis (ICD-10) and actions taken (ICD-9CM). The more complex the diagnosis and the more complex the actions given to the patient, the higher the claim, according to the efforts made by the patient. The increase in the number of ventilated patients is the result of improved services in the ICU, where previously, the ability of officers to perform actions in the ICU was still limited. Training duty doctors and nurses in the ICU improved the quality of service, so the ICD 9-CM code and INA-CBG rates increased. This improved service increases hospital revenue and patient satisfaction (Trisnaryan *et al*., 2024).

The explanation above is in line with research (Angga, Syaodih, and Rachman 2024) with the results of the analysis obtained coefficient of determination obtained value R2 = 0.225, which indicates that the effect of service quality on patient

Satisfaction is 22.5%. The coefficient of determination test results obtained a value of R2 = 0.254, indicating that the marketing mix's effect on patient satisfaction is 25.4%. The coefficient of determination test results R2 = 0.16, which indicates that simultaneously, the effect of service quality and marketing mix on patient satisfaction is 16%.

b. RME recording system begins to be well-adapted

Training and socialization of a good recording system in RME in terms of the completeness of anamnesis, physical examination, and support that must be adjusted to the Berita Acara (BA) claim can reduce the occurrence of *undercoating* (missed coding), which previously often occurred. For example, in the diagnosis of respiratory failure, according to the BA claim, the operational definition of respiratory failure is a decrease in oxygen saturation <91%. Before the socialization of BA claims and RME, patients with saturation <91% were not diagnosed with respiratory failure, so the diagnosis of respiratory failure was not listed in ICD-10 or claimed.

This shows that training in competence and administration is very supportive of improving service quality so that patient *outcomes* will improve and claims will increase in line with improvements in service quality.

Using RME in hospitals reduces expenses through the continuous use of manual paper. The interview results obtained data using 10 reams of paper in a month for each form, which is around 100 forms. Efficiency in storage *(filling*) and longer storage compared to manual RM. RME can be stored for 25 years, while manual RM can only be stored for 5 years. The use of RME also facilitates the claims process where data *input* can be *brigaded* automatically, thereby reducing the occurrence of *errors* and reducing the number of pending claims.

The ideal condition expected by the Hospital in the future is the full implementation of RME equipped with high security for patient confidentiality and infrastructure improvements to reduce *down-server* events.

c. Full implementation of RME includes supporting data such as *flowsheets* and family informed consent, so there is no need for manual scanning.
d. Increased security and confidentiality with *barcode* signatures, the need for *password* changes, and stricter access restrictions that can only be accessed by certain rooms and certain officers. This is important to maintain patient confidentiality.
e. In this case, infrastructure upgrades include signal amplification, *servers*, and

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power storage units. These upgrades are expected to increase RME capacity, reduce *server downtime*, and speed up the data input and storage process.

This ideal condition has not been fully achieved due to several obstacles, such as financing for *barcode* signatures, which are still expensive, so validation is not yet possible. The absence of *eValidation* causes BPJS to be unable to access the supporting data needed, so it still needs to be done manually. Infrastructure improvement also has a relatively high financing risk but is expected to be carried out continuously.

This is in accordance with research (Purwadhi et al., 2024). The results show that there is a difference between the BPJS Health claim rate and the Prima Medika hospital rate. So that a strategy is needed in dealing with these problems by maintaining patient loyalty, maintaining Good relations with BPJS Health, maintaining hospital excellence, forming a *case manager* team, *case-mix*, and anti-fraud so that negative differences in treating BPJS Health patients can be avoided.

This study has limitations, namely the lack of previous studies as references, given the existence of RME, which is still relatively new in Indonesia, the continuing process of improvement and continuous development of RME, and the relatively small number of participants.

IV. CONCLUSION

The implementation of RME in the ICU of RSI Sunan Kudus has been running well in terms of function/role aspects, where officers have carried out their duties according to procedures. The main tasks of the officers include making RME forms from manual to digital, registering inpatients, filling out patient assessments, matching patient data with RME, and coding and making *grouping* and billing to BPJS.

The implementation of RME in terms of the program has been running well, and RME has been stipulated through a Director's Decree since October 1, 2021. Implementation is carried out in stages from outpatient care to inpatient care and special inpatient care, including ICU. The program flow starts with registration, data entry by clinicians, supervision and input of supporting data by MPP, coding by coders, and claim billing.

The implementation of RME in terms of provisions and regulations has gone well, with various rules starting from the Decree on the implementation of RME, Guidelines and Guidelines, and SPO. RSI Sunan Kudus has a policy of maintaining data security, namely, users' access rights, which are determined using their respective usernames and *passwords*.

The implementation of RME in terms of objectives / ideal conditions is going well because it helps and benefits its users, including doctors, nurses, and administrative officers, where RME accelerates the process of registration, service, and claim billing. The obstacle faced at this time is that several *down server* events still interfere with the service process.

The revenue implementation of RME went very well, whereas after the implementation of RME, the income of ICU RSI Sunan Kudus increased significantly. This increase was influenced by an increase in the quality of health services, an increase in the ability to adopt RME correctly to prevent uninputted diagnoses and actions, and easier quality and cost control supervision with the RME system. The ideal conditions expected are continuous improvement and socialization through RME and health technology development.

Researchers hope that similar research will be carried out with a larger number of participants and include different aspects of participants, such as from the *u, ser* aspect, so it can be a continuous evaluation.

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REFERENCES

Afzal, F., Ahmad, A. A., Ali, Q. A., Joshi, S., & Mehra, S. (2021). Fulfilling The Need Of Hour: Systematic Review Of Challenges Associated With Electronic Medical Record (Emr) Implementation - Sbea Model. Science And Technology.

Bisrat, A., Minda, D., Assamnew, B., Abebe, B., & Abegaz, T. (2021). Implementation Challenges and Perception of Care Providers on Electronic Medical Records at St. Paul's and Ayder Hospitals, Ethiopia. BMC Medical Informatics and Decision Making,21 (1), 306. https://doi.org/10.1186/s12911-021-01670-z

Erawantini, F. (2019). Electronic Medical Records: A Review of Benefits in the Context of Primary Care. http://publikasi.dinus.ac.id

Fadhilah, S.A., (2023). Effectiveness of Electronic Medical Records for Outpatient Installation at Brebes Regional Hospital. http://eprints.uwhs.ac.id

Hatta, G. (2011). Guidelines for Health Information Management in Health Care Facilities. Jakarta: UI Press

Hayatunnisa, N. U., Soepangat, S., & Windiyaningsih, C. (2020). Analysis of the Hospital Management Information System Implementation in the Intensive Care Unit of the Presidential Hospital RSPAD Gatot Soebroto Jakarta in 2018. http://ejournal.urindo.ac.id

Huffman, E.K., (1994). Health Information Management, Physicians Record Company, Berwyn. Illinois

Indrawati, S. D., Nurmawati, I., & Muflihatin,

I. (2020). Evaluation of Electronic Medical Records in the Inpatient Coding Section at Rsud K.R.M.T Wongsonegoro Semarang City. http://publikasi.polije.ac.id

Latipah, T., Solihah, S. Setiatin, S. (2021). The Effect of Electronic Medical Records on Increasing the Effectiveness of Outpatient Services at Hospital X, Cerdika: Indonesian Scientific Journal, 1 (20), pp.1422–1434. Available at: https://doi.org/10.36418/cerdika.v1i10.255

Moleong, L. (2006). Qualitative Research Methodology. Bandung: PT Remaja Rosdakarya.

Ningsih, KP. et al. (2022). Manual to electronic medical record data migration training. Link, 18(1), pp.43- 48. available at: https://doi.org/10.31983/link.v18i.8433.

Notoatmodjo, S. (2018). Health Research Methodology. Jakarta: Rineka Cipta

Oufkir, L., & Oufkir, A. A. (2023). Understanding EHR's current status and challenges to implementing nationwide electronic health records in Morocco. Informatics in Medicine Unlocked,42, 101346. https://doi.org/10.1016/j.imu.2023.101346

Permenkes No. 24 Year 2022.pdf. (n.d.). Permenkes_269_tahun_2008.pdf. (n.d.). Purwaningsih, Puspitasari, L., (2018) The Effect of the Number of BPJS Health Patients on the Revenue of RSUD Dr Abdul Rivai Berau. Eco-Build 2(2).

Rahayu, D. (2020). Analysis of the Impact of PSAK 72 Implementation on the Financial Performance of Telecommunication Companies during the Covid-19 Pandemic. Greenomika 2(2).

Rustiyanto. E., 2009, Professional Ethics of Medical Recorder and Health Information. Graha Ilmu, Yogyakarta

Sari, N., Rokhmah, D., & Ma'rufi, I. (2020). Inaccuracy of the Basic Cause of Death Code is the Cause of 600 Million Fund

pISSN 2540-7511, eISSN 2540-7546

Losses in the ICCU Unit at RSUD Dr Moh Saleh Probolinggo. Multidisciplinary Journal,3 (1), 19. https://doi.org/10.19184/multijournal. v3i1.23683

Sugiyono (2013). Quantitative, Qualitative and R&D Research Methods, ISBN: 979-8433-64-10, Alfabeta.

Sudjadi, S., Syaodih, E., & Andriani, R. (2023). The Effect of Service Quality on Trust Mediated by Patient Satisfaction at Telogorejo Semarang Hospital. UBS Journal of Economics and Business, 12(6), 3685-3695.

Surani, S., Perwirani, R., Indahsari, S., Astriyani, R., & Hidayat, T. (2023). Implementation of Electronic Medical Records Contributes to Increased Operational Costs at Surakarta General Hospital. 8(1).

Suwardjono. (2015). Financial statement engineering accounting theory. 3rd edition. Yogyakarta: BPFE

Trisnaryan Pratama, F., Acep Rohendi, & Dasrun Hidayat. (2024). The Effect of Service and Satisfaction with its Impact on Patient Loyalty at the Karawang Bakti Praja Medika Clinic. Da'watuna: Journal of Communication and Islamic Broadcasting,4 (3), 1397 -. https://doi.org/10.47467/dawatuna.v4i 3.1164

Who Global Strategy on Health 2020-2025 18 mar.pdf. (n.d.).

World Health Organization. (2016). Global diffusion of eHealth: Making universal health coverage achievable: report of the third global survey on eHealth. World Health Organization. https://iris.who.int/handle/10665/252529

Witcahyo, E. (2019). Calculation of Unit Costs for Intensive Unit Care Measures at Hospital X in Jember Using the Activity Based Costing (ABC) Method. Indonesian Journal of Health Economics,4 (1). https://doi.org/10.7454/eki.v4i1.2781

Wirajaya, M., Karma, M. and Dewi, MU. (2020). Analysis of Readiness of Dharma Kerti Tabanan Hospital to implement electronic medical records. Journal of Vocational Health, 5(1), p.1. Available at: https://doi.org/10.22146/jkesvo.53017

Yaniawati, P., Indrawan, R. (2024). Research methodology: concepts, techniques, and applications. Bandung: PT Refika Aditama.

Yassir, A., Purwadhi, P., & Andriani, R. (2023). The relationship between service quality and patient re-visit interest at the Citra Medika Clinic in Semarang City. Journal of Economic Education Research,8 (1), 1-12. https://doi.org/10.21067/jrpe.v8i1.823 9

Yulinda, R., Lazuardi, L. & Pertiwi, A.A.P. (2021). Challenges of Electronic Medical Record Implementation based on the Human Resources Dimension at RSGM Prof. Soedomo Yogyakarta, Proceedings of scientific discussions, Innovation, and information technology to support PMIK performance during the COVID-19 19 pandemic, pp.102-106