



## Readiness to implement electronic medical records based on the california community clinic EHR assessment and readiness (CCCEAR) instrument

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### ABSTRACT

Regulatory demands to implement electronic medical records in all health services, including primary care facilities, are mandatory. All primary care facilities are immediately prepared for these conditions. This article aims to assess the readiness of implementing electronic medical records based on the California Community Clinic EHR Assessment and Readiness (CCCEAR) instrument. This type of qualitative research is a case study approach. Data collection techniques using observation and interviews with relevant officers. The results of the assessment of readiness to implement electronic medical records based on CCCEAR at the UPTD Puskesmas Kartasura found that three components were in range II, namely components [1] information technology infrastructure, [2] planning and policies, and [3] budget allocation. Two components are in range III, namely [1] human resources and [2] support from the government. The Kartasura Primary Health Center is ready to implement electronic medical records according to the demands of existing regulations. Approaches to related human resources and the government are needed for smooth implementation.

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### Kata kunci:

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### ABSTRAK

Tuntutan regulasi untuk mengimplementasi rekam medis elektronik di semua layanan kesehatan, termasuk fasilitas layanan primer menjadi kewajiban yang harus dijalankan. Semua fasilitas layanan primer segera bersiap untuk kondisi tersebut. Artikel ini bertujuan untuk melakukan penilaian kesiapan implementasi rekam medis elektronik berdasarkan instrumen California Community Clinic EHR Assessment and Readiness (CCCEAR). Jenis penelitian kualitatif pendekatan studi kasus. Teknik pengambilan data menggunakan observasi dan wawancara kepada petugas terkait. Hasil penilaian kesiapan implementasi rekam medis elektronik berdasarkan CCCEAR di Puskesmas Kartasura didapatkan tiga komponen berada pada ranget II, yaitu komponen [1] infrastruktur teknologi informasi, [2] perencanaan dan kebijakan, dan [3] alokasi anggaran. Terdapat dua komponen yang berada pada range III, yaitu [1] sumber daya manusia dan [2] dukungan dari pemerintah. Secara keseluruhan UPTD Puskesmas Kartasura telah cukup siap untuk implementasi rekam medis elektronik sesuai tuntutan regulasi yang ada. Perlu upaya pendekatan pada sumber daya manusia terkait dan pemerintah untuk kelancaran implementasi.

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**INTRODUCTION**

The Primary Health Center, as the Health Service Technical Implementation Unit, provides first-level health services for public and individual health efforts. The Primary Health Center is the spearhead of health service facilities in Indonesia that offer great benefits for health development in achieving optimal health status. The role of The Kartasura Primary Health Center needs to be increased to strengthen and develop the health service system (Wowor et al., 2016). Primary Health Center provides promotive and preventive services (Kemenkes, 2019).

The development of information technology has an impact on all fields, one of which is the health sector (Azis, 2018). This utilization is supported by various information systems that have been developed to provide health data. To produce valid and reliable health data, system integration must be carried out. The electronic medical record system is one of the system developments carried out to support the exchange of patient medical resume data between health care facilities (smartcare) (Kemenkes 2020).

Electronic Medical Records consist of clinical data storage, clinical decision support, pharmacy, and clinical data documentation (Garets & Davis, 2005). EMR implementation can assist in the provision of better evidence-based health care, higher levels of completeness, accuracy, validity, coordinated patient access and communication, safer drug prescribing, and increased efficiency of medical practice (Alsadi & Saleh, 2019). Implementation of EMR in trusted health care facilities can improve the quality of service to patients (Jahanbakhsh et al., 2011). In implementing Electronic Medical Records (EMR), readiness analysis is the first and most important step before implementing EMR. The readiness assessment should involve comprehensive measures that demonstrate readiness including organizational culture, management and leadership, operational requirements, and organizational culture technical (Ghazisaeidi et al., 2014). Unprepared implementation of EMR in health facilities can cause many obstacles during the implementation process. So that it can

lead to failure of EMR implementation which can have a negative impact on patient care due to the loss of important clinical and administrative data (Saleh et al., 2016).

Minister of Health Regulation number 24 of 2022 concerning Medical Records in section 3 point 1 states that all health service facilities must organize Electronic Medical Records (Kementerian Kesehatan Republik Indonesia, 2022). Therefore all health service facilities, including primary care facilities, immediately prepare for this condition. This article aims to assess the readiness of implementing electronic medical records based on the California Community Clinic EHR Assessment and Readiness (CCCEAR) instrument.

**METHODS**

This qualitative research uses a case study design at The Kartasura Primary Health Center. The research subjects used saturated sampling. The elements studied include human resources (hr), information technology infrastructure, planning and policy, budget allocation, and government support. Data collection techniques using observation and interviews with relevant officers. This research was conducted from September 2022. According to Aini (2020), the results of the analysis were described in narrative form, then scoring was carried out using the California Community Clinic EHR Assessment and Readiness (CCCEAR), which was modified and adapted to the context of the puskesmas. The following is a range of scores on the variable components that will be assessed:

- 0-1 = Not Ready
- 2-3 = Fairly Ready
- 4-5 = Very Ready

The higher the score obtained, the higher the readiness of the variable components being assessed. The results of the overall assessment will be interpreted according to the group of values shown in Table 1.

**Table 1**  
**Reference Standards and Interpretation of EMR Implementation Readiness Assessment (Aini, 2020)**

Range	Graphic point	Score Range	Explanation	Interpretation
I	0	0	Not Ready	Within this score range, it indicates that there are weaknesses in several components that are important for the successful implementation of EMR. Comprehensive identification and planning is required before moving forward on adoption and implementation.
	1	1-14		
II	2	15-28	Fairly Ready	In this range of scores, it shows that in some components of readiness there is good ability. However, several weaknesses were also found in several other readiness components. So it is necessary to further identify the components that are still weak so that the implementation of the Electronic Medical Record (EMR) can run well.
	3	29-42		
III	4	43-56	Very Ready	Within this score range, it indicates that the Puskesmas is ready to implement the Electronic Medical Record (EMR).

**RESULT AND DISCUSSION**

Electronic Medical Record (EMR) is a document containing records about patients' health condition in services, starting from patient social and medical data entered into a computerized health information system. Electronic medical records help improve patient health services for the better. An essential step towards adopting an electronic-based health

recording system requires internal organizational preparation by assessing key factors such as human resources (HR), information technology infrastructure, planning and policy, budget allocation, and government support (Cherry, 2011). In the implementation of electronic medical records, many benefits will be obtained by healthcare facilities to improve the quality of service.

The Kartasura Primary Health Center is preparing to implement electronic medical records. The implemented electronic medical record system is called Sistem Informasi Kesehatan Puskesmas (SIMPUS). Researchers tried to analyze the readiness of implementing electronic medical records using the California Community Clinic EHR Assessment and Readiness (CCCEAR). The following is a discussion of the results of research that researchers have conducted:

### Human Resources Factor

The human resources referred to in this study are people who are directly involved in implementing electronic medical records at UPTD Puskesmas Kartasura, namely doctors, nurses, medical recorders, laboratories, pharmacists, and other health workers. Human resources can be assessed from training and ability to operate computers. In realizing a professional SIM, it must be supported by reliable human

resources, so that SIM can present information quickly, safely, and accurately (Marimin et al., 2006). The readiness of human resources is related to the involvement of users, it is also significantly related to the level of education (Marques et al. 2011).

The Kartasura Primary Health Center has eight medical record officers (five Main Health Center staff and three Supporting Health Centers staff). The educational qualifications of officers consist of Diploma III (four Medical Records education, one nursing education, and one midwifery education), SMA (one staff), and Elementary School (one team). In the Regulation of the Minister of Administrative Reform and Bureaucratic Reform of the Republic of Indonesia Number 30 of 2013 concerning Functional Positions of Medical Recorders and Their Credit Scores, it's stated that in the Community Health Centers, there should be five Skilled Medical Recorders and two Expert Medical Recorders (Menpan RI, 2013).

**Table 2**  
**Assessment of Human Resources (HR) Factors**

No.	Readiness Sub-variable	Explanation	Point	
			R1	R2
1.	Human resources with an IT education background (IT experts) to support the implementation of EMR	The Kartasura Primary Health Center doesn't have human resources with an IT background, but there are human resources who understand IT with a non-IT educational background. There are training plans both internally and externally regarding the implementation of the EMR.	3	3
2.	Ability of staff to use computers	Staff can using computers well, training has been included in the plan, but not yet in a detailed plan regarding implementation time, officers to be trained, and training methods.	3	3
3.	Training implementation plan	The Kartasura Primary Health Center planned that staff will receive training. The training aims as part of the planning process for implementing EMR, redesigning workflows, and as a way to increase the skills or competencies of related staff.	4	3
4.	Staff requirements for EMR implementation	Staff need EMR to facilitate performance in improving quality and efficiency in recording, but conventional systems can still be used optimally.	3	3
Sub-total			13	12
Graphic point			4	3

Note:

P1: My Researcher

P2 : Expert Researcher

The Kartasura Primary Health Center needs staff with an information technology/informatics background. Still, the team can operate computers well, as seen from the operational activities that already use the SIMPUS application (Table 2.). In the future, the design and maintenance of electronic medical records will work with vendors. Officers at The Kartasura Primary Health Center already understand the benefits of Electronic Medical Records (EMR), especially for medical record officers. Staff at The Kartasura Primary Health Center need training on the application of electronic medical records so that during the implementation of EMR, officers can immediately adapt to the new system.

### Information Technology Infrastructure Factors

Infrastructure has been seen as an investment, management has supported it in the provision process (Pratama & Darnoto, 2017). Physical components that must be prepared include servers, laptops and personal computers (PCs), dial-up modems, wireless hardware, printers, scanners, cable modems, digital subscribe lines. While the technical components that must be prepared include software, network, interface, back-up, and backup

power supply. Prepare a technical support team to anticipate problems in the field. Design and build networks, and use servers that suit the number of users. Prepare data and electricity back-ups by using a redundant power supply or uninterrupted power supply (Hartley & Jones, 2012).

Assessment of information technology infrastructure needs at The Kartasura Primary Health Center has yet to be carried out (Table 3). The current information technology infrastructure, especially computers and internet networks, is available in all puskesmas units to facilitate data exchange via SIMPUS. The availability of hardware at UPTD Puskesmas Kartasura is considered sufficient because previously they had implemented a semi-electronic health center information system and medical record. However, there are still some information technology infrastructures that are still needed in preparation for the transition to EMR. One of them is the addition of servers and several additional specifications to minimize server downtime and several other problems that often occur in EMR implementations. Regarding the EMR system, it is planned to be developed from the existing SIMPUS.

**Table 3**  
**Assessment IT Infrastructure Factors**

No.	Readiness Sub-variable	Explanation	Point	
			R1	R2
1.	Assessment of IT infrastructure needs	It has been done, but it is still limited for the purposes of infrastructure procurement and has not been documented in planning.	3	3
2.	Availability of hardware (hardware & network) to support EMR	Hardware is already available in several units at the Primary Health Center to assist with services. There will be additional procurement plans later, but there is no exact amount yet.	3	3
3.	Availability of software to support EMR	Plans to purchase EMR software packages are being considered but have not been discussed and planned and have not been documented in the planning.	3	3
Sub-total			9	9
Graphic point			3	3

Note:  
 P1 : My Researcher  
 P2 : Expert Researcher

**Table 4**  
**Assessment Planning and Policy Factors**

No.	Readiness Sub-variable	Explanation	Point	
			R1	R2
1.	IT planning on quality and efficiency	Quality and efficiency are goals, but these goals are not yet clearly defined and measurable with EMR technology	2	3
2.	Role and responsibility for analyzing product selection, contracts, terms and negotiations with EMR vendors	There has been a clear assignment, but it has not been discussed further because there is no vendor yet	3	3
3.	Policies, procedures, and protocols required for EMR implementation.	Has been considered but not yet analyzed	1	1
Sub-total			6	7
Graphic point			2	3

Note:  
 P1 : My Researcher  
 P2 : Expert Researcher

**Table 5**  
**Assessment Budget Allocation Factor**

No.	Readiness Sub-variable	Explanation	Point	
			R1	R2
1.	Estimated funding for EMR creation	An estimate of EMR funds has been made but not yet in detail, and there has not been a mention in the current period plan regarding the cost of developing the EMR	3	3
2.	Approximate calculation of funds for maintenance of EMR during implementation	Estimates of EMR maintenance funds have not been made, but there are plans related to EMR maintenance	3	3
3.	Budget allocation for EMR	It has not been identified and proposed to the main policy makers, but has been discussed by the Primary Health Center management	3	3
Sub-total			9	9
Graphic point			3	3

Note:  
 P1 : My Researcher  
 P2 : Expert Researcher

### Planning and Policy Factors

Management plays a role in preparing strategic plans, defining and designing business processes, defining expectations, needs and potential. Management is also authorized to form a team that focuses on data or information architecture, plans information management readiness, prepares specific plans for software and hardware conversion, and identifies funding and human resources (Ghazisaeidi et al., 2014). The failure in developing EMR so far has been more due to poor planning, in which the identification of critical success factors is incomplete, specific, and comprehensive.

The master plan can be a clear guide in the development and development of EMR. The information technology master plan can be a very important reference for any stakeholder interested in the development of EMR and the development of health service facilities in general because it is aligned with the vision, mission and strategic plans of the organization (Brigl et al., 2005).

The Kartasura Primary Health Center has planned to implement electronic medical records just now. This is evidenced by the absence of a planning document (master plan) or technical guidelines for developing electronic medical records at the Kartasura Health Center (Table 4). So

that for now there are no objectives/targets/details for EMR development preparation, besides that there is also no procurement plan document and budget allocation related to EMR. Currently, the puskesmas has not prepared a long-term strategic plan including procurement or further development regarding the implementation of EMR. Therefore, UPTD Puskesmas Kartasura needs to carry out careful planning in the form of a master plan so that EMR can be successfully implemented.

### Budget Allocation Factor

Budget is an important issue because health service facilities must prepare information technology infrastructure including computers, wired and wireless networks, electricity, security systems, consultants, and training (Handiwidjojo, 2009). Lack of funds is one of the main problems in the implementation of information systems in health care facilities (Zikos et al., 2013).

The management of the Kartasura Primary Health Center plans to make the electronic medical record software using the existing SIMPUS. Later, the Kartasura Primary Health Center will hand over the electronic medical record to the vendor (Table 5.). The budget allocation for the electronic medical record itself, both for making the electronic medical record, maintaining the electronic medical record, and other budget allocations for implementing electronic medical record, has not yet been identified and has not been proposed but has indeed been discussed by management.

### Government Support Factor

Support from the government is needed in the development of information systems, from planning and budget approval to the operational stage (Simanjuntak, 2012). The government support, namely in terms of the investment required for the system to be built. The government (through the Sukoharjo District Health Office) supports implementing electronic medical records at The Kartasura Primary Health Center. Still, this support has yet to take the form of a documented commitment (Table 6.). In addition, help from the government regarding the implementation of EMR was

proven by holding meetings to discuss electronic medical records with the participation of all health service facilities under the auspices of the Sukoharjo District Health Office.

### Overall Readiness Assessment

Readiness to implement electronic medical records at the Kartasura Primary Health Center was assessed using the CCCEAR instrument (2008), which was modified according to the conditions at the Primary Health Center, obtaining a score of forty-one out of a maximum score of seventy (Table 7.). The acquisition of this value indicates that the Kartasura Primary Health Center is quite ready to implement electronic medical record.

Based on the results of this analysis, it can be described the area of readiness of the Kartasura Primary Health Center for implementing the electronic medical record (Fig 1.). Planning and policy factors are areas that need to be prepared immediately for the implementation of this electronic medical record.

The research results on the readiness of implementing electronic medical records using CCCEAR. The assessment focuses on human resources (HR), information technology infrastructure, planning and policy, budget allocation, and government support. The overall evaluation of the five variables obtained a forty-one out of a maximum score of seventy. The study's results were also compared with the research results from expert researchers to prove the high level of research subjectivity so that the research could be objective. A score of forty-one was obtained from a maximum score of seventy. There was no difference in the scores of both researchers and expert researchers. Values are in the same range, namely range II, with the same interpretation. With the performance above, the Kartasura Primary Health Center is ready to implement electronic medical records. An assessment of the readiness to implement electronic medical records is needed to determine the strengths and weaknesses of the Kartasura Primary Health Center in implementing electronic medical records. It can be used as a reference to strengthen its weaknesses and correct them before electronic medicine restoration at the Kartasura Primary Health Center.

**Table 6**  
**Assessment Government Support Factor**

No.	Readiness Sub-variable	Explanation	Point	
			R1	R2
1.	Government commitment in supporting the implementation of EMR	The government's commitment is contained in a written policy regarding support for the proposal by the Primary Health Center to use EMR for quality improvement, but there has been no approval for budget allocations.	5	4
Sub-total			5	4
Graphic point			5	4

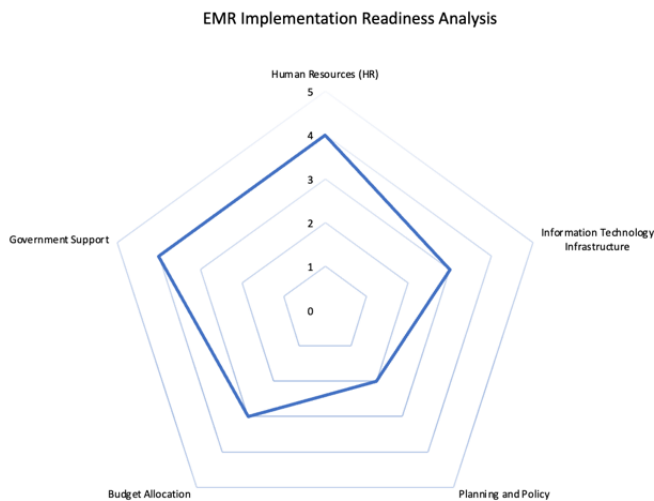
Note:

P1: My Researcher

P2 : Expert Researcher

**Table 7**  
**Overall Readiness Assessment**

No.	Readiness Area	Sub-Total	Range	Point	Explanation
1.	Human Resources (HR)	13	III	4	Very Ready
2.	Information Technology Infrastructure	9	II	3	Fairly Ready
3.	Planning and Policy	6	II	2	Fairly Ready
4.	Budget Allocation	9	II	3	Fairly Ready
5.	Government Support	4	III	4	Very Ready
Total		41	II	3	Fairly Ready



**Figure 1.**  
**Area of Readiness to Implement EMR at UPTD Puskesmas Kartasura**

## CONCLUSION AND SUGGESTION

Readiness to implement electronic medical records based on the California Community Clinic Ehr Assessment And Readiness (CCCEAR) instrument at the Kartasura Primary Health Center obtained an assessment with a total score of forty-one out of a maximum score of seventy. This condition is in range II of the readiness area for implementing electronic medical records. This range of scores indicates that there are good capabilities in some readiness components, but there are also weaknesses in some elements. The Kartasura Primary Health Center is ready to implement electronic medical records. The Kartasura Primary Health Center needs to evaluate and improve, including forming a special team that has precise tasks and functions, conducting information technology infrastructure needs assessments, proposing and budgeting funds for procurement and information technology infrastructure, and conducting training to increase the needs of officers to implementation of electronic medical records. This research is an initial input for the Puskesmas to compile and develop a more specific plan and determine a better target plan for implementing electronic medical records. In the future, it is necessary to carry out similar research by adding data collection methods and data analysis methods so that they can provide a detailed description of the process of implementing electronic medical records, especially at the Kartasura Primary Health Center.

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## Conflict of Interest Statement

We declare no conflicts of interest.

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