

Analytical Data for Electronic Medical Records in Primary Health Care

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Abstract. Digital health transformation encourages primary health facilities to implement electronic medical records (RME) that are interoperable according to standard medical classification and terminology. The standard RME also allows connecting to wearable devices for direct patient monitoring. An analytical approach to digital data has the potential to support clinical decision making for primary care physicians. This study aims to Strengthening primary care as a center for continuous patient care by using an analytical approach in the form of a dashboard.. This study uses a participatory action research approach in implementing RME in primary care. The 4 stages of action research were carried out by involving primary care physicians (dentists and general practitioners), medical records, nurses, pharmacists and electronic medical record developers. The trial implementation of RME and wearable devices was evaluated using the System Usability Scale (SUS). Structured RME data makes it easy to analyze and visualize in the form of a dashboard to support primary care management and monitor individual patient health status. The analytic features in RME that allow direct patient monitoring are perceived as useful for supporting continuous patient care. The use of data standards in clinical records such as ICPC, LOINC and SNOMED-CT makes it easier to achieve semantic interoperability including potential interoperability with portable medical devices.

Keyword: ICPC 3, Wearable Device, Dashboard Patient, Electronic Medical Record, Primary Health Care

1 Background

Primary health care facilities have an important role in organizing health service efforts, be it promotive, preventive, curative or rehabilitative. As well as being the first point of contact in the health care system, primary care is a liaison with other health services through an effective referral system [1]. Several studies show that strengthening primary services can increase the efficiency of health financing through its role as a gatekeeper [2]. In addition, primary services can support the quality of health services in the community, such as the ability to manage 144 diseases thoroughly, follow up on medical management of patients with chronic illnesses, select and identify appropriate health resources for patients with an integrated referral system.

However, the strengthening of primary services still faces several challenges such as the availability and distribution of primary care doctors, the gap in incentive

models, the limits of authority and scope of services that can be provided, the availability of medical support facilities, as well as the satisfaction and culture of the community in obtaining health services which are still centered on hospitals and medical specialist. Research conducted by Werni, Nurlinawati, and Rosita in 2017 regarding the implementation of essential public health efforts (UKM) in remote and very remote Puskesmas showed that as many as 87% of 131 Puskesmas carried out 5 types of essential services (health promotion; environmental health; maternal health, children and family planning; nutrition services; and, disease prevention and control) and the rest carry out less than 5 types of essential services. Data from the Institute for the Evaluation of Health Metrics, Ministry of Health in 2019 showed that there were 96.8% of infant deaths, 76.4% of child deaths, 63.9% of adolescent deaths, 72.6% of productive age deaths and 73.5% of elderly deaths caused by preventable or partially preventable disease or condition. This shows that services that focus

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on promotive and preventive efforts must be a priority even though curative and rehabilitative services are also available in primary health services [3]. Based on previous studies, not all health centers in 8 districts/cities have health human resources according to the Minister of Health of the Republic of Indonesia Number 75 of 2014, but general practitioners, midwives and nurses are available in all health centers, although the number is still lacking. Meanwhile, in all medical practices, the most widely available health human resources are general practitioners and nurses. There have been changes in planning for human resource procurement in the regions after JKN, increased workload and working hours, so that it is necessary to plan and procure human resources based on needs [4].

Some countries are pursuing some models of more equitable incentives for primary service delivery [5], job dissatisfaction from a person can increase improvement turnovers employees, and decreased employee productivity so that it can also increase staffing costs and medical costs [6] as an example, several studies of job satisfaction that have been studied in the field of health services concluded that the effect of employee job satisfaction on job quality, effectiveness and efficiency is very high. The better quality of work will be shown if the level of satisfaction with one's work is higher so as to produce effectiveness and efficiency in health services [7]. This is in line with the competence of primary care physicians through the primary care specialist program.

One of the first-level health facilities is a clinic, a clinic is a health service facility that organizes individual health services that provide basic and/or specialist medical services. A health service is required to provide adequate and satisfactory services. Therefore, as a health service provider, a health facility requires the support of electronic medical records to optimize recording in primary health services. Through the Republic of Indonesia Minister of Health Regulation number 24 of 2022 concerning the implementation of electronic medical records, every health service facility (Fasyankes) is required to run an electronic patient medical history recording system [8].

The solution for primary services that will be provided is related to interoperability issues and PMK 24 regulations, namely by adding several supporting features so that they can maximize existing services in primary health facilities, such as the electronic medical record (RME), which is a computerized health information system in provides detailed information records including patient demographic data, patient medical history, allergies, history of laboratory tests, and some decision support [9]. The challenges of electronic medical records are interoperability and integration [10]. The Ministry of Health of the Republic

of Indonesia has inaugurated the Satu Sehat platform to achieve interoperability and integration of digital health services used by the public, health service facilities and other relevant stakeholders.

Electronic medical records contribute significantly to improving the quality of service, one example is the facilitation of primary health services, namely the family doctor clinic. In applying electronic medical records to family doctor clinics, it is ideal to use a special classification standard for primary health services, namely the International Classification for Primary Care (ICPC). So far, primary health services in Indonesia still use the International Statistical Classification of Disease (ICD). The International Classification of Primary Care (ICPC) is a classification system that aims to explain patient clinical information data in primary health care [11].

The provision of primary health services must be able to take advantage of the use of wearable devices to monitor patients. A wearable device is an electronic device that can determine physical conditions and patterns life of its users [12]. With the integration of wearable devices with electronic medical records will produce an interactive dashboard that allows users to easily and quickly view data visualizations, one of which is in the form of a patient's condition chart. The patient dashboard is useful for monitoring the continuity of patient care, where data comes from electronic medical records, wearable devices, or patient contributions through personal health records (data accessibility/medical information for patients).

2 Method

The method in this study used participatory action research, where researchers collected data through observation and interviews or focus group discussions involving research subjects. The research subjects involved were family doctors, nurses and pharmacists in primary care, as well as primary care patients.

Research Period January-November 2023, Data collection 10 patient respondents in primary care Family doctor, Nurse, Pharmacist, Medical recorder, Research Location UGM Korpagama Family Medicine Clinic.

2.1 Wearable Device and Dashboard System Design

The design of this Monitoring System and Dashboard begins with making flowcharts, entity relationship diagrams, data flow diagrams, use case diagrams, and activity diagrams. This Monitoring system will later be accessed via Mobile Apps which can be installed through the Play Store and consists of two Mobile Apps, one Web Based Application for Administration, while

the dashboard will later be accessed via a Web Based application.

2.2 Prototype

There are 2 types of prototypes for the Monitoring System, namely Mobile Apps for Patients and Web Apps for Administration, while for dashboards using Web Apps. This prototype is designed so that users/patients can interact with Monitoring and the dashboard that will be used and can provide feedback for further development. The Monitoring User Interface and dashboard were designed using figma and then entered into Bootstrap and displayed and used to get feedback from users to evaluate the usability of the Monitoring System.

3 Results

3.1 Stages of Data Needs Analysis

The stages of data analysis in this study include:

- Action diagnosis stage, at this stage a literature review is carried out related to primary service electronic medical records with ICPC, use of wearable devices and presentation of patient information in the form of dashboards. Furthermore, a Focus Group Discussion (FGD) was carried out with family doctors and health staff at the family clinic to identify needs and problems. use of electronic medical records in primary care. The output of this stage is the need for electronic medical records and management of medical record data to support continuity of care.
- In the action planning stage, at this stage a focus group discussion (FGD) was conducted to determine priorities for the use of electronic medical records in primary care. The output of this stage includes plans to implement electronic medical records connected to wearable devices to produce dashboards.
- In the implementation phase, at this stage the development of electronic medical records based on the International Classification for Primary Care (ICPC) version 3 will be carried out, then testing the functions of electronic medical records, including reconciliation of data sources from wearable devices and personal health records. The output of this stage is an interoperable ICPC-based electronic medical record.
- Evaluation Phase, at this stage an evaluation is carried out using the System Usability Scale (SUS) framework to evaluate the usability of electronic medical records. The output of this stage includes continuous improvement of electronic medical records in primary care.

3.2 Data Sources

Sources of data in this study are primary data and secondary data obtained from data collection through questionnaires, interviews and documentation.

3.3 Dashboard Design

The dashboard is designed according to the needs of primary services. Figure 1, Figure 2, and Figure 3 show the dashboard design that has been designed:

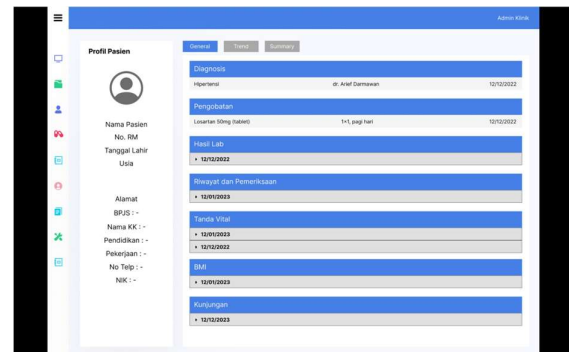


Fig. 1. General (Patient History) shows a dashboard related to the patient profile which diagnosis, treatment, lab results, history and examination, vital signs, etc.

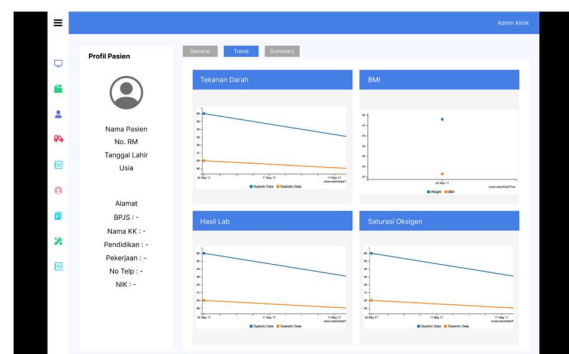


Fig. 2. Trend (Patient Graph) shows a dashboard regarding patient trends containing blood pressure, BMI, lab results and oxygen saturation

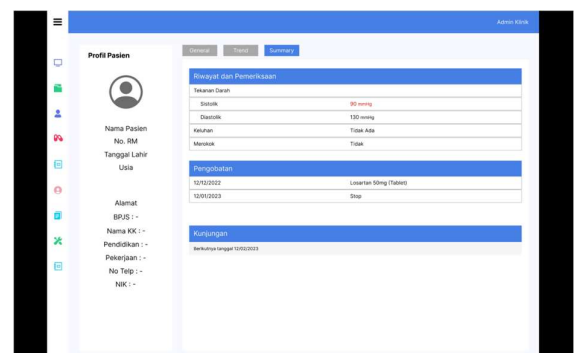


Fig. 3. Summary (Summary Patient) shows a summary containing the patient's history and examination, treatment that has been carried out, as well as history of visits to health facilities

3.4 Implementation of Electronic Medical Records based on ICPC-3

Figure 4 shows a general patient examination form with subjective indicators based on ICPC-3 and Figure 5 shows a general patient examination form with assessment indicators based on ICPC-3.

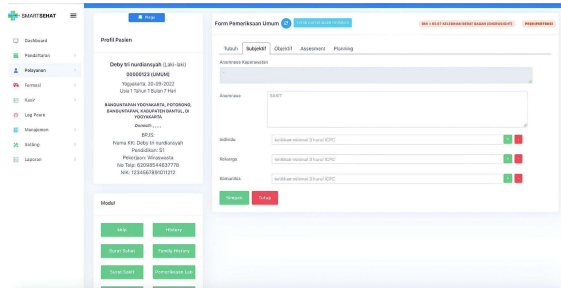


Fig. 4. Subjective with ICPC-3

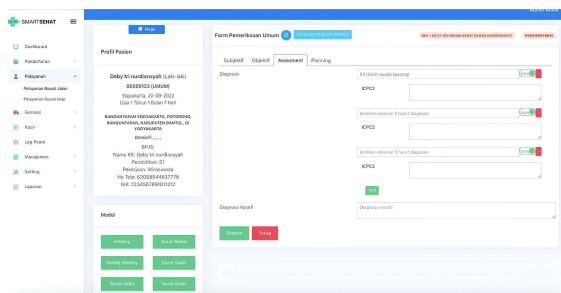


Fig. 5. Assessment with ICPC-3

3.5 Utilization of wearable devices in supporting electronic medical records

The following (Figure 6) is a prototype of a medical gamma application (Monitoring application) that utilizes wearable devices and is integrated with electronic medical records in primary care.

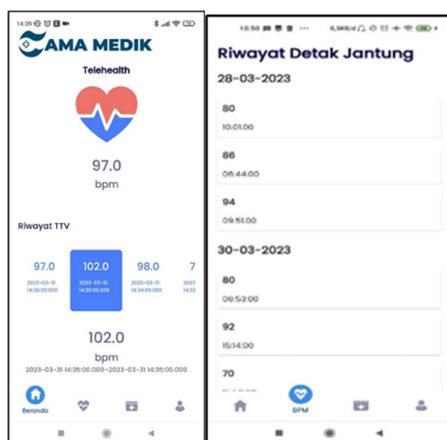


Fig. 6. Application of Gama Medik for a Wearable device

Evaluation of the Monitoring Application used the System Usability Scale (SUS) questionnaire and was carried out by 10 respondents. The questionnaire we sent resulted in the scores listed in Table 1.

Table 1. SUS Score Results for Monitoring Applications

Respondent Data	SUS Score/Score
1	62.5
2	67.5
3	70
4	77.5
5	52.5
6	52.5
7	57.5
8	62.5
9	55
10	62.5
Average SUS Score is 62	

4 Discussion

Electronic medical records contribute significantly to improving the quality of service, one example is the facilitation of primary health services, namely the family doctor clinic. In applying electronic medical records to family doctor clinics, it is ideal to use a special classification standard for primary health services, namely the International Classification for Primary Care (ICPC-3) where so far primary health services in Indonesia still use the International Statistical Classification of Disease (ICD). The International Classification of Primary Care (ICPC-3) is a classification system that aims to explain patient clinical information data in primary health care.

The provision of primary health services must be able to take advantage of the use of wearable devices to monitor patients. A wearable device is an electronic device that can determine the physical condition and lifestyle of its users. With the integration of wearable devices with electronic medical records, it will produce an interactive dashboard that allows users to easily and quickly view data visualizations, one of which is in the form of a patient's condition chart. The patient dashboard is useful for monitoring the continuity of patient care, where data comes from electronic medical records, wearable devices, or patient contributions through personal health records (accessibility of medical

data/information for patients). Acceptance of patients in using wearable devices is quite acceptable, this is proven from the results of the SUS data showing that the SUS results with a value of 62 are classified as "Enough" which can be interpreted that the use of wearable devices can be well received by users and can be immediately implemented to support health services in the future because wearable devices are made to monitor health at this time generally equipped with movement sensors and heart rate. These two sensors have become a must-have feature for every smartwatch manufacturer today so that patients can see their condition while they are being treated. With this, as more and more sensor technologies can be embedded into smartwatches, the greater the opportunity for smartwatches to improve human health with various aspects [13].

5 Conclusion

In implementing electronic medical records in primary care to support continuity of care, the International Classification of Primary Care (ICPC-3) standard can be used. Patient telemonitoring can utilize wearable devices. As well as a patient dashboard that connects various useful data sources to support clinical decision making.

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