

Development of Electronic Health Record Application for Integrated Surgery Center

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ABSTRACT: The development of the EHR Application at the surgical service center in the hospital is a combination of two service units working together, namely: the surgery unit and the anesthesia unit. Although there has been a lot of research into the development of applications in surgical and anesthesia units, that it is necessary to build an EHR application that can combine the integration concepts of surgery and anesthesia medical services unit. This study aims to develop an EHR Application for Surgery Center which consists of integrated surgical and anesthesia service units. Methodology in developing EHR surgery center application consist of several stage, start from requirements analysis, design, construction and implementation. EHR Application for surgery center which integrates surgical units and anesthesia units has been successfully built with features: registration of surgery and anesthesia patients, pre-operation, pre-anesthesia, intra-operation, intra-anesthesia, post-operation and post-anesthesia and an implementation test was carried out at one of the regional hospitals in Riau Province, Indonesia.

KEYWORDS: EHR, Electronic Health Record Application, Surgery Center, Anesthesia Center

INTRODUCTION

Recent developments in technology have impacted the digitalization of health data and facilitated the adoption of electronic health record (EHR) application, which have become mandatory in some countries [1]. A modern EHRS is not simply a digitized paper chart. Rather, it is a digital application that can actively interact with providers and patients and is composed of a series of data fields that lend themselves to analysis, processing, and reporting to support communication, appropriate clinical interventions, quality improvement, and patient safety [2] [3].

EHR emerged as a result of the rapid development of Internet technology and the advancement of medical information, gradually replacing the complicated handwritten medical records, which has become an indispensable part of the hospital [4]. EHR is generated in the clinical treatment process. It refers to the digital medical record based on the application of the medical information system and the comprehensive information of medical records based on the corresponding pictures, texts, forms, images, data and data [5].

The development of the EHR application at the surgical service center in the hospital is a combination of 2 service units working together, namely: the surgery unit and the anesthesia unit [6] [7]. Developing an anesthesia module in the operating room is one of the significant steps toward the implementation of EHR in health care centers. Developing an electronic anesthesia module can manage a patient's anesthesia information by recording procedures, physiological changes, key events, and drug

prescriptions that occur during the pre-intra and post-operative period [8].

Anesthesia information management systems (AIMS) have evolved from simple, automated intraoperative record keepers in a select few institutions to widely adopted, sophisticated hardware and software solutions that are integrated into a hospital's electronic health record system and used to manage and document a patient's entire perioperative experience [9].

The implementation of clinical decision support tools within electronic medical record (EMR) could improve Acute Kidney Injury (AKI) care and outcomes. While clinical decision support tools have the potential to enhance recognition and management of AKI. The clinical decision support was developed for use by multiple healthcare providers at the time and point of care on general medical and surgical units [10] [11].

The research to determine Minimum Data Set (MDS) for Anesthesia information management system (AIMS) in Caesarean section in Iran was developed to defined set of data elements holding information regarding a series of target entities to provide a basis for planning, management, and performance evaluation in Obgyn Surgery [12]. Overall 8 classes of data (consisted of 81 key data elements) were determined as final set. Also, the most important required capabilities were related to airway management and hypertension and hypotension management [13] [14] [15].

Although there has been a lot of research into the development of applications in surgical and anesthesia units, researchers have concluded that it is necessary to build an

METHODOLOGY

Methodology in developing EHR Surgery Center application consist of several stage, start from requirements analysis, design, construction and implementation.

Requirements analysis

The initial phase where stakeholders gather to define the high-level requirements and scope of the EHR Surgery Center application. This phase focuses on capturing the essential features and functionalities that the EHR application must have. Stakeholders who were sources came from general hospitals and psychiatric hospitals in Riau Province, Indonesia.

Design

This is a collaborative process focused on creating and refining EHR Surgery Center application design based on user feedback. Start from creation of EHR database structure, application prototypes and allows users to visualize and interact with the design early in the process

Construction

It focuses on building the system through iterative cycles, allowing for rapid prototyping and frequent feedback. EHR is developed in small, manageable increments or iterations. EHR Surgery Center application prototypes is built based on the designs and requirements gathered in earlier phases. After each iteration, users review the EHR application prototypes

EHR application that can combines the integration concepts of surgery and anesthesia medical services unit.

and provide feedback. This feedback is essential for making necessary adjustments and improvements in subsequent iterations. As features are developed, they are integrated into the overall application.

Implementation

This phase involves final preparations for deployment and ensuring that the EHR Surgery Center application is ready for end-users. Start from comprehensive testing is conducted to ensure that the EHR Surgery Center application functions correctly and meets all requirements. Training sessions for end-users to familiarize them with the application’s features and functionalities. Migrating data from previous systems, configuring servers, and ensuring that all components are correctly set up. Finalizing user manuals, technical documentation, and support materials and gathering feedback from users after the deployment helps identify any areas for improvement or additional features that may be needed

RESULTS AND DISCUSSION

Requirements analysis

This phase focuses on identifying the essential features and functionalities that the EHR Surgery Center application must have. Essential features and functionalities came from medical services provide in the hospital. A medical service unit running in a hospital can be seen in Figure 1.



Figure 1 Medical Services Unit

Medical services in a hospital consist of a registration department, an outpatient or emergency department, an inpatient department, an operating room section for patients who require surgery, a laboratory section for clinical pathology and anatomical pathology examinations, a radiology section, a nutrition section, and a medical check-up section, pharmacy section and billing section for payment.

Design

The design phase begins with designing the medical service process that will be handled by the EHR Surgery Center application, which will be explained in detail in Figure 2.

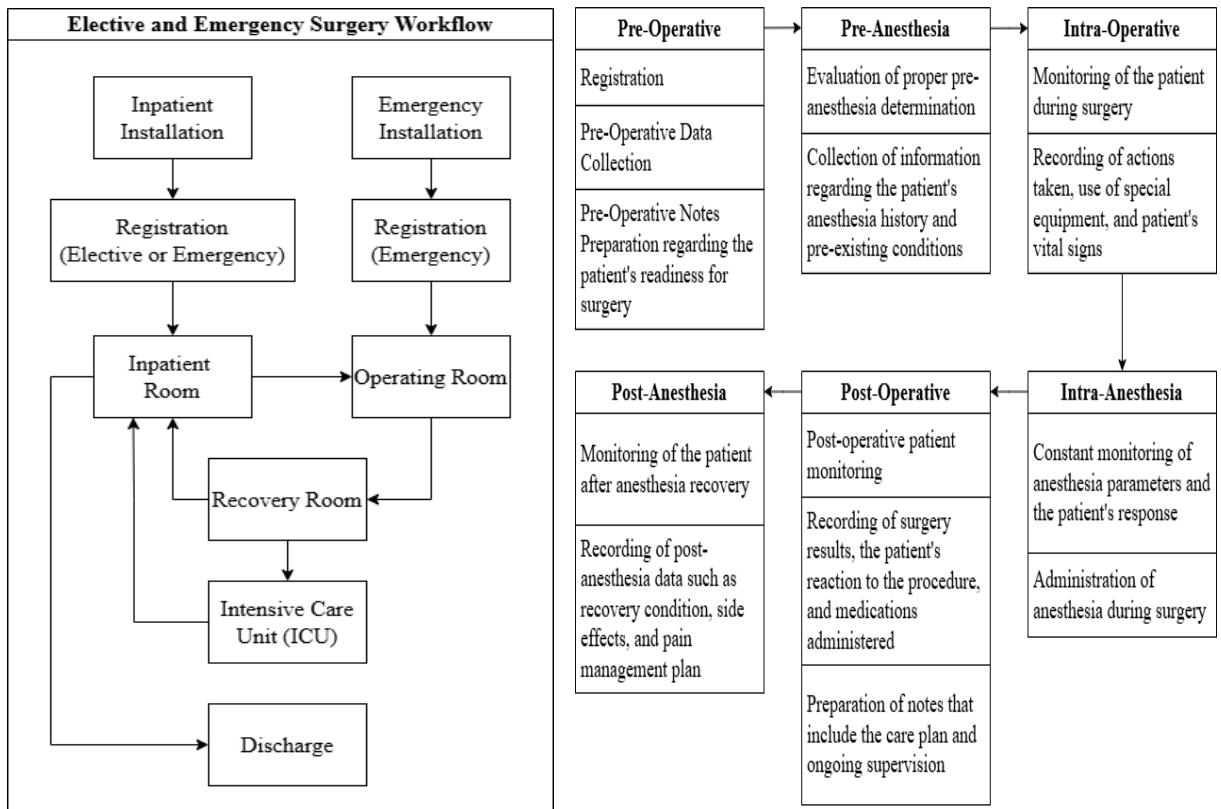


Figure 2 Medical Services Process in Surgery Center

A descriptive overview of the EHR Surgery Center application database class diagram can be seen in Figure 3.

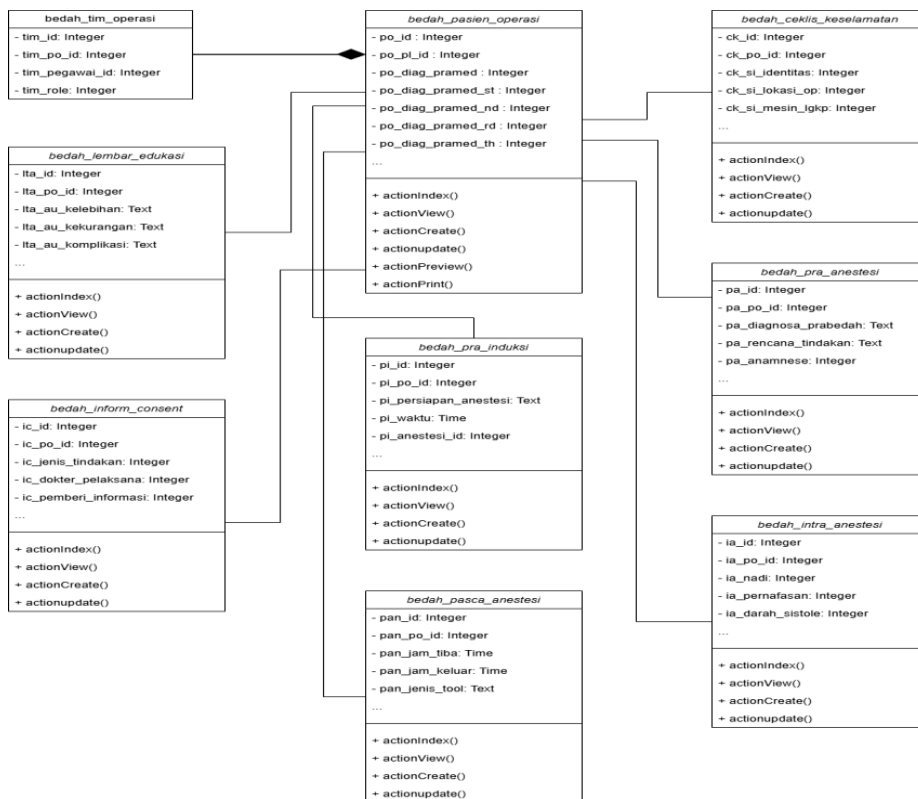


Figure 3 EHR Surgery Center Class Diagram

CONSTRUCTION

EHR Surgery Center application is developed in small, manageable increments or iterations. The application is built based on the requirements and designs gathered in earlier

phases. The results of the EHR Surgery Center application development can be seen in Figures 4 and 5 below.

Figure 4 explains the process of filling in data in the application in the Pre-Operation and Pre-Anesthesia Form which is carried out by the surgery unit and anesthesia unit nurses.

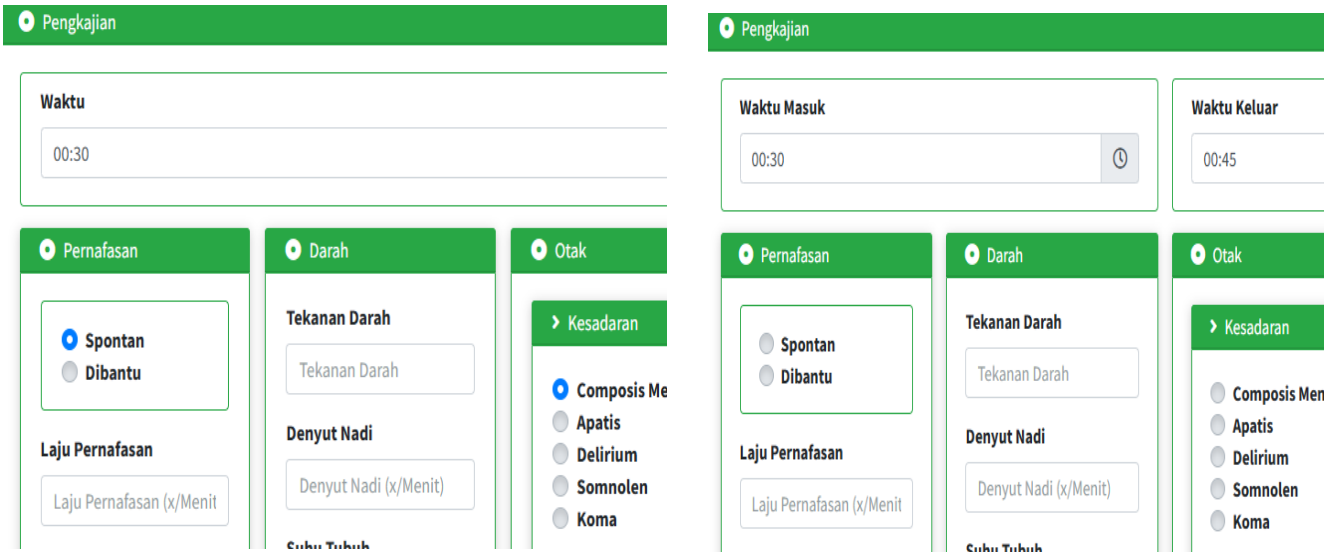


Figure 4 Pre Operative and Pre Anesthesia Form

Figure 5 explains the process of filling in data on the Post-Operation and Post-Anesthesia Forms carried out by the Surgeon and Anesthetist.

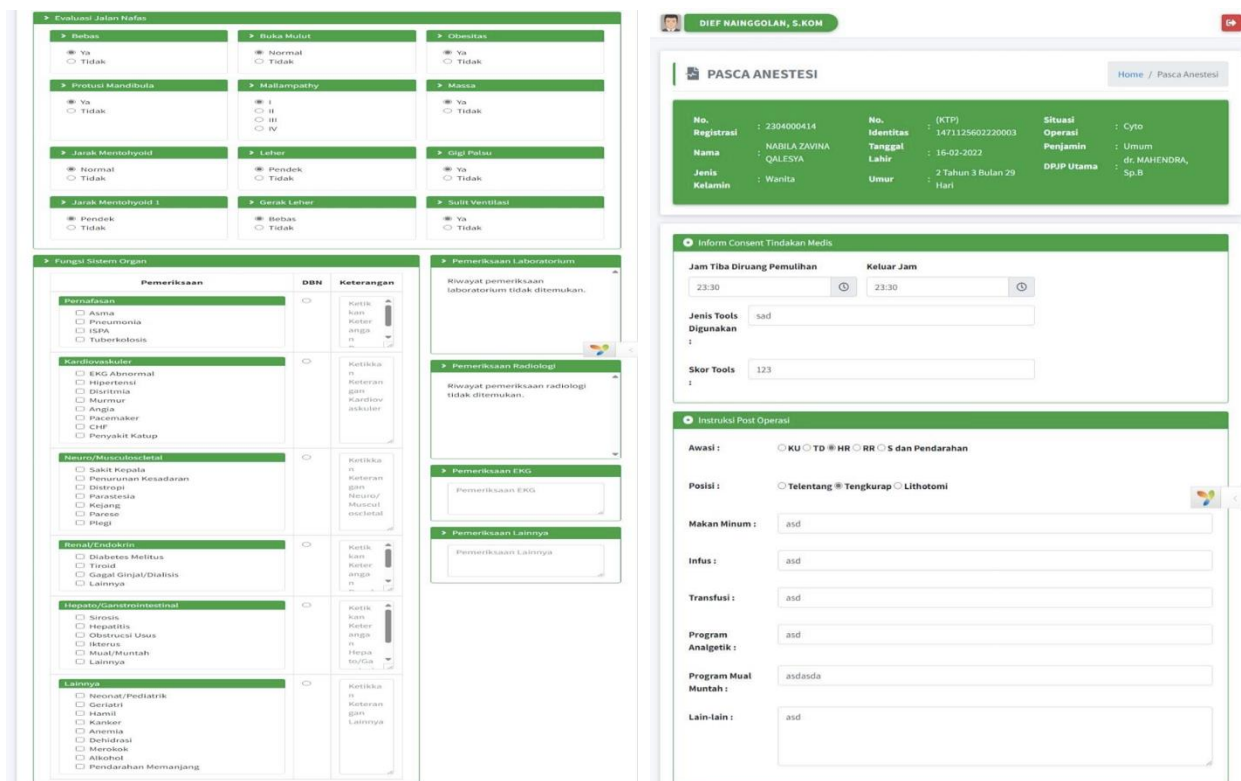


Figure 5 Post Operative and Post Anesthesia Form

Implementation (N/A)

The Implementation of EHR Application for Surgery Center test was carried out at one of the regional hospitals in Riau Province, the surgery unit and the anesthesia unit

CONCLUSION

The EHR Application for surgery center which integrates surgical units and anesthesia units has been successfully built with features: registration of surgery and anesthesia patients, pre-operation, pre-anesthesia, intra-operation, intra-anesthesia, post-operation and post-anesthesia and an implementation test was carried out at one of the regional hospitals in Riau Province with the aim of facilitating and increasing the effectiveness of filling in integrated medical record data in surgical service centers.

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