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Development of a Post-Anesthesia Phase Documentation Feature in the Areme Application for Anesthesiology Nursing Care

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Abstract: The rapid advancement of technology requires innovation in anesthesia nursing education, particularly in transitioning conventional documentation of anesthesia nursing care (ASKAN) into electronic formats. To support this need, the AREME application was developed as a tool to assist students in documenting ASKAN across different phases of anesthesia care. Previous versions of the system were limited, as documentation features only covered the intra-anesthesia phase. This study addresses those limitations by expanding the application to include comprehensive documentation from pre-anesthesia through post-anesthesia. Using a Research and Development (R&D) design with a Rapid Application Development (RAD) approach, the study produced new modules and interface improvements. Specifically, a post-anesthesia documentation feature was integrated, enabling outputs that encompass both intra- and post-anesthesia phases. The findings demonstrate that the AREME application has been successfully enhanced to meet user needs, improve documentation completeness, and support more effective recording of anesthesia nursing care.
Keywords: Anestesia Nursing Care, post anestesia documentatiom, electronic medical recod.

INTRODUCTION

The use of technology in the healthcare sector continues to develop day by day; therefore, health professionals need to apply their health knowledge as an effort to improve the health status of the community. Consequently, health resources must be empowered and supported in developing technology-based health services [1]. In the era of the Fourth Industrial Revolution (Industry 4.0), technology has become a major driver, particularly in the field of medical records [2]. Global technological advancement has accelerated the transformation of clinical documentation from paper-based to electronic systems, which are more effective and efficient for documenting and processing patient data [3]. Electronic medical records (EMRs) can improve the quality of services in healthcare institutions [4]. However, implementation poses technical challenges, as the successful use of electronic medical records depends on the level of acceptance among medical staff in adopting and mastering the technology [2].

Various healthcare services in the United States have implemented Electronic Health Record (EHR) systems for more than 10 years. According to the Healthcare Information and Management Systems Society (HIMSS) Analytics Report in 2015, 1,313 hospitals in the United States had fully implemented physician documentation, clinical decision support systems (DSS), and electronic access to medical imaging [5]. The implementation of electronic medical records has also been carried out in several hospitals across Indonesia. Based on the performance achievements of the Directorate of Referral Health Services in the 2022 Government Agency Performance Accountability Report, 345 hospitals had implemented Electronic Medical Records (Rekam Medis Elektronik/RME) out of a total of 3,072

hospitals in Indonesia. This indicates that implementation in Indonesian hospitals remains at only 11.23% [6].

To respond to current technological developments—particularly for anesthesiology nursing students—adaptation is needed from conventional ASKAN documentation to E-ASKAN documentation. Therefore, the AREME application system has been developed. Anesthesia Electronic Medical Record (AREME) is an application for recording and documenting anesthesiology nursing care electronically [7]. In previous research, the development of the AREME application for ASKAN documentation showed that the application was able to facilitate a documentation process that was previously handwritten, making it more structured and systematic. However, several limitations need to be addressed, such as the development focus being limited only to the intra-anesthesia process [7]. Based on this background, further development of the AREME application is required to improve the completeness of anesthesiology nursing care documentation, rather than being restricted to intra-anesthesia documentation alone. This is because complete anesthesia medical records are a key element of good-quality anesthesia practice [8].

To address these issues, the researchers intend to further develop the AREME application by adding a post-anesthesia documentation feature in accordance with the guidelines in the Anesthesiology Nursing Care (ASKAN) handbook.

RESEARCHMETHOD

Research Site and Period

This study was conducted at the D4 Anesthesiology Nursing Study Program, Universitas Muhammadiyah Purwokerto, during October–December 2025.

Research Object

The object of this study was the AREME application, which was developed in the post-anesthesia phase to document the anesthesiology nursing care process.

Data Collection Techniques

The research data were obtained through several complementary data collection techniques, as follows:

1. Observation
   Direct observation was conducted on the process of completing Anesthesiology Nursing Care (ASKAN) documentation using the AREME application. This observation aimed to obtain a detailed understanding of how students utilized the application in documentation practice, while also identifying constraints and advantages that emerged during use.
2. Interviews
   Semi-structured interviews were conducted with students and clinical practice supervisors (lecturers). These interviews allowed respondents to share their experiences, perceptions, and expectations regarding the application, thereby producing more in-depth and contextual information about user needs.
3. Literature Review
   A literature review was carried out by examining various sources, including textbooks, journal articles, and guidelines related to information systems and anesthesiology nursing documentation. This review served as the theoretical foundation to strengthen the analysis and to ensure that the application development aligned with standards and previous studies.

Development Procedure

1. Requirement Planning (Needs Identification)
   System requirements were examined based on anesthesia documentation guidelines and user input [14]. User needs were identified through interviews, observations, and documentation studies of the ASKAN documentation process.

2. Design Workshop (System Design)
   System design was conducted to facilitate the definition of the information system to be developed and to establish the overall system architecture [14]. The design outputs included a Use Case Diagram and an Entity Relationship Diagram (ERD), covering the user interface and the database structure.

3. Implementation
   This stage involved developing the AREME application according to the design results, followed by system testing using Black Box Testing to ensure that all features functioned in accordance with the specifications [14].

RESULTS AND DISCUSSION

Requirements Identification (Requirement Planning)

The identification process was carried out by observing the results of previous system developments and reviewing user responses through question-and-answer sessions and interviews. Based on the collected data, the researchers were able to identify several key findings that served as the foundation for system development, namely:

1. A post-anesthesia recording module feature is required as part of the completeness of ASKAN documentation.
2. The results generated from the post-anesthesia module can be printed for ASKAN student documentation purposes.

Design Workshop

Use Case Diagram (UCD)

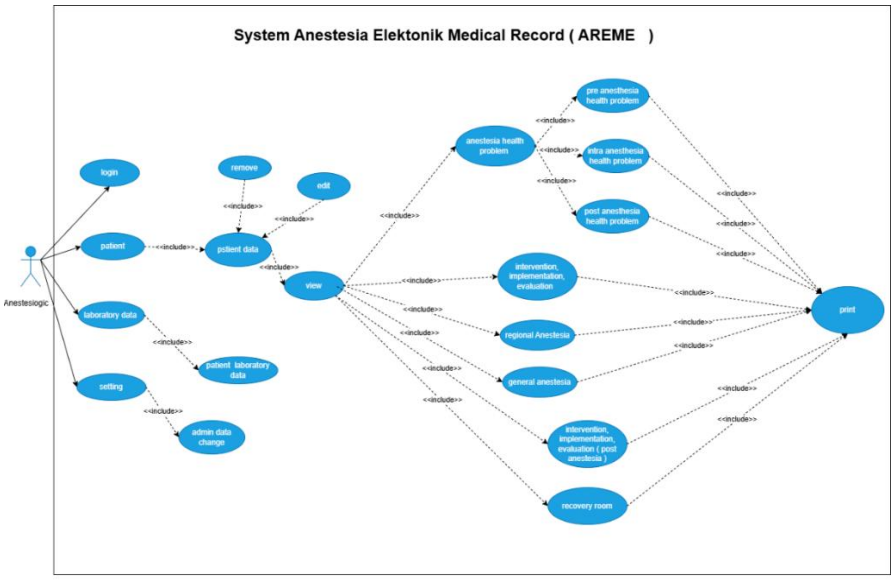

Figure 1. *use case diagram* (UCD)

A Use Case Diagram (UCD) is one of the system modeling tools used to describe workflows in a structured and easily understandable manner. This diagram also serves as a communication medium between domain experts, end users, and developers, ensuring that all stakeholders share a common understanding of the designed system [21].

The development process began with modifying the initial use case diagram. After the admin (anesthesiologist) adds patient data, the admin is able to view, edit, and delete patient records. Within the patient view menu, the admin can also input the additional features developed by the researchers.

In the health problem documentation input feature, the admin can select the anesthesia phase (pre-anesthesia, intra-anesthesia, and post-anesthesia). Additional features include documentation inputs for the intervention phase, implementation, and post-anesthesia evaluation. Furthermore, a new documentation feature was added for when the patient is in the recovery room, referred to as the recovery room documentation feature.

Entity Relationship Diagram (ERD)

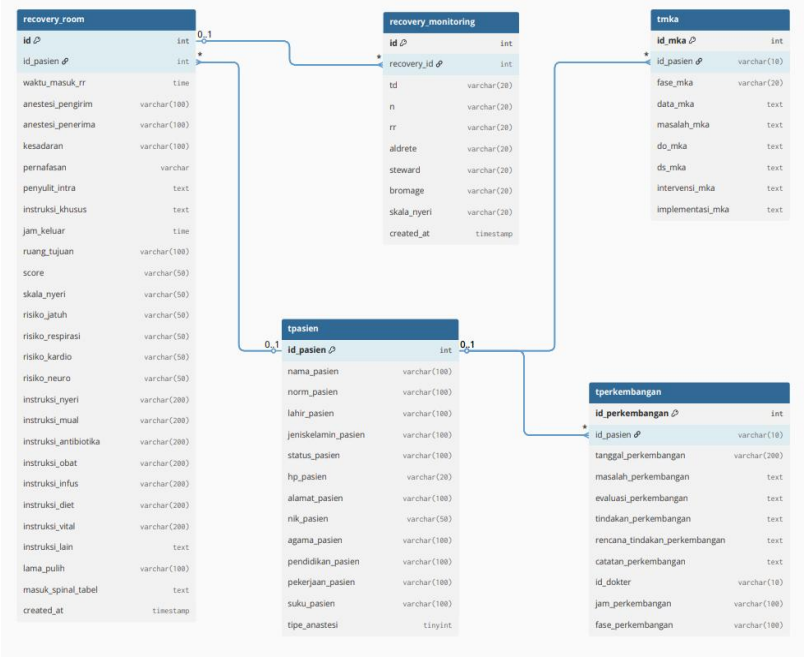

Figure 2. Entity relationship diagram (ERD)

An Entity Relationship Diagram (ERD) is used to conceptually represent data before it is implemented into an actual database schema [22]. The ERD serves as a blueprint of a database in the form of a model that defines data components and the relationships among them [23].

The main components of an ERD consist of entities, attributes, and relationships (cardinality). Cardinality represents the association between two or more entities. Relationships are illustrated by lines connecting related entities and are labeled according to the type of relationship they represent [22].
The following describes the relationships shown in Figure 2:

1. Relationship between Patient and Anesthesia Health Problems (tmka)
   The relationship between Patient and tmka has a one-to-many cardinality.
2. Relationship between Patient and Intervention, Implementation, and Evaluation Notes (tperkembangan)
   The relationship between Patient and tperkembangan has a one-to-many cardinality.
3. Relationship between Patient and Recovery Room Records (recovery room)
   The relationship between Patient and recovery room has a one-to-many cardinality.
4. Relationship between Recovery Room and Recovery Monitoring
   The relationship between Recovery Room and Recovery Monitoring has a one-to-many cardinality.

Implementation

Implementasi data base

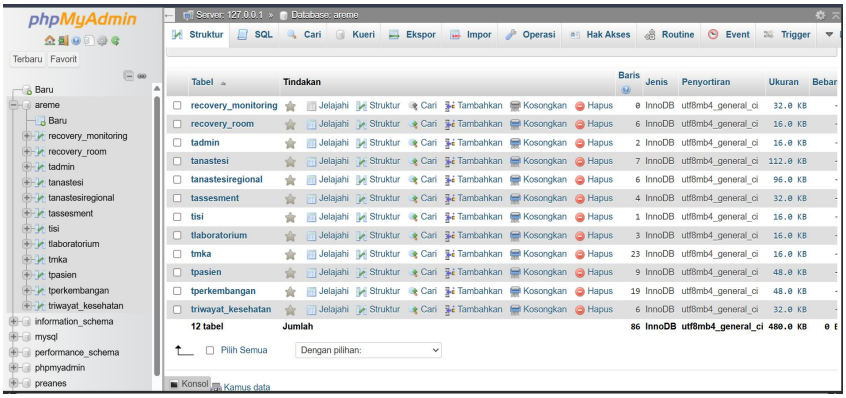

Figure 3. Implementasi data base

Database design was conducted to determine the structure and table requirements to be used in the system's data storage process [24]. Database design can be understood as the process of identifying relevant information and data processing requirements, and then mapping these results into the database management system used.

The stages of database design generally include four main steps: requirements specification, conceptual design, logical design, and physical design [25]. A database management system consists of a collection of interrelated data along with a set of programs used to access them. Through this system, users can perform various operations such as reading, adding, deleting, and retrieving data as needed [16].
In the database structure shown in Figure 3, the added data include:

1. Recovery Monitoring Table — used to store post-anesthesia patient monitoring data.
2. Recovery Room Table — used to store patient data during the recovery room phase.
3. TMKA Table — designed to allow users to select anesthesia phases (pre-anesthesia, intra-anesthesia, and post-anesthesia).
4. Tperkembangan Table — further developed into tables containing care plans, implementation, and intra- and post-anesthesia evaluation records.

Interface Design Implementation

At this stage, the software design was realized in the form of program units by organizing independent modules according to the required functions [14]. These modules were then translated into computer language through coding using Visual Studio Code with PHP (Hypertext Preprocessor) as the programming language. PHP is an open-source programming language used to develop websites by embedding scripts within HTML code [19].
As a result, an application system tailored to user needs was successfully developed, producing:

1. Patient data form menu interface

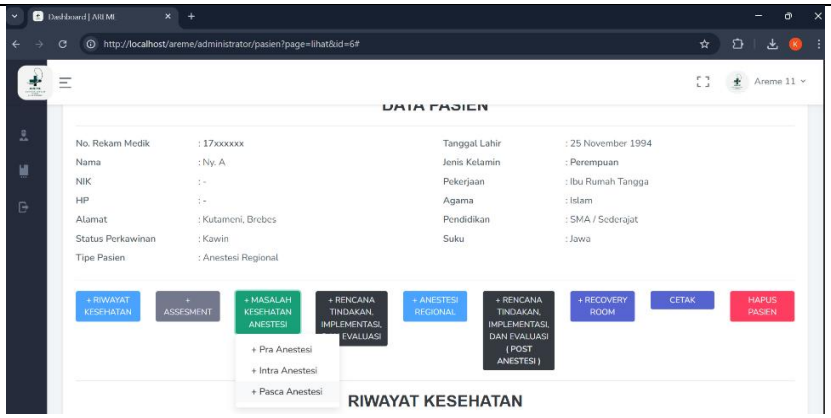

Figure 4. Patient Data Form Interface

Figure 4 shows the patient data page that appears after the admin or user completes the patient data form. The patient data page contains features that are tailored to the needs of Anesthesia Nursing Care documentation.

In the context of developing post-anesthesia phase documentation, the page includes features such as post-anesthesia health problems, progress records (care plans, implementation, and post-anesthesia evaluation), and the recovery room feature, which contains the recovery monitoring table.

2. Data input display for the (+ Post-Anesthesia Health Problems) feature

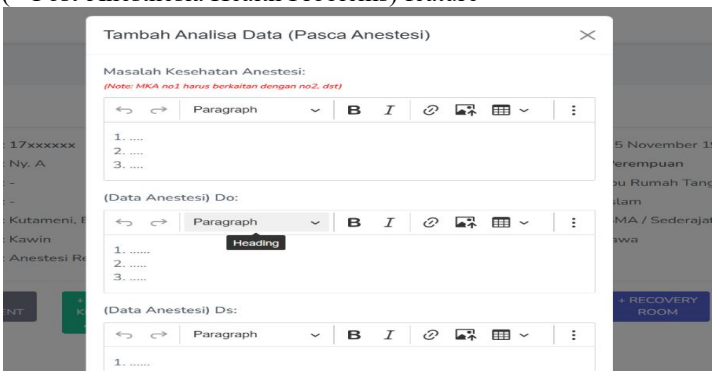

Figure 5. Post-Anesthesia Health Problems Data Input Interface

Figure 5 shows the data entry form for post-anesthesia health problems. In this feature, users can input data including post-anesthesia data analysis, patient objective data (OD), and patient subjective data (SD). Users are able to enter documentation data multiple times, allowing the documentation to be adjusted for patients who have more than one post-anesthesia anesthesia health problem (MKA).

3. Data input display for the Progress feature (+ Care Plan, Implementation, and Post-Anesthesia Evaluation)

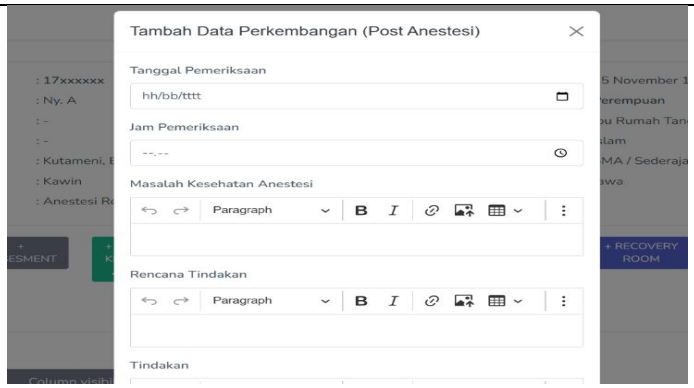

Figure 6. Post-Anesthesia Progress Data Input Interface

Figure 6 shows the data entry form for post-anesthesia progress. In this feature, users can input data including time, anesthesia health problems, care plans (interventions), actions (implementation), and progress notes (evaluation) during the post-anesthesia phase. The feature also allows users to enter documentation data multiple times so that it can accommodate patients who have more than one post-anesthesia anesthesia health problem (MKA).

4. Data input display for the (+ Recovery Room) feature
In the recovery room feature, users can input patient documentation records while the patient is in the recovery room, which is divided into three main sections.

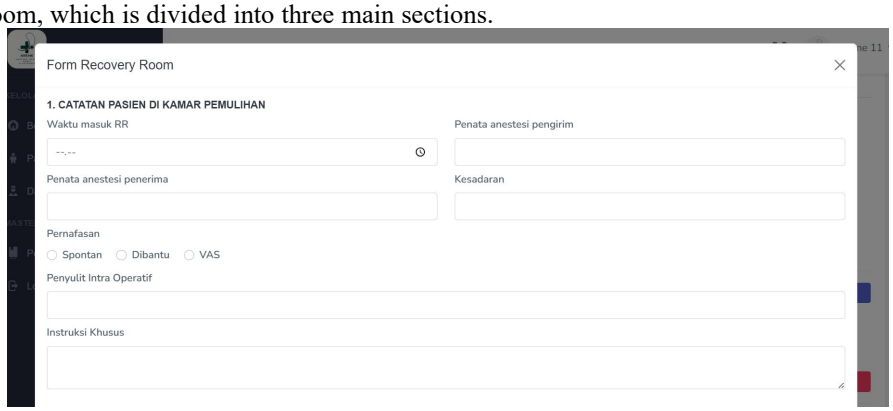

Figure 7. Display of Point 1: Patient Notes in the Recovery Room

In the first section (shown in Figure 7), users can input documentation data including admission time, sending anesthetist, receiving anesthetist, level of consciousness, respiration status, intraoperative complications, special instructions, and recovery duration, which are linked to the post-anesthesia monitoring table.

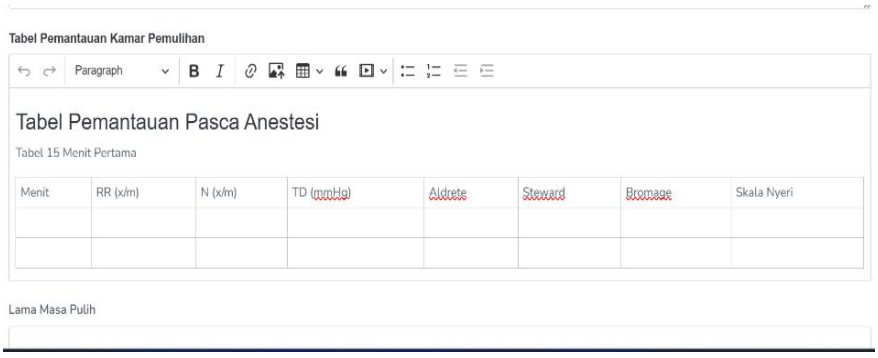

Figure 8. Recovery Monitoring Table Interface

Figure 8 shows the data input interface for the recovery monitoring table in the recovery room. In this monitoring table, users can record patient monitoring data at regular time intervals, including respiratory

rate (RR), pulse (HR), blood pressure (BP), Aldrete score, Steward score, Bromage score, pain scale, and recovery duration. Documentation can then proceed to the second section (patient discharge from the recovery room), as shown in Figure 9.

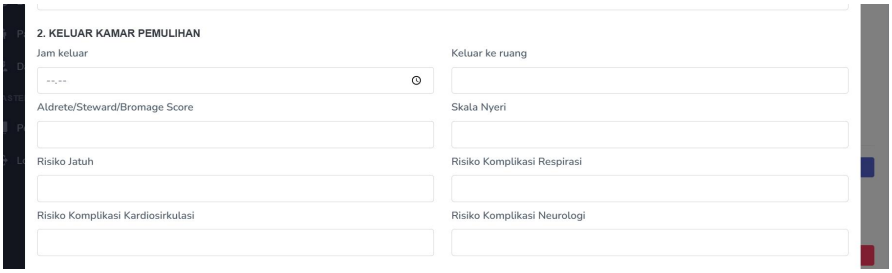

Figure 9. Display of Point 2: Patient Discharge from Recovery Room

The second section (Figure 9) displays the patient discharge documentation form, which includes discharge time, Aldrete/Steward/Bromage scores, pain scale, presence or absence of risks (fall risk, cardiovascular complications, respiratory complications, neurological complications), and the destination ward after leaving the recovery room. Users can then continue documentation in the next section, shown in Figure 10.

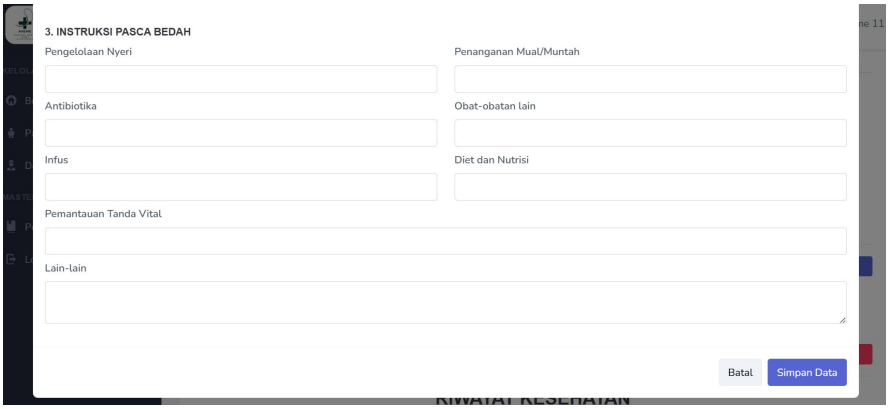

Figure 10. Display of Point 3: Postoperative Instruction Documentation

The third section (Figure 10) displays the postoperative instruction input form, which includes pain management, antibiotics, recommended intravenous fluids, vital sign monitoring recommendations, nausea/vomiting management, other medications, diet and nutrition, and additional instructions.

5. Display of the Print Feature Output

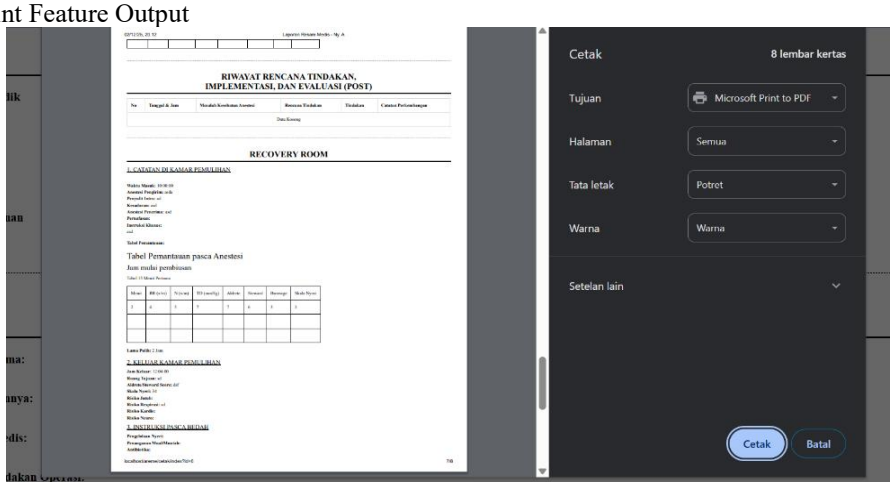

Figure 11. Print Output Interface

Figure 11 shows the print output page generated by the application system. This page displays the ASKAN results from the developed AREME program, which includes patient documentation records during both intra-anesthesia and post-anesthesia phases. The information presented includes patient data analysis, hemodynamic monitoring during anesthesia, anesthesia health problems, and intervention, implementation, and evaluation actions.

In the post-anesthesia phase, the printed output also includes recovery room documentation such as patient notes in the recovery room, the post-anesthesia monitoring table, discharge records, and postoperative instructions, all summarized within the recovery room feature.

Black Box Testing

Black box testing is an application system testing method used to determine whether menus and functions operate according to user requirements and run successfully [26]. After user approval, the next development stage involved system testing conducted on Thursday, December 11, 2025, by an expert team. The testing results showed 100% validity, indicating that all menus and functions operated in accordance with user needs.

The results of the system testing are presented in the following table.

Table 1. Black Box Testing Results

No.	Test Description	Test Procedure	Expected Result	Test Result
1	Admin login test	Enter username and password, then click Log In	The Dashboard page is displayed	Valid
2	Dashboard button testing	a) Click Home button b) Click Patients button c) Click Laboratory Data button d) Click Settings button e) Click Logout button	a) Displays the Home page b) Displays Add Patient and Patient Data pages c) Displays the Laboratory Data page d) Displays the Settings page e) Returns to the Login page	Valid
3	Patient Data page button testing	a) Test Add Patient Data input b) Test View, Edit, and Remove buttons	a) Opens the page for entering patient data b) Allows viewing, editing, and deleting patient data, and saves the updates	Valid
4	Anesthesia Health Problem input button testing	a) Input and save pre-anesthesia data b) Input and save intra-anesthesia data c) Input and save post-anesthesia data	a) Opens the Anesthesia Health Problem input page; saving succeeds; pre-anesthesia health problem data are displayed in the Anesthesia Health Problem module b) Opens the input page; saving succeeds; intra-anesthesia data are displayed c) Opens the input page; saving succeeds; post-anesthesia data are displayed	Valid
5	Intra-anesthesia Care Plan, Implementation, and Evaluation input test	Enter intra-anesthesia care plan, implementation, and evaluation data, then save	Saving succeeds; the entered data are displayed in the intra-anesthesia progress section	Valid
6	General anesthesia / Regional anesthesia input test	Enter general/regional anesthesia data, then save	Saving succeeds; the entered data are displayed in the General/Regional Anesthesia section	Valid
7	Post-anesthesia Care Plan, Implementation, and Evaluation input test	Enter post-anesthesia care plan, implementation, and evaluation data, then save	Saving succeeds; the entered data are displayed in the post-anesthesia progress section	Valid
8	Recovery room data input test	Enter recovery room data, then save	Saving succeeds; the entered data are displayed in the Recovery Room section	Valid

No.	Test Description	Test Procedure	Expected Result	Test Result
9	Print button test	Click the Print button	Displays the print preview/output page	Valid
10	Delete patient button test	Click the Delete Patient button	Displays a delete confirmation option	Valid

CONCLUSION

This study successfully formulated recommendations for the development of the AREME system (Anesthesia Electronic Medical Record) by adding a post–anesthesiology nursing care documentation feature designed to improve the completeness of ASKAN records. The analysis results indicated that the AREME system indeed requires a dedicated feature for post-anesthesia documentation, as the previous system did not provide facilities for recording this stage. As a solution, this study proposed the development of a post-anesthesia module with an Entity Relationship Diagram (ERD)-based design to ensure data integrity. The module was then integrated into the application system, enabling users to digitally record, monitor, and evaluate post-anesthesia patients in a more structured manner.

To achieve better outcomes in the AREME application, the authors recommend continuously improving the ability to integrate theoretical knowledge with field practice so that research results become more relevant and applicable. This study is expected to serve as a reference for the advancement of anesthesiology nursing, particularly in the digitalization of documentation. The development of the post-anesthesia documentation feature in the AREME application can also serve as an initial foundation for more complex future research, such as adding an administrative management function so that the system can be implemented on a larger scale.

Furthermore, anesthesiology nursing students are expected to utilize the findings of this study as a practical learning tool for entering intra- and post-anesthesia data. By using the enhanced AREME application, students will become more familiar with digital documentation systems and be better prepared to meet the demands of modern clinical practice. Equally important, educational institutions are encouraged to support further research to enrich the AREME system so that it can be widely implemented across academic settings and healthcare facilities.

REFERENCES

[1] M. C. Yuniar *et al.*, “Pengembangan Teknologi dalam Bidang Kesehatan,” *J. Teknol. Sist. Inf. dan Apl.*, vol. 18, no. 2, pp. 49–52, 2022, [Online]. Available: https://www.e-journal.poltekkesjogja.ac.id/index.php/JTK/article/view/1143%0Ahttps://www.e-journal.poltekkesjogja.ac.id/index.php/JTK/article/download/1143/998

[2] F. R. Ikawati, “Efektivitas Penggunaan Rekam Medis Elektronik Terhadap Peningkatan Kualitas Pelayanan Pasien di Rumah Sakit,” *Ranah Res. J. Multidiscip. Res. Dev.*, vol. 6, no. 3, pp. 282–292, 2024, doi: 10.38035/rrj.v6i3.819.

[3] A. Keperawatan, E. Dalam, and P. Praktik, “JURNAL,” vol. 6, no. 6, pp. 836–845, 2023.

[4] E. wilda Faida, “Analisis Kesiapan Rekam Medik Elektronik Dengan Metode Technology Readiness Index Rumah Sakit Universitas Airlangga Surabaya,” *J. Kesehat.*, vol. 7, no. 3, pp. 140–154, 2020, doi: 10.25047/j-kes.v7i3.121.

[5] S. Ge, Y. Song, J. Hu, X. Tang, J. Li, and L. Dune, “The development and impact of adopting electronic health records in the United States: A brief overview and implications for nursing education,” *Heal. Care Sci.*, vol. 1, no. 3, pp. 186–192, 2022, doi: 10.1002/hcs2.21.

[6] A. Al Izza and S. Lailiyah, “Kajian Literatur: Gambaran Implementasi Rekam Medis Elektronik di Rumah Sakit Indonesia berdasarkan Permenkes Nomor 24 Tahun 2022 tentang Rekam Medis,” *Media Gizi Kesmas*, vol. 13, no. 1, pp. 549–562, 2024, doi: 10.20473/mgk.v13i1.2024.549-562.

[7] B. W. Abadi, M. Tania, G. Ching, T. Hardiyani, and R. Annisa, “Pengembangan Anestesi Rekam Medis Elektronik (AREME) untuk Dokumentasi Asuhan Keperawatan Anestesiologi,” vol. 6, no. 2, pp. 126–136, 2025, doi: 10.25047/j-remi.v6i2.5715.

[8] M. A. Pemalang, "2024 Madani : Jurnal Ilmiah Multidisipline Studi Kelengkapan Dokumentasi Pra Intra dan Pasca Anestesi di RSUD 2024 Madani : Jurnal Ilmiah Multidisipline," vol. 2, no. 9, pp. 185–195, 2024.
[9] M. Amin, W. Setyonugroho, and N. Hidayah, "ImPujihastuti. (2010). Isti Pujihastuti Abstract. Prinsip Penulisan Kuesioner Penelitian, 2(1), 43–56.plementasi Rekam Medik Elektronik: Sebuah Studi Kualitatif," *JATISI (Jurnal Tek. Inform. dan Sist. Informasi)*, vol. 8, no. 1, pp. 430–442, 2021.
[10] M. R. Pertiwi and D. Hardiyanti, "KEPERAWATAN DI RUMAH SAKIT A," vol. 7, no. 23, pp. 1230–1240, 2023.
[11] I. K. Setiabudi *et al.*, *Asuhan Keperawatan Anestesiologi/ Asuhan Kepenataan Anestesi (ASKAN) Edisi 1*. 2023.
[12] R. Akbar and M. Irwan Padli Nasution, "Peran Sistem Informasi Dalam Mengambil Keputusan," *JoSES J. Sharia Econ. Sch.*, vol. 1, no. 3, pp. 1–4, 2023, [Online]. Available: https://doi.org/10.5281/zenodo.10276994
[13] M. Penelitian and D. Pengertian, "dan Tahapan," vol. 4, no. 3, pp. 459–470, 2025, doi: 10.54259/diajar.v4i3.5092.
[14] A. Jayanti and S. Sugiarsi, "Pengembangan Modul Rekam Medis Elektronik (RME) Rehabilitasi Medik Rawat Jalan," vol. 5, no. 4, pp. 316–329, 2024, doi: 10.25047/j-remi.v5i4.4890.
[15] A. F. Amanda, M. F. Afrizal, and Y. Sugiarti, "Penerapan Metode Rapid Application Development (RAD) dalam Pelatihan Pembuatan Aplikasi Sederhana," vol. 4, no. 2, pp. 109–118, 2024.
[16] E. Devia, L. W. Santoso, S. Rezeki, C. Nursari, N. Azizah, and M. H. Saputra, *Sistem basis data*.
[17] H. Sandra, "Performance Analysis of Openlitespeed and Apache Web Servers in Serving Client Requests," vol. 02, no. 02, pp. 114–129, 2022.
[18] J. Wahyudi, M. Asbari, I. Sasono, T. Pramono, and D. Novitasari, "Database Management in MYSQL," vol. 6, no. 2, pp. 2413–2417, 2022.
[19] Y. Sahar, U. A. Djemma, and P. S. Selatan, "Jurnal riset sistem informasi," vol. 1, no. 3, pp. 27–36, 2024.
[20] J. Jend, A. Y. No, T. Baru, and K. Baturaja, "PERANCANGAN SISTEM INFORMASI INVENTARIS BARANG PADA KANTOR NOTARIS DAN PPAT R . A LIA KHOLILA , S . H MENGGUNAKAN VISUAL STUDIO CODE," vol. 3, no. 2, pp. 37–48, 2020.
[21] Y. Andriyani, I. D. Id, E. Mahdiyah, and A. Aminuddin, "Ingénierie des Systèmes d ' Information Use Case Realization in Software Reverse Engineering," vol. 27, no. 2, pp. 335–341, 2022.
[22] O. Palinggi *et al.*, "Collabits Journal," vol. 1, no. 2, pp. 102–104, 2024, doi: 10.22441/collabits.v1i2.27252.
[23] S. Al-fedaghi, "Conceptual Data Modeling : Entity-Relationship Models as Thinging Machines," vol. 21, no. 9, 2021.
[24] A. Suryadi, Y. Wisda, T. Arif, and N. S. Novitasari, "Rancang Bangun Sistem Informasi Rekam Medis Klinik Rawat Jalan Berbasis Web," vol. 12, no. 1, pp. 37–43, 2022.
[25] V. Beniwal and R. Chauhan, "Relational database design based on the entity- relationship model," vol. 7, no. 2, pp. 32–36, 2025.
[26] H. Amaliyah, M. Yunus, M. C. Roziqin, and M. Riyan, "Rancang Bangun Rekam Medis Elektronik Pelayanan Rawat Jalan Berbasis Web," vol. 5, no. 4, pp. 288–298, 2024, doi: 10.25047/j-remi.v5i4.4781.