

Development of the ENC Android Application for Electronic Nursing Care

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ABSTRACT

The rapid digitalization of the healthcare sector is transforming nursing education and practice, particularly in the area of clinical documentation. In Indonesia, as mandated by Peraturan Menteri Kesehatan Nomor 24 Tahun 2022, all healthcare facilities must document patient medical histories electronically. However, nursing students face challenges in practicing electronic documentation due to limited access to hospital-based EMR systems. This study aims to develop an Electronic Nursing Care (ENC) application as an Android-based platform for nursing students to practice digital documentation aligned with national nursing standards, such as SDKI (Indonesian Nursing Diagnosis Standards), SLKI (Indonesian Nursing Outcomes Standards), and SIKI (Indonesian Nursing Interventions Standards). The ENC application was developed using an Agile methodology, consisting of five sprints: backend development, core features, UI/UX integration, advanced features, and comprehensive internal testing. A 2023 prototype trial demonstrated high user satisfaction, with 93% of students expressing satisfaction with the app's user interface and experience. The ENC application was designed to reduce the administrative burden on nursing students by offering tools for documenting the nursing process, including assessment, diagnosis, planning, implementation, and evaluation. The initial results indicate that the application meets technical specifications and has the potential to enhance nursing education by providing a structured, user-friendly platform for digital documentation. The study suggests further pilot testing in clinical settings, development of additional features, and ongoing evaluation to ensure the application's success in nursing education and clinical practice.

Keywords: Android Application, Electronic Nursing Care (ENC), Electronic Medical Records (EMRs), Nursing Education, Nursing Process, Healthcare Digitalization

INTRODUCTION

The rapid digitalization of the healthcare sector has become a key driver of innovation, particularly in nursing education and practice (Smith & Johnson, 2021). Digital transformation in healthcare facilities has replaced traditional paper-based clinical documentation with electronic systems, enabling more efficient data collection, recording, and management. In alignment with Peraturan Menteri Kesehatan Nomor 24 Tahun 2022, all healthcare facilities in Indonesia are now mandated to document patient medical histories electronically (Peraturan Menteri Kesehatan, 2022).

The implementation of electronic medical records (EMRs) in hospitals highlights the necessity for nursing education to adapt to this digital shift. Developing an electronic nursing care (ENC) application specifically designed for clinical practice students addresses this need (Adams & Thomas, 2020). High-quality nursing services rely on structured documentation as a written record of nurses' responsibilities and authority. This documentation follows the phases of the nursing process including assessment, diagnosis, planning, implementation, until evaluation and adheres to national standards, including SDKI (Indonesian Nursing Diagnosis Standards), SLKI (Indonesian Nursing Outcomes Standards), and SIKI (Indonesian

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Nursing Interventions Standards) (Budi & Sari, 2019).

Electronic nursing documentation has demonstrated the ability to reduce the administrative burden on nurses. Research shows that nurses spend approximately 37% of their working time on paper-based documentation, time that could be better utilized in patient care (Kurniawan, 2021). Despite the benefits of digital systems, nursing intern students in Indonesia lack access to suitable tools for practicing electronic documentation. A survey conducted in Australia and New Zealand revealed that only 37.8% of institutions incorporate EMRs into their education programs, with the majority of students still relying on paper-based systems during clinical practice (Jones et al., 2018).

Relying solely on clinical internships to build digital documentation competencies is inadequate, as students face restricted access to hospital EMRs due to privacy and security concerns (Wang, 2020). Nursing curricula must integrate opportunities for students to practice electronic documentation skills in controlled environments, ensuring they are prepared to meet the demands of a digitalized healthcare landscape (Fahmi & Riana, 2021).

The ENC application was designed to address this gap by reducing the documentation burden for students and improving accessibility to nursing care tools (Zhang & Lee, 2022). A 2023 prototype trial demonstrated promising results (Minanton et al., 2024):

93% of students were satisfied with the application's user interface (UI) and user experience (UX).

100% of participants anticipated its application in clinical practice.

98% believed the application would reduce documentation burdens.

97% indicated it would minimize documentation errors and save time.

This study aims to develop an Android-based ENC application as an electronic nursing care platform, advancing the digitalization of nursing education and bridging the gap between theoretical learning and clinical practice.

LITERATURE REVIEW

The global trend of digitizing healthcare systems highlights the need for electronic solutions that enhance efficiency and reduce administrative burdens in nursing documentation. Traditional paper-based methods, while historically foundational, are increasingly seen as time-consuming and prone to errors. Electronic Nursing Documentation Systems (ENDS) provide real-time access to patient data, improve documentation accuracy, and streamline workflows, meeting modern demands for quality and safety in healthcare.

Several studies have explored the benefits and challenges of transitioning to electronic documentation in healthcare. Research by Raghunathan et al. (2022) emphasizes the limited adoption of EMRs in nursing education, noting that only 37.8% of institutions in regions like Australia and New Zealand incorporate EMRs into their curricula. This finding underscores a significant gap, as nursing students are often exposed to EMRs only during internships, where access is restricted due to data privacy concerns. Similarly, Shafiee et al. (2022) highlight the inefficiency of manual documentation, noting that nurses spend nearly 37% of their working time on paperwork, which could otherwise be directed toward patient care.

In contrast, studies like those by Herfandi et al. (2022) and Karlina & Indah (2022) illustrate the potential of electronic solutions in education, particularly through platforms tailored for specific needs. These studies underscore the importance of user-centered design approaches, such as design thinking, to create effective and accessible digital tools for nursing students.

Despite these advancements, gaps persist. Current nursing education programs largely lack platforms that provide hands-on practice with electronic documentation systems tailored to the structured processes of nursing care, including assessment, diagnosis, planning, implementation, and evaluation. The reliance on internships for digital skill acquisition is inadequate, as students face barriers to accessing hospital

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EMRs. Furthermore, existing platforms often fail to align with nursing documentation standards like SDKI, SLKI, and SIKI, limiting their applicability in real-world settings.

Additionally, the challenges of integrating EMRs into educational settings are compounded by issues such as system speed, usability, and the need for training. (Everett-Thomas et al, 2022) stress the importance of creating academic environments where students can develop digital competencies in a controlled, secure manner, free from the constraints of clinical data privacy restrictions.

Building on previous studies, the ENC (Electronic Nursing Care) application addresses these gaps by offering a structured, Android-based platform designed specifically for nursing students. Prior research on ENC focused on UI/UX design using a design thinking approach, resulting in a prototype that received positive feedback for its usability, quality, and accessibility (Minanton et al., 2024). This research demonstrated that ENC could significantly reduce manual documentation burdens and better prepare students for modern healthcare environments.

The current study extends this foundation by implementing the ENC application and evaluating its effectiveness in real-world educational and clinical settings. The goal is to bridge the identified gaps in nursing education by providing a tailored tool that aligns with both academic and professional standards.

This review positions the ENC application as a solution that merges theoretical knowledge with practical application, addressing the dual challenges of education and clinical practice. By synthesizing insights from diverse studies, it highlights the critical role of tailored digital tools in enhancing nursing education and bridging the gap between traditional methods and the demands of a digitalized healthcare system. The study aims to further validate ENC's efficacy, contributing to the broader discourse on integrating technology into nursing education.

METHOD



Fig. 1 Sprint Planning Development of the ENC Application

The development of the ENC (Electronic Nursing Care) application adopts the Agile methodology, characterized by its iterative and incremental approach to ensure flexibility and responsiveness to user needs (Schwaber & Sutherland, 2017). The process is structured into five sprints, facilitating systematic progress from initial setup to deployment while integrating user feedback at multiple stages. These sprints align with the phases of the nursing process (assessment, diagnosis, planning, implementation, and evaluation) and adhere to established nursing documentation standards such as SDKI, SLKI, and SIKI. Building on previous research that focused on UI/UX design and requirements analysis, this phase of the study streamlines the methodology into two primary stages: Development and Internal Testing, ensuring a targeted and effective approach to application refinement.

The development process was structured into five key sprints, integrating internal testing as part of the workflow.

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Tabel 1. Sprint Overview

Sprint	Focus Area	Activities	Outcome	Testing
Sprint 1	Initial Setup and Backend Development	Configure development tools, establish backend architecture (servers, databases)	Functional backend infrastructure for managing patient records and other data.	Validated database operations, ensuring smooth data storage and retrieval.
Sprint 2	Core Features Development	Develop primary functionalities: patient records, nursing care plans, and task management.	Basic application functionalities aligned with the nursing process phases.	Tested workflows for creating, saving, and editing nursing care plans.
Sprint 3	UI/UX Integration	Integrate the pre-designed UI/UX from previous research into the application.	Fully integrated user interface and experience that aligns with nursing students' needs.	Assessed the integration of UI/UX, ensuring design consistency and functionality.
Sprint 4	Advanced Features Development	Add advanced features: logbooks for clinical activities and scheduling with reminders.	Enhanced utility with functional logbooks and scheduling systems.	Verified the functionality of advanced features; resolved identified performance issues
Sprint 5	Comprehensive Internal Testing	Consolidate all features for thorough testing across devices; simulate real-world scenarios.	A stable and feature-complete version ready for future User Acceptance Testing (UAT).	Conducted scenario-based testing to ensure functionality, performance, and stability.

This phased development approach ensured that internal testing was integrated seamlessly into the Agile sprints, providing iterative feedback to refine the application. Each sprint built upon the previous one, ensuring that the ENC application's functionalities and design met the research objectives while addressing technical and usability issues.

This methodology establishes a strong foundation for the ENC application, paving the way for future phases, including User Acceptance Testing (UAT) and deployment.

RESULT

Android-based ENC (Electronic Nursing Care) application has been successfully developed as an electronic nursing documentation platform designed to support clinical education for nursing students in Indonesia. This application aims to address the challenges faced by nursing students in accessing and mastering the use of digital documentation systems in clinical environments. Although the application has not yet been directly tested in clinical practice, the initial development has shown promising results in terms of design and functionality. The application requires minimum specifications that can support the smooth operation of both hardware and software.

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Tabel 2. Specification

Component	Minimum Specification	Recommended Specification
Processor	Quad-core 1.4 GHz	Octa-core 2.0 GHz or higher
RAM	2 GB	4 GB or higher
Storage	16 GB	32 GB or High
Display	5 inches, HD resolution (720p)	6 inches, Full HD resolution (1080p)
Camera	8 MP (for documentation and scanning)	12 MP or higher (for better photo quality)
Operating System	Android 8.0 (Oreo) or higher	Android 10 or higher
Internet Connection	Wi-Fi or 4G cellular data	Wi-Fi, 4G, or 5G

This hardware specification ensures that the ENC application runs smoothly and provides an optimal user experience for nursing students using Android devices to document nursing care digitally.

Application Implementation

In this stage, the application is deployed based on the existing system design to achieve the desired objectives. The implementation involves executing a series of tasks in a structured manner, from start to finish. As part of the application documentation, the following screenshots of the interface and key features of the application are presented, illustrating its use at various stages of nursing documentation.

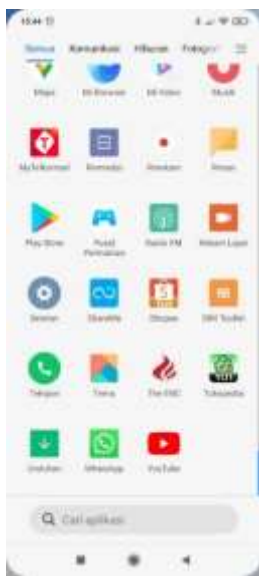


Fig. 2 The icon display of The ENC is the app icon on the Android phone screen.

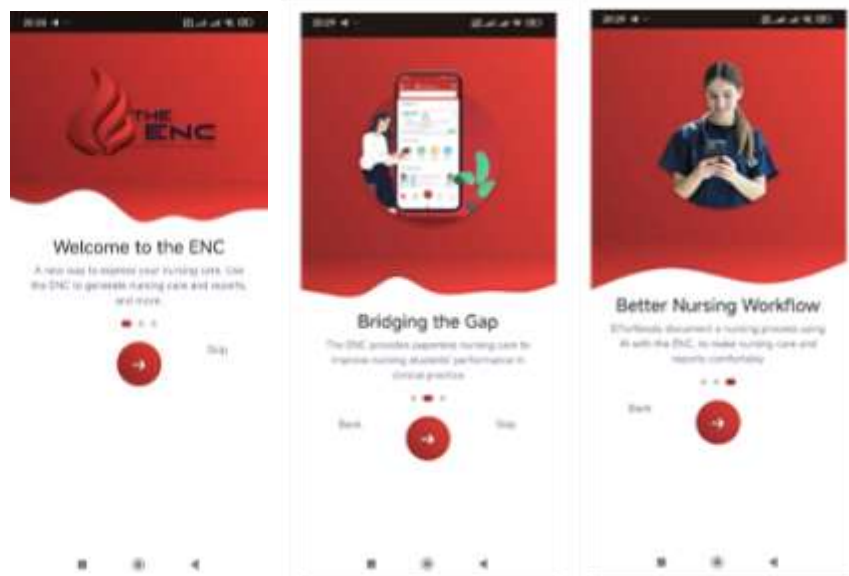


Fig. 3 Onboarding Screen of an App

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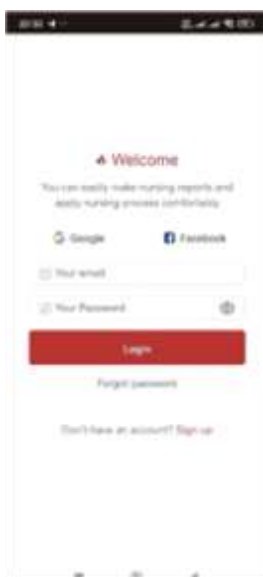


Fig. 4 The login screen of an app, where users are required to enter their username and password to access their account



Fig 5. The sign-up screen or registration screen in an app, where new users can create an account by clicking on the "Daftar" (Register) button.



Fig 6. The application's interface upon accessing the main dashboard. The initial menu consists of top reports, main application features, and the students' shift schedule.

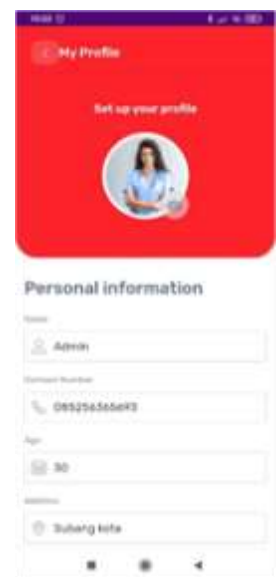


Fig 7. The application's interface when accessing the user profile menu.

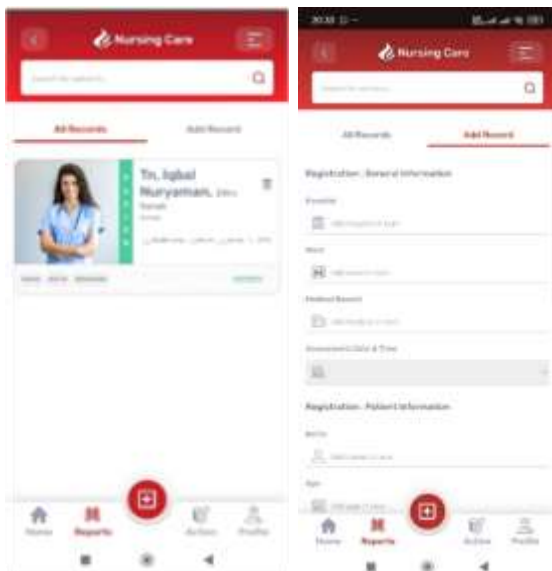


Fig 8. The application's interface on the "Record" menu. In this menu, all the patient records that have been added will be displayed, and the user can add new patient records.

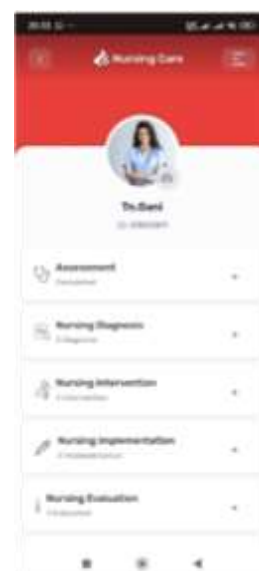


Fig. 9. Interface of the "Nursing Care" menu, where users can complete the nursing care process after adding the patient



Fig 10. The application's interface on the "Nursing Care" menu, during the stage of completing the assessment (general

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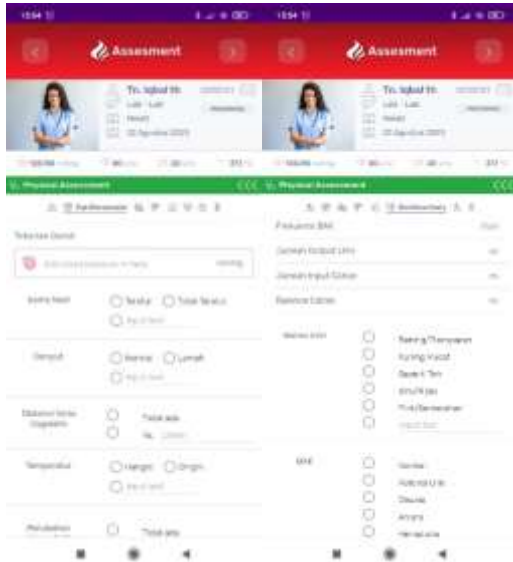


Fig 10. The application's interface on the "Nursing Care" menu, during the stage of completing the assessment (general assessment and physical assessment).

profile in the "Record" menu

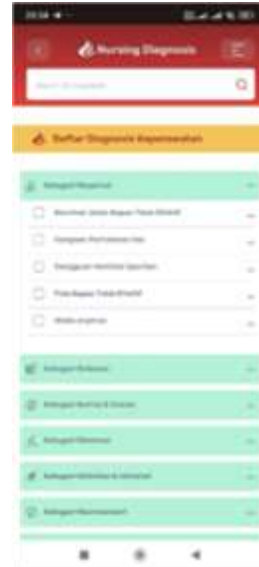


Fig 11. The application's interface on the "Nursing Care" menu, during the nursing diagnosis stage.

assessment and physical assessment).



Fig 12. The application's interface on the "Nursing Care" menu, during the nursing interventions stage (SLKI and SIKI).

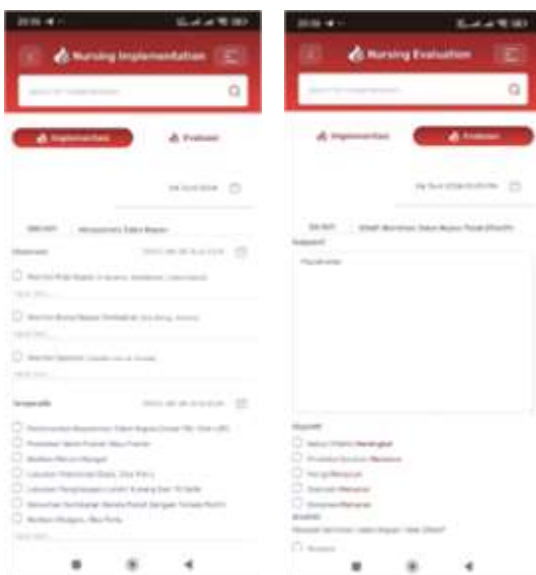


Fig 13. The application's interface on the "Nursing Care" menu, during the implementation and evaluation stages.

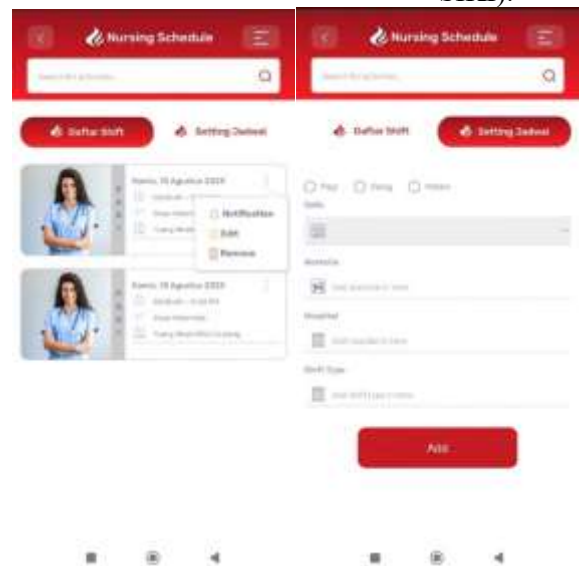


Fig 14. The application's interface for the second feature, the nurse/student shift schedule, which consists of a shift list and schedule settings.

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Fig 15. The application's interface for the third feature, the nurse/student activity logbook.



Fig 16. The application's interface for the fourth feature, the competency targets for nurses/students during clinical practice.



Fig 17. The application's interface related to user regulations and privacy for The ENC.

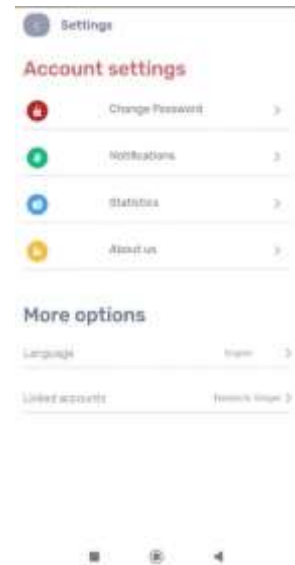


Fig 18. The application's interface for user account settings in The ENC.

CONCLUSION

The development of the ENC application as an Android-based electronic nursing care platform has been successfully completed. This application is designed to address the challenges nursing students face in accessing and mastering digital documentation systems in clinical environments. The initial results from the development phase indicate promising outcomes in terms of both design and functionality. The application is optimized to run smoothly on devices with minimum specifications, ensuring efficient operation across a wide range of hardware and software setups.

The implementation of The ENC application is expected to bring significant implications. In nursing education, the application provides a digital platform that enhances the quality of clinical nursing education by allowing students to practice the documentation of nursing processes in alignment with current standards. This tool helps students become proficient in digital documentation, which is increasingly necessary in modern healthcare environments. For the workforce, the application prepares students for the digital demands of the healthcare sector, where electronic systems for patient data documentation are becoming the norm. Additionally, by offering a structured, efficient tool for documentation, the ENC application supports the broader adoption of electronic medical records (EMRs) in Indonesia, in line with government initiatives to accelerate the digitalization of healthcare services.

To ensure the continued success and effectiveness of The ENC application, several recommendations are proposed: conducting pilot testing in real clinical settings, further developing additional features (such as scenario-based learning), providing user training, and implementing ongoing evaluations. By pursuing these recommendations, The ENC application has the potential to be widely accepted and implemented in nursing education across Indonesia, helping students develop essential digital competencies and better preparing them for a workforce that is increasingly dependent on technology.

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IMPLICATION

1. For nursing education: the use of the enc application can enhance the quality of clinical nursing education by providing a platform that makes it easier for students to practice documenting nursing processes digitally. With this application, nursing students can learn to use tools that are aligned with the standards applied in hospitals and other healthcare facilities.
2. For the Workforce: This application helps prepare students to be more ready for the workforce, which increasingly relies on electronic systems for patient data documentation. Proficiency in using electronic documentation systems will give nursing graduates a competitive edge.
3. For the Healthcare System: By providing a more efficient and structured documentation tool, this application contributes to the better implementation of electronic medical records (EMR) in Indonesia. This aligns with government efforts to accelerate the digitalization of the healthcare sector to improve the quality of healthcare services.

RECOMMENDATION

1. Testing and Field Implementation: To assess the effectiveness of The ENC application, it is crucial to conduct pilot testing in real clinical settings, such as hospitals or other healthcare facilities. This testing will provide further insights into the application's compatibility with clinical practices and its impact on the quality of nursing care.
2. Development of Additional Features: To maximize the application's support for students and healthcare professionals, the development of additional features such as scenario-based learning and integration with electronic medical records (EMR) systems in hospitals should be considered.
3. Training for Users: To ensure effective use of the application, training programs for students and faculty members should be prepared. This will help them understand how to use the application optimally in the learning process.
4. Continuous Evaluation: After implementation, it is important to conduct ongoing evaluations of the application's effectiveness in improving students' skills in electronic nursing documentation, as well as to assess user satisfaction with the application.

With these recommendations, it is hoped that The ENC application can be more widely accepted and implemented in nursing education in Indonesia, while also helping students become better prepared to enter a more digitalized workforce.

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