Developing an Android-Based Application Documentation System of Postpartum Care for Indonesian Midwifery Students

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Abstract

Midwifery students still take notes the old-fashioned way, on paper, which has become very inconvenient. Students struggle to create accurate and complete care documentation due to the risk of losing important data, transferring data, and scribbling. Mobile Case Midwifery Notes (CMNotes) is an Android-based documentation system designed to develop learning methods and interactive consultations between students and lecturers. CMNotes facilitates digital and comprehensive recording of patient data starting from assessment, diagnosis, and plan of care to implementation and evaluation by applying Varney's management principles and Subjective Objective Analysis Planning (SOAP) documentation. This study is research and development (R&D) to produce a documentation system for midwifery care emphasising postpartum and breastfeeding care. The researchers recruited 185 midwifery students from Aceh Health Polytechnics to be involved in a needs analysis. Out of the total number of students, 39 students took part in the implementation stage where their

experience using the application was assessed. The needs analysis revealed that postpartum care and breastfeeding are important subjects, and their documentation is the most important aspect. The implementation results show that the CMNotes provide convenience and satisfaction for students when documenting childbirth and postpartum care. Since CMNotes could provide the reference range of data, the system allows students to identify and focus on the issue experienced by the patients. Due to user feedback on the system's usability, it is necessary to create an Android-based CMNotes application to fill in patient data more easily and effectively without the need for internet access.

Keywords: postpartum; midwifery documentation; student; mobile Case Midwifery Notes

Introduction

Midwifery documentation is essential for midwives in providing midwifery care. This is because midwifery care provided to clients requires recording and reporting that can be used as a reference of accountability for various problems that may be experienced by clients in the future (Kerkin, Lennox, and Patterson 2018). In addition, documentation is an authentic record or original document that can be used as evidence in legal matters. According to Olivia Tierney et al. (2018), documentation in midwifery is evidence of midwives' recording and reporting of nursing (midwifery) care that is useful not only for the benefit of clients but also for midwives and the health team in providing health services based on accurate and complete written communication. Apart from being a recording and reporting system, midwifery documentation is also used as information about the health status of patients in all midwifery care activities carried out by midwives (Juwita et al. 2019). In addition, documentation also allows for the collection, storage, and dissemination of information to maintain several important facts continuously.

Currently, based on the Midwife's Practice Diary (Dawson et al. 2018), the documentation model of midwifery care used by most students is manual recording. This becomes impractical for several reasons, including taking up more time, risking data loss, piling up paper reports, and difficulty updating data. Usually, the data that is filled out manually is incomplete due to time constraints and some items are often considered unimportant (Juwita et al. 2019; McKellar, Fleet, and Dove 2018; Mutiah et al. 2021). Therefore, innovation in the field of midwifery medical records is necessary so that the recording process can be carried out more effectively and efficiently. Web-based digital patient data recording methods can be an alternative to overcome the various limitations of manual recording (Jenkins et al. 2018).

A computerised recording system is one of the most popular trends in the documentation of midwifery and nursing care (Pansuwan and Klankhajhon 2021; Posmontier 2011). Many institutions are starting to build or buy computerised systems that support midwifery practice. Various groups in the healthcare industry use the term computer in

various ways, one of which is computer-based patient records (CPR). CPR is a computer system that plays a role in concluding, storing processes, and providing information needed in midwifery service activities, research, and education (Craswell et al. 2021). This model contains all forms of clearly programmed notes, making it easier for practitioners in the diagnostic process and reducing traditional recording activities. The advantages of CPR include the following: records can be read clearly; records are always on hand; it improves the productivity of midwives; it reduces records damage; it supports the process of midwifery care; it reduces redundant documentation; midwifery records are well categorised; reports are printed automatically; documentation follows standards of midwifery care and it ensures data availability (Uden, Valderas, and Pastor 2008).

Several electronic recording systems have been implemented, including the Academic Electronic Health Record (AEHR) used by the nursing students at Arab American University in Palestine (Jenkins et al. 2018; Salameh, Ewais, and Salameh 2020). Data suggests that students who used AEHR could build their knowledge by learning from clinical cases, analysing evidence-based clinical problems, learning collaboratively, having access to innovative technology, and improving competence. In addition, AEHR can provide an opportunity for clinical instructors to directly review cases obtained by students. A system developed by another group, named the integrated electronic medical record (ieMR), was found to be acceptable by midwives and childbearing women in Australia, who were positive towards the use of the system (Cooper, Warland, and McCutcheon 2018).

In this research report, we aim to provide a comprehensive account of the successful implementation of an Android-based system known as Case Midwifery Notes (CMNotes) for the digital documentation of postpartum and breastfeeding records in the Midwifery Study Programme at Aceh Health Polytechnics, Indonesia. CMNotes serves as a digital documentation system specifically designed to enhance learning methodologies and foster interactive consultations among students, lecturers, and clinical supervisors. This system enables the digital and thorough recording of patient data, encompassing the entire spectrum from assessment, diagnosis, care planning and implementation to evaluation, all of which are grounded in Varney's management principles and the Subjective Objective Analysis Planning (SOAP) documentation approach.

The conceptual foundation of CMNotes documentation originates from the maternal assessment format, taking into account the competencies of midwives in intrapartum and postnatal care, and is further developed to accommodate additional assessment formats as required. Through this research, we intend to elucidate the significance and implications of CMNotes in the field of midwifery education and practice, thereby offering a more explicit articulation of the study's aims and objectives.

Methods

This article is based on research and development deploying the model of Analysis, Design, Development, Implementation and Evaluation (ADDIE) (Ahmad, Boota, and Masoom 2014; Nazar and Zulfadli 2017; Nazar et al. 2020). The study consisted of three parts: (1) A needs analysis study was conducted by using a questionnaire consisting of 10 items employing a Likert-scale model; (2) the design and development stage of the application followed; (3) lastly, there was an implementation stage where students' experience was measured using a questionnaire consisting of 15 items. During the needs analysis, 185 respondents participated, and we only assessed 39 students' experiences related to the application of the CMNotes.

Respondents' Demographic Characteristics

A total of 185 students from five different campus locations were involved in the needs analysis study (Table 1). The questionnaire was delivered online via a WhatsApp group created for the research purpose.

Table 1: Characteristics of respondents included in the needs analysis study (*n*=185)

Characteristics	*N*	Percentage (%)
Campus location		
Midwifery Study Programme, Meulaboh	67	36.2
Midwifery Study Programme, Aceh Tengah	16	8.6
Midwifery Study Programme, Langsa	36	19.4
Midwifery Study Programme, Aceh Utara	61	32.9
Midwifery Study Programme, Banda Aceh	5	2.7
Grade		
II	14	35.9
III	25	64.1
Age group (years)		
18	3	7.6
19	10	25.6
20	20	51.2
21	3	7.6
22	3	7.6

Table 1 illustrates the demographic characteristics of respondents. More than half of the students were 20 years old; only 15.2% of the students were between 21 and 22 years old.

Research Instrument

A total of 10 questions were prepared for the needs analysis, and we used five scale questions based on the Likert model. A total of 15 questions were prepared to assess the

students' thoughts and opinions regarding the use of CMNotes during the implementation study. The questionnaire was aimed at assessing the experience of students in using mobile CMNotes in terms of usability, functionality, and the design of the application. All instruments were subjected to a validation and reliability test. A Cronbach's alpha test was used to evaluate the validity and reliability of each instrument. The validity and reliability score of the study instrument is presented in Table 2.

Table 2: Validity and reliability score of research instrument

Subscale	Validity (%)	N	No. of items	Cronbach's alpha
Needs analysis questionnaire	100	171	10	0.871
Students' experience questionnaire	100	39	15	0.894

Statistical Analysis

Statistical analysis was performed by using Cronbach's alpha test. The item was considered reliable when alpha > 0.6. IBM's Statistical Package for the Social Sciences (SPSS) version 25 was used as an analysing software.

Ethical Clearance

This research has received ethical clearance from the Research Ethics Commission of the Faculty of Nursing at the University of North Sumatra (No: 2318/VI/SP/2021).

Results and Discussion

Needs Analysis

The purpose of the needs analysis in software development is to ensure that the software addresses the most important needs of the users and solves the problems they face. This information can then be used to guide the software development process, including the design, functionality, and features of the software. For example, if software is being developed for a small business, a needs analysis would help the developers understand the specific needs and challenges faced by the business. This information could then be used to design software that streamlines the business processes and provides a solution to the specific challenges faced by the business (Nazar and Zulfadli 2017).

In short, knowledge of the requirements and needs of the target users ensures that the final product meets those needs and provides a solution to the challenges faced by the users. A comprehensive needs analysis can lead to the development of software that is user-friendly, efficient, and effective (Issa and Isaias 2015; Kalimullah and Sushmitha 2017; Rubin and Chisnell 2008). Therefore, in this study, we conducted a needs assessment for CMNotes postpartum to acquire students' needs and opinions regarding

postpartum mobile documentation through an Android-based application. The results of the needs analysis for CMNotes are presented in Table 3.

Table 3: Detailed responses of the students during the needs analysis for CMNotes (*n*=185)

No	Question	Mean± SD
1	Postpartum care and breastfeeding are important subjects in supporting midwives' competence	3.97±1.18
2	Documentation of midwifery care is the most important part in the implementation of effective midwifery care	4.04±1.12
3	Students must be skilled in documenting postpartum midwifery care	3.99±1.09
4	The conventional postpartum care documentation format (writing) is no longer practical to use currently	3.47±1.12
5	I have difficulty in documenting because I must write a lot of patient data	3.56±1.14
6	When using the documentation format in hospitals/clinics, patient data is often lost	3.39±1.21
7	Recording patient data manually is impractical and ineffective	3.29±1.20
8	The postpartum care documentation format will be easier to use if it is digital-based	3.67±1.13
9	I am still interested in recording postpartum midwifery care using paper	3.36±1.13
10	It is time to switch to a "paperless" system in documenting midwifery care	3.71±0.98

The analysis questionnaire revealed that students feel that postpartum care and breastfeeding are important subjects in supporting midwives' competence, and documentation of the midwifery care is the most important part, as it scored more than 4 (Table 3). Most students also feel that conventional documentation should be updated to digital documentation due to practicality and safety. Therefore, digital documentation as introduced by mobile CMNotes is a promising system that can be implemented in midwifery care, especially in postpartum and breastfeeding documentation. Some students were still interested in using the conventional paper-based documentation, but when they were asked if the conventional mode should switch to the digital mode, most of them agreed (3.71).

Postpartum midwifery care is an important aspect of maternal and new-born health, and digital documentation has emerged as a valuable tool for midwives in providing quality care to their patients (Cooper, Warland, and McCutcheon 2018; Hartinah et al. 2021). Digital documentation refers to the use of technology such as computers, mobile devices, and cloud-based systems to store, manage, and share patient information (Holla and Katti 2012; Jumbri and Ishak 2022; Ma, Gu, and Wang 2014).

The benefits of using digital documentation in postpartum midwifery include improved accuracy, increased efficiency, and better patient engagement (Craswell et al. 2021; Vlachopoulos and Makri 2017). Digital documentation reduces the risk of errors and omissions associated with manual documentation and allows midwives to access patient information quickly and easily. Additionally, digital documentation can enhance patient engagement by providing them with access to their own health information and enabling them to participate in their own care (Jenkins et al. 2018).

However, there are also challenges associated with the use of digital documentation in postpartum midwifery. These include concerns about data privacy and security, the need for technology infrastructure, and the cost of implementation (Alfaris, Lian, and Mulyadi 2021; Hartiningrum and Fitriani 2021). Additionally, some midwives may struggle with the learning curve associated with using new technology and may need support in adopting digital documentation practices. Digital documentation has the potential to revolutionise postpartum midwifery care, providing midwives with powerful tools to improve the quality of care they provide to their patients. While there are challenges associated with its implementation, the benefits of digital documentation in postpartum midwifery cannot be ignored. With proper training and support, midwives can effectively utilise digital documentation to provide their patients with the best possible care.

Design and Development Stage of CMNotes

The application was designed according to Varney's and SOAP's methods of midwifery care. Step-by-step stages included in the application would allow students to evaluate the patient effectively. The form prepared inside the application allows students to digitally fill in the data, evaluate the patient, and take proper action to help patients based on recorded data that was previously recorded in the application. The design flow chart can be seen in Figure 1.
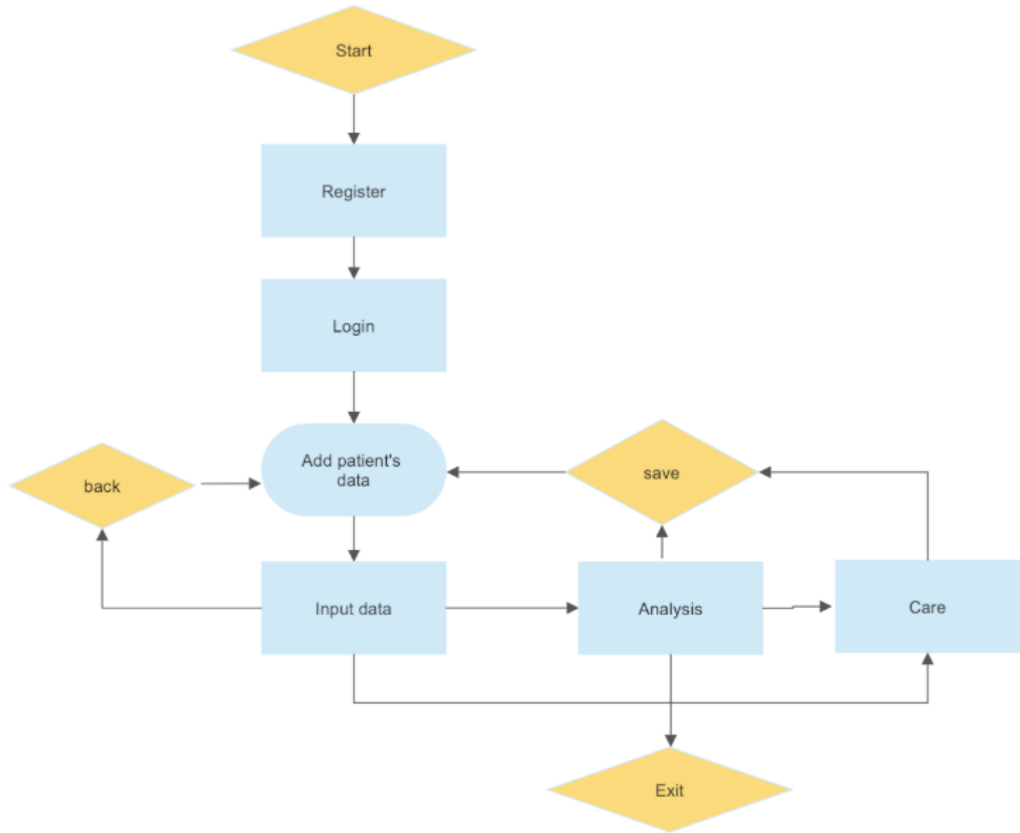
Figure 1: Design and development flow chart of CMNotes

The system was developed using PHP (hypertext preprocessor), HTML (hypertext markup language), and JavaScript. These three types of software are commonly used in web development. PHP is a server-side scripting language used for dynamic web applications (Tsai 2013), while HTML provides the structure and content of web pages (Fatimah, Arianto, and Bahfiarti 2021; Mutiah et al. 2021). JavaScript is a scripting language that allows for interactive elements and dynamic functionality on web pages. By utilising these technologies, the developers were able to implement the necessary commands and create the architecture of the CMNotes application.

The developed web application was then converted to APK (Android application package) format. After the completion of programming using PHP, HTML, and JavaScript, the assets and code of the CMNotes application were converted into APK format. An APK is the file format used to distribute and install applications on Android devices (Alfaris, Lian, and Mulyadi 2021; Nazar et al. 2020). In this case, the conversion was performed using the Website 2 APK software. This software likely facilitated the transformation of the web-based code and assets into a format suitable for installation on Android devices. Once the CMNotes application was converted into APK format,

users could install it on their desired Android devices. APK files can be installed directly on Android devices, allowing users to access and utilise the application's features and functionalities. By installing the CMNotes APK, students majoring in midwifery could conveniently use the application on their Android devices for labour documentation and other related tasks.

Figure 2 shows screenshots of several steps within the application that students go through when using the application to evaluate postpartum midwifery care. Firstly, they are required to register using an email and login details to access the application. Secondly, they are allowed to record their data for lecturing purposes. Thirdly, they can start recording and evaluating patient data, and based on the interview, they can add the evaluation data followed by deciding the appropriate caring action they could probably take to help the patient. The application has significantly reduced the time it takes to record patient data because the forms needed to record the data are readily provided by the application, so the students could effectively use their time to concentrate on the interview. The forms also provide guidance and clues to make filling in the data more reliable and effective (Azimi 2013; Mui et al. 2011).
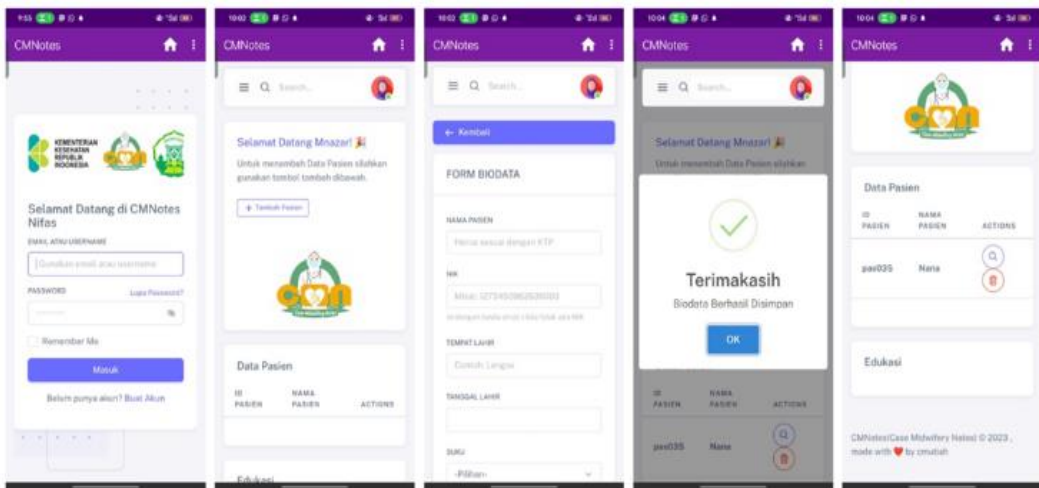

Figure 2: Screenshots of several steps from CMNotes application

Implementation Stage and Students' Experience Study

At the implementation stage, the students were allowed to operate the application in their actual course. They had a chance to run the application step by step, which starts by filling in the patient's data and subsequently entering the diagnostic data obtained from the interview. After using the application, the students were requested to respond to 15 items of evaluation to comment on the use of the application. The results of students' experience are depicted in Table 4.

Table 4: Study of students' experience using CMNotes

No	Subscale	Mean ±SD
1	Ease of use	85.13±11.74
2	Functionality	88.21±10.83
3	Design	83.56±13.72

Table 4 shows the responses of students majoring in midwifery to the Android-based CMNotes application. In general, most students who have used the application think that it is very easy to understand. They also feel comfortable with the application because the features and menus are easy to use, so students are satisfied (over 85%) with this CMNotes mobile application. When asked whether this application met their needs for labour documentation, more than 87% answered that it was very suitable for their needs in carrying out delivery documentation. Most student users also think that by using this application, they can easily avoid mistakes in the recording process and the function of this application is very much in line with their expectations. More than 88% of students said that this application made it very easy for them to conduct a thorough assessment of patients and could save time for recording because most of the important and necessary recording menus are already available in the application. Students only need to choose without having to record again manually.

The positive responses from students majoring in midwifery regarding the Android-based CMNotes application indicate that the application has successfully met their needs and provided valuable benefits. Let's further discuss the implications and significance of these findings:

1. Ease of understanding and user-friendliness: The fact that most students find the application very easy to understand and comfortable to use is crucial. It suggests that the application has a well-designed interface and intuitive features, allowing students to navigate and utilise it effectively. This ease of use likely contributes to the high satisfaction levels reported by the students.

2. Satisfaction and meeting documentation needs: The high satisfaction rate (over 85%) indicates that the CMNotes application has fulfilled the expectations and requirements of the students in terms of labour documentation. This suggests that the application provides the necessary features and functionalities to support students in documenting deliveries effectively. By meeting their needs, the application likely enhances their overall experience and productivity in this aspect of their studies.

3. Error avoidance and accurate recording: The students' feedback that the application helps them avoid mistakes in the recording process is significant. Accurate documentation is crucial in midwifery, as it ensures the availability of reliable information for patient care, research, and legal purposes. The CMNotes application seems to provide students with a reliable tool for

maintaining accurate records, which is essential for maintaining high-quality healthcare practices.

4. Alignment with expectations and assessment capabilities: The students' perception that the application's functions align with their expectations is a positive outcome. This indicates that the CMNotes application delivers on its promises and provides the desired functionalities for comprehensive patient assessments. By simplifying the assessment process, the application likely contributes to better patient care and more efficient workflow for the students.

5. Timesaving and elimination of manual recording: The feedback from students indicating that the CMNotes application saves time in the recording process is highly valuable. Manual recording can be time-consuming and prone to errors. By providing pre-defined recording menus and eliminating the need for manual entries, the application streamlines the documentation process and allows students to allocate more time to patient care and other critical tasks.

Generally, the positive responses from students majoring in midwifery regarding the Android-based CMNotes application demonstrate its effectiveness and significance in their educational and professional careers. The application's user-friendly nature, ability to meet documentation needs, error-avoidance capabilities, alignment with expectations, time-saving features, and elimination of manual recording contribute to improved efficiency and quality in labour documentation and patient assessments. These findings highlight the potential benefits of integrating technology into healthcare education and practice, offering students valuable tools to enhance their skills and optimise patient care.

Online note-taking makes it easy for students to focus more on patient problems because the CMNotes mobile application and similar applications usually provide ready-made menus for users to choose easily (Petelin et al 2019; Tejamaya et al. 2021). Features like this are important in order to save recording time and avoid mistakes in the recording process. Hartiningrum and Fitriani (2021) state that the digital pregnancy registration application makes it easy for students to do more accurate, efficient, effective, and comprehensive documentation. E-health applications in various fields are needed by health practitioners so that recording, monitoring, and follow-up actions to be taken can be digitally documented, stored neatly, and protected from physical damage (Juwita et al. 2019; Mustamu and Markus 2020; Narayanan 2012).

Conclusion

The Android-based CMNotes has been effectively used and implemented by the students of the Midwifery Department of Aceh Health Polytechnics. The application was designed as needed and expected by students in documenting postpartum and breastfeeding care. Positive experience was reported by the respondents during CMNotes implementation in a real classroom. The students perceived the convenience

of using the application with minor corrections and data addition. This study suggests that the CMNotes application would improve the documentation of midwifery care.

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