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Smart Postpartum Application and its Effect on Discharge Preparedness, Self-care, and Successful Breastfeeding

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ABSTRACT

Background: Breastfeeding difficulties and maternal self-care challenges may persist after hospital discharge, emphasizing the need to strengthen discharge planning and postpartum support. Self-care needs may differ between mothers who have vaginal births and those who undergo caesarean deliveries. Postpartum mothers increasingly use information and communication technologies to seek health information. **Objectives:** This study aimed to examine the effects of a smart postpartum application on discharge preparedness, successfull breastfeeding, and maternal self-care. **Methods:** A quasi-experimental pretest–posttest design with a control group was used. Participants were 96 postpartum mothers in Semarang, recruited through purposive sampling. **Results:** Discharge preparedness improved significantly within the intervention group from before to after the intervention ($p < 0.001$). However, post-intervention differences between the intervention and control groups were not statistically significant for discharge preparedness, breastfeeding success, or maternal self-care ($p > 0.05$). **Conclusion:** The discharge preparedness improved within the intervention group; the findings did not demonstrate that the smart postpartum application was more effective than the care received by the control group. Further research is needed to establish its effectiveness in supporting discharge preparedness, breastfeeding, and maternal self-care.

Keywords: Discharge Preparedness; Mobile Application; Postpartum

INTRODUCTION

Various problems, such as insufficient milk production and improper nursing techniques, cause inadequate breastfeeding. Common obstacles include unfamiliarity with the shape of the breasts and nipples, ignorance of breastfeeding techniques, and the inability to distinguish between problems caused by inadequate nursing and milk content. Based on the basic health research of Indonesia (Riset Kesehatan Dasar) in 2018, a majority of postpartum mothers 62.7% reported experiencing difficulties with breastfeeding. Overall, 37.3% of postpartum mothers by that data breastfed exclusively. In Central Java Province, the percentage of exclusive breastfeeding is 65.57%. Success in exclusive breastfeeding Early breastfeeding influences the success of exclusive early breastfeeding (Balitbangkes Kemenkes, 2018).

A comprehensive understanding is essential for mothers to address issues promptly. Educational media serve as a tool for successful education for mothers. Education delivered through appropriate media is expected to prevent issues from arising in the first place. Breastfeeding education is provided to mothers postpartum through the media. Education during hospitalization is part of discharge planning. The postpartum week of the postpartum period represents a critical physiological and psychological transition phase where maternal problems often peak. Therefore, as suggested by Yikar *et al.* (2026), mobile health applications should be integrated into routine care and installed prior to hospital discharge to ensure continuous support. Mothers still encounter issues with breast milk supply after hospitalization. This situation indicates that discharge planning indicators are not yet optimal. Previous research indicates that postpartum mothers still require effective timing and content for their education (McCarter-Spaulding & Shea, 2016). Therefore, postpartum education is needed to ensure continuity of information from hospitalization to home care (post-hospitalization) so that breastfeeding mothers receive continuous care. Discharge planning for breastfeeding mothers includes helping new mothers understand the possible benefits of breastfeeding, strengthening their breastfeeding skills, and knowing when they have enough breast milk. The appropriate discharge planning method should be easily accessible to breastfeeding and postpartum mothers at any time and place and can be obtained through technology-based discharge planning

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methods. Nurses play a principal role in educating mothers to enhance healthcare quality during the hospital-to-home transition, as effective discharge programs proactively equip women to positively perceive home care while assuming full responsibility for their recovery and their infant's clinical well-being (Almomani *et al*., 2024).

Recent studies indicate that postpartum mothers are more likely to use information and communication technology to seek health information (Gibson & Hanson, 2013; Guerra-Reyes *et al*., 2016). Several previous studies have examined applications designed to support successful breastfeeding among postpartum mothers. Meedya *et al.* (2021) reported that mobile applications can provide informational support and health interventions for breastfeeding mothers. Their systematic review of breastfeeding support applications also concluded that combining educational activities with personalized web-based support through discussion forums appeared to be the most effective approach to improving breastfeeding outcomes and long-term exclusive breastfeeding rates. One concern reported by postpartum mothers was the lack of information and assistance with self-care after discharge from the hospital. This highlights the necessity of developing and closely examining intelligent mobile applications that focus on postpartum discharge planning and nursing efficacy with more customization and engagement (Anggorowati *et al.,* 2022). Future electronic technology-based internet-based breastfeeding therapies should consider improving communication with mother and customizing the suggested intervention (Almohanna *et al.,* 2020).

Although mobile health applications to support postpartum mothers are increasingly developing, most applications still focus on specific domains, such as breastfeeding support (Syam *et al*., 2024), postpartum health education (Choudhury *et al*., 2021; Shorey *et al.,* 2017), or monitoring mothers and babies (Koçak *et al*., 2021). A systematic review shows that applications to support breastfeeding have heterogeneous content coverage and intervention components, while evidence regarding the long-term effectiveness on the sustainability of breastfeeding remains limited (Ziebart *et al*., 2025). Technology-based interventions also show potential in enhancing knowledge and breastfeeding self-efficacy, but the personalization of interventions and user engagement still require strengthening (Almohanna *et al.,* 2020). Additionally, although postpartum discharge planning can enhance maternal readiness, self-care abilities, and breastfeeding self-efficacy, these components have not yet been consistently integrated with breastfeeding support and postpartum self-care in a single continuous digital intervention. The integration is strengthened through interactive features to enhance maternal engagement, supporting the success of breastfeeding practices and continuous postpartum healthcare from healthcare facilities to home.

This study aimed to examine the effects of a smart postpartum application on discharge preparedness, successful breastfeeding, and maternal self-care.

METHODOLOGY

Study Design

The research design was quasi-experimental, incorporating a pre-post-test alongside a control group (Polit & Beck, 2022). In this design, neither the experimental nor the control group was selected randomly. In this design, both the experimental and control groups were compared. The experimental group received the smart postpartum application as an additional educational intervention, whereas the control group received conventional postpartum education as part of routine care provided by healthcare professionals. A pretest was given on the first day of postpartum care, and a posttest was given on the seventh day of postpartum period.

Participants

The research subjects were postpartum mothers in Semarang City. The sample size was determined using Cohen's sample-size tables for a two-group comparison, with an anticipated effect size of 0.70, $\alpha = 0.05$ (two-tailed), and a statistical power of 90% (Cohen, 1992). The required sample was 48 participants per group, resulting in a total sample of 96 participants. The sample-size calculation was based on a standardized effect-size approach rather than a comparison of two proportions. The respondent selected using purposive sampling divided into a control group (selected 53 postpartum mothers but finished only 48 mothers) and an intervention group (selected 51 postpartum mothers but finished only 48 postpartum mothers). The researchers designated specific hospitals to receive the intervention, while others served as control sites. Group allocation was determined by the hospital where each participant received postpartum care: mothers at the intervention sites were assigned to the intervention group, while those at the comparison sites were assigned to the control group. This approach was

employed to minimize the potential for contamination between the groups. The inclusion criteria were mothers who were in the immediate postpartum period (the first day after childbirth and before hospital discharge), had given birth at a hospital, were able to communicate effectively, and had access to the internet. Postpartum mothers who experienced complications requiring intensive medical care, and postpartum mothers who were unable to complete the study procedures were excluded from the study. Discharge preparedness was the primary outcome, while self-care and breastfeeding success were considered secondary outcomes.

Data Collection

The study instruments comprised a respondent characteristics questionnaire, the Readiness for Hospital Discharge Scale–Postpartum (Weiss & Piacentine, 2006), a breastfeeding success questionnaire, and a postpartum maternal self-care questionnaire (Lederman *et al.,* 1981). The Readiness for Hospital Discharge Scale–Postpartum contained 22 items and had been translated and validated. After receiving an explanation of the study and providing informed consent, respondents completed the questionnaires through Google Forms.

Data Analysis

Data were analyzed using SPSS to examine the influence of variables, discharge preparedness, successful breastfeeding, and self-care for postpartum mothers. Categorical variables can be presented by frequency and percentage, and the continuous variables can be presented by mean and standard deviation. The Wilcoxon signed-rank test was used to assess changes in discharge preparedness scores between pre and post-intervention group, as the data did not meet the assumptions for parametric analysis. The Mann–Whitney *U* test was employed to compare post-intervention discharge preparedness scores and breastfeeding success outcomes between the intervention and control groups because these analyses involved two independent groups and non-parametric data. Independent-samples *t*-tests were used to compare post-intervention self-care scores between the intervention and control groups, as the outcome was treated as a continuous variable and met the assumptions for parametric testing.

Ethical Consideration

The research obtained ethical clearance from the Faculty of Medicine, Universitas Diponegoro, Indonesia, with reference number 71/EC/KEPK/FK UNDIP/III/2021 on 23rd March 2021.

RESULTS

Table 1: Characteristics of Postpartum Mothers in Semarang in 2021 (n=96)

Variable/ Category	Control group (n=48)		Intervention group (n=48)		*p*
	f (%)	Mean (min-max)	*f* (%)	Mean (min-max)	
Age		25 (15-38)		28.75 (19-44)	0.34
Education					0.89
Elementary	3 (6.3)		1 (2.1)		
Junior High	11 (22.9)		6 (12.5)		
Senior high	17 (35.4)		15 (31.3)		
University	17 (35.4)		26 (54.2)		
Job					0.34
Employed	27 (56.3)		27 (56.3)		
Housewife	21 (43.8)		21 (43.8)		
Birth history					0.32
Spontaneous	24 (50)		16 (33.3)		
Cesarean Sections	24 (50)		32 (66.7)		
Place of birth					0.24
Hospital Type A	2 (4.2)		8 (16.7)		
Hospital Type B	45 (93.8)		39 (81.3)		
Hospital Type C	1 (2.1)		1 (2.1)		
Breastfeeding					0.60
No	16 (33.3)		2 (4.2)		
Yes	32 (66.7)		46 (95.8)		
Birth weight		3082 (2300 – 3900)		3014 (2200-4500)	0.32
Early breastfeeding initiation					0.80
No	6 (12.5)		8 (16.7)		
Yes	47 (87.5)		40 (83.3)		
Discharge preparedness		167.5 (113-206)		173(100-209)	0.44
Successful breastfeeding		70 (46-96)		69 (55-84)	0.56

Table 1 explains that mothers in the intervention group averaged 28.75 years old, with majorities having higher education (54.2%), employed (56.3%), delivering via cesarean section (66.7%), giving birth in type B hospitals (81.3%), initiating early breastfeeding (83.3%), and breastfeeding their infants (95.8%). In contrast, control group mothers averaged 25 years old, split evenly between high school and higher education (35.4% each) and delivery methods (50% spontaneous vs. 50% cesarean), with majorities working outside the home (56.3%), delivering in type B hospitals (93.8%), initiating early breastfeeding (87.5%), and breastfeeding overall (66.7%).

Table 2: Differences in Postpartum Mothers' Discharge Preparedness Pretest and Posttest in the Intervention Group

Variable	Before intervention Mean ± SD	After intervention Mean ± SD	*p*
Discharge Preparedness	148.15 ± 31.40	170.25 ± 25.18	<0.001*

**Wilcoxon*

Based on Table 2, the Wilcoxon test showed a significant difference in discharge preparedness in the intervention group before and after using a smart postpartum application ($p<0.05$).

Table 3: Differences in Discharge Preparedness and Successful Breastfeeding among Postpartum Women between Control and Intervention Group

Variable	Control (n=48) Mean ± SD	Intervention (n=48) Mean ± SD	*p*
Discharge Preparedness	167.44 ± 21.73	170.25 ± 25.18	**0. 44**[a]
Successful Breastfeeding	69.15 ± 12.24	70.27 ± 9.29	**0.72**[a]
Self-Care	69.17 ±4.44	69.33 ±5.38	**0.19**[b]

[a]*Mann-Whitney;* [b]*t-test*

Based on Table 3, the Mann-Whitney test indicated that discharge preparedness ($p= 0.44$), successful breastfeeding ($p= 0.72$), and self-care ($p= 0.19$) did not show a significant difference between the intervention and control groups.

DISCUSSION

The application developed in this study is named Smart Postpartum Application. This application was a tool that provided information and educational resources to help postpartum mothers prepare for discharge. It facilitates communication, allowing mothers to report any concern while at home and receive timely responses, and also includes an instrument to assess a mother's readiness for discharge following childbirth. In addition, this application also contains education on postpartum self-care, which helps mothers understand common complaints, recognize potential health issues, and know the appropriate handling methods, as well as education related to breastfeeding preparedness, which provides important information to support the initiation and continuation of breastfeeding after postpartum mothers return home. This application does not only focus on one aspect of postpartum care but integrates several interrelated maternal education needs into one app. The study results indicated that postpartum mothers were generally between 20 and 30 years of age. Mothers in this age group may have the physical maturity needed to care for themselves and their infants (Railyan *et al.,* 2021). Most mothers in the control group were employed, whereas most mothers in the intervention group were housewives. Although housewives may have greater flexibility to organize self-care and infant care, their available time and energy may be limited by household responsibilities, particularly when support is unavailable. Managing household tasks alongside postpartum recovery and infant care may contribute to maternal fatigue. Most participants reported initiating breastfeeding early, although a small proportion reported initiating it late. Breastfeeding experiences and difficulties vary among mothers, and certain anatomical factors affecting the maternal breast may interfere with breastfeeding (Gridneva *et al.,* 2025; Ventura *et al*., 2021).

The significant pre- post improvement in discharge preparedness among mothers in the intervention group suggests that the Smart Postpartum Application may enhance their discharge preparedness for managing postpartum care at home. However, because the post-intervention difference between the intervention and control groups was not statistically significant, this improvement alone cannot establish the effectiveness of the smart postpartum application. The application's content was specifically compiled and adapted to different postpartum stages to address mothers' evolving needs. The improvement observed within the intervention group was consistent with findings reported by Gün *et al*. (2022), who found that smartphone-based education outperformed traditional methods. Similarly, Bilgiç and Bozkurt (2026) reported that online education during pregnancy improved postpartum discharge preparedness. Accessible digital content that mothers can review repeatedly may support their information needs during the transition from hospital to home, although the present findings did not establish its superiority over the care received by the control group.

However, there were no significant differences in discharge preparedness, successful breastfeeding, and self-care between the control and intervention groups. Unlike Usnawati and Hanifah (2025), the Breast Milk Mother mobile application successfully enhanced knowledge, attitudes, breastfeeding timing, and the sufficiency of breast milk for infants. Maternal breastfeeding self-efficacy significantly influences successful breastfeeding outcomes, reflecting a mother's emotional readiness, perceived ability, and effort to breastfeed her baby. To ensure success, breastfeeding must be effectively monitored through professional postpartum follow-ups (Yikar *et al.,* 2026). A qualitative study in Nigeria by Olajubu *et al.* (2022), who used SMS as a medium for postpartum education, found important themes related to increasing mothers' understanding of self-care and the use of postnatal services, because the messages received helped strengthen knowledge and recommended practices. This study result shows the difference in delivery mode between intervention and control groups. While spontaneous vaginal births were more likely in the control group, cesarean deliveries were more common among mothers in the intervention group. Given that cesarean birth has been linked to decreased early ambulation and less favorable functional recovery during the first postpartum period when compared to vaginal delivery, this distinction may have an impact on postpartum recovery (Ma *et al.,* 2018). Therefore, when assessing maternal self-care and discharge preparedness outcomes, manner of birth may be a possible confounding factor.

To achieve optimal breastfeeding outcomes, mothers must possess specific clinical proficiencies due to the physiological demands of post-caesarean wound recovery during the early puerperium. Discharge preparedness did not differ significantly between the intervention and control groups after the intervention. This finding suggests that the smart postpartum application, as implemented, did not demonstrate an additional benefit for discharge preparedness compared with the care received by the control group. Possible explanations include the intervention's design, participants' engagement with the technology, and the relevance of the content to individual needs. The application may also have lacked sufficiently tailored information or support for behavioral change. However, these explanations remain speculative unless they were directly assessed in the study. Factors such as psychological barriers, expectations of the application, educational background, social support, engagement, and duration of use may influence the effectiveness of postpartum health applications (Oktar *et al.,* 2026; Schoemann *et al.,* 2026; Yanıkkerem *et al.,* 2018). Although digital interventions aim to promote autonomy, postpartum mothers must be evaluated holistically, as their level of comfort is directly linked to their ability to maintain effective self-care. During this period, mothers transition into taking full responsibility for their own healthcare services, which necessitates appropriate support for both mother and infant to ensure a smooth adaptation (Yikar *et al.,* 2026).

This is in line with Osman *et al*. (2025), who noted that while digital applications can enhance maternal autonomy in meeting their needs independently, they may still face limitations in providing personalized

clinical guidance. These limitations emphasize how tough it is to deliver postpartum treatment just through digital technologies. In this context, this result is in line with previous evidence indicating that breastfeeding and postpartum self-care outcomes are influenced not only by access to information but also by continuous professional support and contextual clinical factors. Therefore, digital interventions may be more effective when integrated with direct support from healthcare providers rather than implemented as stand-alone strategies (Griffin *et al.*, 2021).

In particular, by offering ongoing education and assistance outside of hospital settings, nurses play a crucial role in incorporating digital health technology into postpartum care. Nurses may guarantee that postpartum moms receive consistent, evidence-based information that is customized to meet their requirements by integrating this application into routine discharge planning. This will boost the mother's confidence and readiness for at-home care. Additionally, nurses may be able to maximize time efficiency while maintaining the standard of patient education by utilizing the Smart Postpartum Mother Application. This digital strategy fosters active involvement in pregnant women's health management, provides personalized treatment, and empowers mothers. This thorough approach to discharge education not only standardizes care but also significantly contributes to the overall improvement of healthcare outcomes by reducing the risk of complications after hospital discharge. When well-supplied by nurses, such digital strategies serve to empower mothers and enhance their long-term ability to create a nurturing environment at home (Almomani *et al.,* 2024).

Limitations

A limitation of this study was the limited educational content in the application. The limitation also restricts our ability to evaluate the application's long-term impact on user mastery and continuous engagement. To address this gap, future development efforts should focus on expanding the depth and variety of instructional materials, including interactive exercises and advanced topics. Breastfeeding outcomes also needed to be evaluated properly.

Future Scope

Future studies should use multicenter randomized or carefully matched designs and report intervention fidelity, missing data, also blinded outcome assessment. Larger samples and longer follow-up are needed to estimate the effect of the application. Process and mediation analyses should determine whether changes in knowledge, perception, and practical skill. Digital follow up may improve reach but should be evaluated.

CONCLUSION

A significant difference showed in discharge preparedness in the intervention group before and after using a smart postpartum application (p=0.001). The increase in discharge preparedness scores in the intervention group supports the potential use of the application as a supplementary educational tool during the postpartum period. In the other hand, discharge preparedness (p= 0.44), successful breastfeeding (p= 0.72), and self-care (p= 0.19) did not show a significant difference between the intervention and control groups. Future research should consider the psychological condition of the mother, expectations regarding the application, as well as the involvement and adequate usage time of the application for postpartum mothers.

CRediT Authorship Contribution Statement

A.N.G.: Conceptualization, Methodology, Investigation, Data Curation, Supervision, Validation, Formal Analysis, Original Draft, Project Administration. **A.N:** Methodology, Formal Analysis, Supervision, Review and Editing. **D.N.:** Validation, Supervision, Writing - Review. **I.K.M.:** Original draft, Validation, Visualization, Writing - Review and Editing. All authors reviewed and approved the final manuscript and accepted accountability for the work.

AI Assistance Declaration

Paperpal, Grammarly, and Quillbot was used to assist with English-language refinement, manuscript organization, and consistency checking against the original dissertation. It was not used to generate or alter primary data or to introduce unverified statistical results. All AI-assisted text and numerical statements were critically reviewed, verified against the source documents, and revised by the authors. The authors take full responsibility for the accuracy, integrity, and final content of the manuscript.

Conflict of Interest

During the course of the research and this conclusion, there was no conflict of interest in the study.

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