

## Development of Smart Postpartum Care Application Based on Community Health Centers, as a Method for Mentoring Postpartum Mothers: A Mixed Method Approach

### Abstract

**Background:** Early detection of postpartum problems can help reduce maternal mortality in Indonesia. Early detection can be achieved by monitoring postpartum mothers using a guidance system. The purpose of this study was to describe the development of a guidance system, namely, Smart Postpartum Care (SMAP CARE) and present its functional and acceptance tests. **Materials and Methods:** This study was a development study conducted in 2019 using a mixed-method approach. Data were collected through Focus Group Discussions (FGDs) and a literature study. The FGD participants consisted of six doctors, six nurses, and midwives from six community health Public health center in Semarang City, Indonesia. The collected data were analyzed using the Colaizzi method. The content of the postpartum mentoring application was based on input from the experts in health education and health services. Before widely applied, a feasibility study on the application was carried out in community health centers involving postpartum mothers and health care teams. **Results:** Five themes were generated from FGDs: (1) postpartum monitoring facilities; (2) monitoring postpartum mothers through visits to health centers and home care; (3) problems with postpartum mothers (including problems with mothers, babies, and the environment); (4) management of high-risk postpartum mothers; and (5) the risk of postpartum mothers, which could cause death. The SMAP CARE provides some features to educate postpartum mothers, for example (a) changes in the physiological aspects of postpartum mothers, (b) breast milk, (c) newborn care, (d) signs of danger in newborns, (e) problems with babies, (f) problems with postpartum mothers, and (g) signs of danger in postpartum mothers. **Conclusions:** The application developed in this research, SMAP CARE, helps to facilitate mentoring for postpartum mothers and can be extended to community health centers in Indonesia.

**Keywords:** Health education, mentoring, postnatal care

### Introduction

The postpartum period is the most critical period because the mother's organs are recovering to its normal condition as before pregnancy.<sup>[1]</sup> The Maternal Mortality Rate (MMR) in Indonesia is 305 deaths per 100,000 births, which is higher than the average rate in the United States with 38 deaths per 100,000 births and in the world with 295 deaths per 100,000 births.<sup>[2,3]</sup> Indonesia's MMR is still higher than other developing countries.<sup>[4]</sup> The most reported concerns in the postpartum period are the information and assistance on self-care follow-up, after discharge from the hospital.<sup>[5]</sup> The inadequacy and the underutilization of postpartum care services are likely due to several factors, including poor education, poverty, and limited access

to health care facilities.<sup>[6]</sup> The absence of postpartum care can also be related to varied priorities and perceptions of maternal and infant needs among health care providers, new mothers, and their families. This situation is likely to be influenced by regional and cultural practices.<sup>[7]</sup> Postpartum education should be provided during hospitalization for two or four days. To ensure successful postpartum, education should also be provided continuously to increase the mothers' abilities in performing self- and baby-cares.<sup>[5]</sup>

Community health centers are the health service facilities that are closest to the community. The services are focused on promotion and prevention. Mentoring postpartum mothers is included in the

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promotion and prevention strategies to prevent problems for postpartum mothers and their babies. Several researchers have developed applications to use for postpartum women. These applications make it easier to monitor the improvement of postnatal women and detect postpartum depression early; they are also easy to use, interactive, convincing, and evidence-based with credible sources.<sup>[8-11]</sup> However, to the best of our knowledge, there is no application that focuses on education for postpartum mothers that is integrated with monitoring and detection features. This type of application is significant during the coronavirus pandemic, in which education with limited direct contact is very much needed. It can also be regarded as an e-learning program for postpartum mothers. Smart Postpartum Care (SMAP CARE) is an application designed for women from the end of pregnancy to the postpartum period as an educational and communication facility between postpartum women and health services. This study aimed to describe the development of the SMAP CARE and present the results of its function tests to show the acceptance of this mobile health application among postpartum mothers and the health professionals.

## Materials and Methods

The research was conducted from August to November 2019. This research is a development study using a mixed-method approach that combines qualitative phenomenological studies and pre-experimental quantitative studies. The research consisted of two stages, which were carried out sequentially using different designs. The research began with a qualitative study using a phenomenological approach to identify the problems that often occur in postpartum mothers and gain experience of health workers in managing postpartum mothers at the health center level. The phenomenological approach was used to gain meaning from the experience of health workers in the management of postpartum mothers. After being enriched by the literature review, the results of the phenomenological studies were translated to the content of the SMAP CARE application. This application is website-based with use by health workers and postpartum mothers. After the application prototype was produced, a pre-experimental study was carried out using a posttest-only design (quantitative study).

The sampling method used is purposive sampling. Data were collected through Focus Group Discussions (FGD) and literature study. The FGD was conducted at the Halmahera Community Health Center in one group involving six physicians, six nurses, and six midwives who worked in six community health centers in Semarang. The selection of these community health centers was based on cluster sampling, including (1) urban areas, (2) areas near the coast, and (3) areas near the mountain. Prior to the discussion, the participants were given an explanation of the aims and objectives of the FGD. They were also provided

with some information they needed before giving their consent. The FGD was recorded using a recording facility on the researcher's smartphone. The information submitted by the participants was validated at the end of the FGD by confirming what was meant. Data source triangulation was also performed by confirming the data from other health workers from one health center. The Colaizzi analysis of the data was performed after the recording was listened repeatedly and arranged in a transcript.

The steps of data analysis using Colaizzi are carried out as follow: 1) describe phenomenon under study, 2) collect a description of the phenomenon through the opinions or statements of participants. Researchers conducted interviews and wrote them in the form of a transcript to be able to describe the description of the research concept. 3) read the entire description of the phenomenon that has been submitted by all participants. 4) reread the transcript of the interview result repeatedly and quotes meaningful statements for all participants. 5) the researcher elaborates the meaning that is in the statement of all participants significantly. 6) organizing collections of meaning that are formulated into groups of themes. 7) Researchers write a complete description in the form of research results. 8) the researcher met the participants again to validate the description of the analysis results. This is done in order to equalize perceptions between researchers and participants. 9) The researcher combines the data from the validation results to the participants into the description of the results of the analysis.

Transferability is done by making a report with provide a detailed, clear, systematic, and understandable description trusted. In this research, credibility was assessed by member checking, peer debriefing, and triangulation of sources. Dependability in this study was assessed by conducting an audit of the entire research process by reviewing or criticizing the research results. To determine confirmability, the data in this study were obtained by confirming the data with key informants and audit trials.

The literature review sources used in this study included articles, books, and guidelines at both international and national levels with keyword "guideline", "management", "postpartum" and those issued in the last 10 years (2009–2019). The main guidelines referred to those for implementing postpartum management, is a book on maternal and child health published by the Ministry of Health of the Republic of Indonesia. The literature reviews provided reinforcement on the contents of the health education feature in SMAP CARE. The development of the SMAP CARE also involved collaboration with information system experts. During this stage, inputs from experts in health education and health services, as well as inputs from information systems experts, were obtained.

The feasibility study and application of SMAP CARE on postpartum mothers and health care teams were conducted

in community health centers. The samples for this feasibility study were the health workers at community health centers and postpartum mothers in community health center areas with the characteristics of having a smartphone, sufficient storage capacity to install the application, and being able to operate the application. The SMAP CARE function test was conducted on 30 respondents selected using purposive sampling. Respondents who met the inclusion criteria: third trimester pregnant women living in the working area of Mangkang, Bangetayu, Sron dol, Ngesrep, Rowosari, and Halmahera public health centers were involved in the study. The respondents signed an informed consent form prior to their participation in the study. The respondents were then asked to register in the SMAP CARE application and complete their demographic data, self-identity, husband identity, pregnancy, and childbirth history. Furthermore, the respondents could access the educational features available in the application, including infant care, newborn danger signs, newborn problems, postpartum problems, breastfeeding, psychological adaptations in postpartum mothers, cesarean section, perineal wound care and postpartum nutrition.

The respondents were given the opportunity to try the SMAP CARE application for 2 weeks. During this period, the respondents accessed all features in the application. The respondents tried to fill in the features that required data entry, such as identity, delivery reports, and data on third-day and seventh-day of postpartum mothers. Subsequently, they were given a questionnaire developed by the researchers to evaluate the usefulness of the application, its user-friendliness, and educational benefits. The respondents were also requested to provide their impressions after using the SMAP CARE application.

### Ethical considerations

This study was reviewed and approved by the Health Research Ethics Committee with a reference number of 54/EC/KEPK/D/Kep/VIII/2019 dated August 9, 2019. Ethical aspects were considered in this study by respecting the autonomy of respondents involved in the FGD or feasibility test of the application. Additionally, the benefits of this information are also provided in the application.

### Results

The results of the qualitative study obtained the themes in Table 1 which became the basis for developing SMAP CARE applications and the results of the quantitative study obtained an overview of the use of SMAP CARE in Table 2. The results of the FGD data analysis yielded in 5 themes [Table 1]. These five developed themes included: (1) postpartum monitoring facilities based on postpartum maternal data, consisting of nine categories; (2) (3) problems with postpartum mothers, consisting of three categories; (4) management of high-risk postpartum mothers; there were obstacles to mentoring and referral;

therefore, a suitable management strategy is required. This theme consisted of six categories; and (5) the risk of postpartum mothers which could cause death, describing the causes of postpartum maternal death.

The content of education for postpartum mothers and guidelines for monitoring during the postpartum period were collected. The education material included information on physiological changes in postpartum mothers, breast milk, newborn care, newborn danger signs, problems with babies, problems with postpartum mothers, post caesarean section, wound care in postpartum mothers, and nutrition in postpartum mothers. The guidelines for monitoring during postpartum period consisted of Day 1–3 of postpartum, Day 4–7 of postpartum, Day 8–14 of postpartum, and Day 15–42 of postpartum.

The results of the SMAP CARE function test are presented in Table 2. All respondents stated that the SMAP CARE application was easy to use and provided solutions to problems in postpartum mothers and newborn babies. This is in line with the result of the function test, in which all respondents (100%) answered yes in the accessibility and usability of the application. Moreover, its educational features were available as needed with an attractive appearance. The respondents also said that the communication and educational features interconnected between health workers and mothers were very useful. The notification feature in the SMAP CARE made it easy for mothers to remember check-up times and functioned as a reminder to health workers. If at a specified time the mother did not come to the health service center, the health worker could ask about the mothers' condition directly through the application. Postpartum mothers could monitor their condition using the SMAP CARE application.

### Discussion

Postpartum care is a fairly long period and during this period many changes occur in the mother and baby. Monitoring of postpartum mothers through visits to health services is limited in time so that there is a delay in monitoring maternal health. This study aimed to develop an application for postpartum mothers that can function to provide monitoring, e-education, and early detection in one activity. Mentoring postpartum mothers with the SMAP CARE is a new aspect of the interaction between postpartum mothers and health care teams at community health centers. Mentoring aims to increase the mothers' active involvement in self-care and baby care during the postpartum period. The instructions given in the SMAP CARE helps mothers identify and solve the problems related to postpartum care. The results of FGD on the management of postpartum mothers showed that monitoring postpartum mothers was carried out through visits to the community health center and home care. This activity stopped when a situation occurred, such as at the COVID-19 pandemic, that broke out in early 2020. Monitoring without face-to-face interaction is an alternative provided for

**Table 1: Data analysis from the Focus Group Discussion (FGD)**

Sub theme	Theme
Postpartum data	Postpartum monitoring facilities based on data on postpartum mothers
Maternal monitoring facilities	
Postpartum monitoring	Monitoring postpartum mothers through visits to health center and home care
Postpartum problems	Problems with postpartum mothers, including problems with mothers, babies, and environment
Pregnant and postpartum women with high risk handling	Management of high-risk postpartum mothers; there were obstacles in mentoring and referring, so that a handling strategy was needed
The risk of postpartum mothers	The risks of postpartum mothers which could cause death

**Table 2: Function test of SMAP CARE\*, 2020 (n=30)**

Item	Yes n (%)	No n (%)
Accessability	30 (100)	0 (0)
Create account	30 (100)	0 (0)
Usability	30 (100)	0 (0)
Identity	30 (100)	0 (0)
Notification	29 (96.70)	1 (3.30)
Labor history	30 (100)	0 (0)
Medical history	30 (100)	0 (0)
Health education as needed	28 (93.30)	2 (6.70)
Attractive display	14 (46.70)	16 (53.30)
Colour variation	10 (33.30)	20 (66.70)
Features	22 (73.30)	8 (26.70)
Connected patient	23 (76.70)	7 (23.30)

\*Smart Postpartum Care

postpartum mothers. The SMAP CARE application, which provides interactions between postpartum mothers and the health care team, is a mobile service that fulfills postpartum visits as a part of postpartum care.<sup>[12]</sup>

SMAP CARE as an e-education strategy is different from other e-education that has been previously conducted using the telephone or short message-based postpartum maternal education in the middle to lower-middle groups such as in Ecuador in 2012 that increased mothers' presence at postpartum and baby examinations, increased the provision of exclusive breastfeeding, and decreased condom use and infant morbidity.<sup>[13]</sup> Postpartum care has improved over the last 20 years; there are enormous inequalities in both completeness and coverage. More than 90% of women in developed countries, such as American and European countries, comply with World Health Organization (WHO) Postnatal Care (PNC) recommendations. However, in middle-income countries, only between 37% and 51% of women received postnatal visit within 48 h of delivery.

Studies conducted in several countries such as Myanmar, India, Ghana, Tanzania, and Ethiopia show that the full use of PNC ranges from 10% to 60%.<sup>[14]</sup> The achievement of postpartum visits through the mothers' presence at the community health center in Indonesia has reached 61.59%.<sup>[15]</sup>

The Ministry of Health of the Republic of Indonesia targets three postpartum visits: the first visit from 24 h to 6 days, the second visit from 7 to 28 days, and the third visit from 29 to 42 days. The WHO recommends a postnatal visit for a period of 24 h, the third day, between 7 and 14 days, and 6 weeks.<sup>[16]</sup> The absence of postpartum mothers in postnatal visits is influenced by factors such as the perceptions of the quality of PNC,<sup>[17]</sup> motivation, education, family roles, and knowledge.<sup>[18]</sup> Other reasons for postpartum mothers not having PNC visits include unwanted pregnancy, health issues with the newborns, and rare visits to Antenatal Care (ANC) since the beginning of pregnancy.<sup>[19]</sup>

Mentoring postpartum mothers using an application system makes the access easier. It is hoped that the percentage of postpartum visits will also increase. Every pregnant woman can be invited to use the application and update the condition according to the time of visit. This facilitation in SMAP CARE is contained in the notification, which is an e-visit of postpartum mothers. The main contents of postpartum education include problems that are often encountered by postpartum mothers, babies, and the environment, as well as the risk conditions of postpartum mothers. The SMAP CARE provides information on educational needs during childbirth, for both self-care and baby care. The ease of access to health education is expected to increase the knowledge of postpartum mothers so that their self-reliance can increase. Information needs can lead to information seeking early in the postpartum period, exclusive breastfeeding and problems with breastfeeding, general health and behavior problems, and topics related to discomfort or difficulty in discussing with health care providers. Overall, breastfeeding is the problem that mostly leads to information seeking in the postpartum period.<sup>[20]</sup> Awareness of postnatal danger signs is an important factor that motivates women and their families to attend health services as the earliest opportunity for the purpose of prevention and early detection.<sup>[21]</sup> The needs of postpartum mothers, in addition to postpartum health education facilities, are available to mean directly to the health care team. This speeds up problem identification. The consultation does not require time to wait for service hours at the community health center. Visiting the community health center is conducted only if recommended by the health care team. Through the SMAP CARE application, all postpartum mothers will receive online visiting services from the community health center.

Application-based education is attributed to the appearance of the application in this study. The color

display is related to the aspect of attractiveness. The SMAP CARE application was less attractive and lacked color variation as indicated by more than 50% of respondents saying no to either of these aspects. The black color used in the application is less attractive than the blue and red colors.<sup>[22,23]</sup> The content development of the SMAP CARE application has received inputs from the experts but has not undergone interrater testing. In addition, the development of monitoring and education applications for postpartum mothers was conducted in the context of the provincial capital region, which may be different from other regions.

## Conclusions

The SMAP CARE application can be used as a valuable alternative to facilitate mentoring for postpartum mothers in community health centers in Indonesia. However, the feasibility test in this study was still limited to postpartum mothers in the provincial capital region. This application can be used further on postpartum mothers. Further studies can examine the effectiveness of the application with changes in variables associated with postpartum mothers.

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## Conflicts of interest

Nothing to declare.

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