The maternal referral mobile application system for minimizing the risk of childbirth

by Ratna Dwi Wulandari

ARTICLE

The maternal referral mobile application system for minimizing the risk of childbirth

Diah Indriani,[1] Nyoman Anita Damayanti,[2] Danu Teguh,[3] Muhammad Ardian,[3,4,5] Hud Suhargono,[3,5] Satriawansyah Urbaya,[6] Ratna Dwi Wulandari,[2] Triska Susila Nindya,[7] Ernawaty Ernawaty,[2] Nuzulul Kusuma Putri,[2] Ilham Akhsanu Ridlo[2]

[1]Department of Biostatistics and Population Studies; [2]Department of Health Admnistration and Policy, Faculty of Public Health Universitas Airlangga, [3]Indonesian Obstetrics and Gynecology Association (POGI); [4]Airlangga Hospital, Universitas Airlangga, [5]Faculty of Medicine; [6]Information Technology Practitioner; [7]Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Indonesia

Abstract

Background: The maternal mortality rate in Surabaya is still quite high due to ineffectice referral health systems. Primary Health Care (PHC) has difficulty referring patients to hospitals which have available resources. The purpose of this study is to develop a mobile app system framework for the maternal referral system.

Design and Methods: This study was developed based on the results of the Focus Group Discussion (FGD) with midwives, doctors and primary health care heads about the referral system regulation in Surabaya City.

Results: A mobile app system can be used to communicate patients' conditions to the hospital. The hospital then will refer back to the PHC as a home care service after the birth. This mobile app has gone through a trial and a development process; it is currently in the process of structuring the mobile app based on the bugs that occur in the system.

Conclusions: This mobile app still needs development, especially in minimizing system bugs, and providing faster, more accurate communication.

Introduction

One of the goals of the Millennium Development Goals (MDG's) is to reduce the Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) by 102 per 100,000 live births for MMR and 23 per 1,000 live births for IMR. The target is expected to be achieved in 2015. The year 2016 is a transition period from the end of the MDGs and the first year of implementing the world development agenda known as the Sustainable Development Goals (SDGs).

In the SDGs, it is stated that one of the objectives to be achieved is the reduction of MMR to 70 per 100,000 live births and IMR by 12 per 1,000 live births in 2030. Based on data from the Surabaya City Health Office (2018), MMR in East Java Province in 2015 – 2017 has decreased to reach 79 per 100,000 live births. This means that based on MDG's indicators, MMR in Surabaya has been better than MDG's targets. However, if you look at the targets set in the SDGs, efforts still need to be made to further reduce the IMR.

Surabaya is one of the cities in East Java Province with the highest MMR, with 34 maternal deaths.[1] The causes of maternal death include 3 cases of delay (late decision making, late arrival at health facilities and late in receiving medical help). In addition to these, maternal deaths are also caused by 4 too's (too young to get pregnant, too old to get pregnant, too many children, and too close to children). Based on the information obtained from the results of a Focus Group Discussion (FGD) with several midwives and heads of PHC in Surabaya City (PHC Kalijudan, Mulyorejo, Tenggilis, Gunung Anyar, Medokan Ayu and Kalirungkut), it emerged that the cause of high maternal mortality in Surabaya was the constraints in the referral system of expectant mothers and babies, explained as follows:

a. When referring patients, the PHC must call the hospitals which have advanced health service facilities.

b. Often when referring to a government hospital, referrals are often rejected because the hospital thinks that it can still be handled at the PHC.

c. Patients who are referred to hospitals are often send beack to the PHC without any adequate advice. Most of these patients have mild pre-eclampsia and post-date patients who should be treated at hospital. In addition, private hospitals do not accept BPJS (National Social Insurance in Indonesia) patients if they are not in emergency condition, so these are often send back to the PHC.

d. Many patients do not know that even a normal delivery should be carried out at PHC.

e. When there is a need to refer a patient, the PHC usually contact the hospitals with the lowest type/classes; if there is no response it will be immediately referred to the the highest level of hospital. Thus there can be a buildup of patients which will later also affect the quality of services.

Difficulties in referral health system may still arise due to factors, such as the complexities of patients, late response, and barriers in coordinating care. The purpose of this study is to develop a mother-and-baby referral information system in Surabaya based on a web and mobile application to accelerate the referral communication flow.

Design and Methods

This is action research which is located in city of Surabaya, with a number of sample 6 PHC in Surabaya, namely Mulyorejo, Kalijudan, Gunung Anyar, Medokan Ayu, Kalirungkut and Tenggilis and 3 hospital namely Suwandhi, Haji and Airlangga Hospital. The preparation of the Mobile application is based on the results of the FGD and those of the in-depth interview with an expert (Obgyn specialist doctor). The stages of its preparation are: identification of information needed in PHC and Hospitals, identification of the Surabaya City referral flow, application setting, testing and evaluation.[2]

Results

Identification of information needs

In-depth interviews with experts revealed that the referral process must include important information about the patient, such as patient identity, patient's physical condition before being referred to, patient's name, age, pregnancy history (gravida, parity, abortus, gestational age, fetal number, fetal condition, fetal heart rate, estimated fetal weight), pregnancy phase, obstetric complications, non-obstetric [7] complications, puerperal delivery, Poedji Rochjati Score Card (PRSC), Poedji Rochjati Score Card (PRSC) risk group, patient's condition (consciousness, hemoglobin, anemic, dyspnea, jaundice, cyanosis, tension, pulse, respiration, axillary temperature, SPO2, convulsions, flux, urine).

Identification of the referral flow in the city of Surabaya

The results of the document study and in-depth interviews with the Surabaya City Health Office about the referral flow of pregnant women in Surabaya City are summarized in Figure 1. In this referral system flow, the treatment of pregnant women with risky and non-risky pregnancy conditions has been differentiated. This is adjusted to the condition of health care facilities for pregnant women.[1,3]
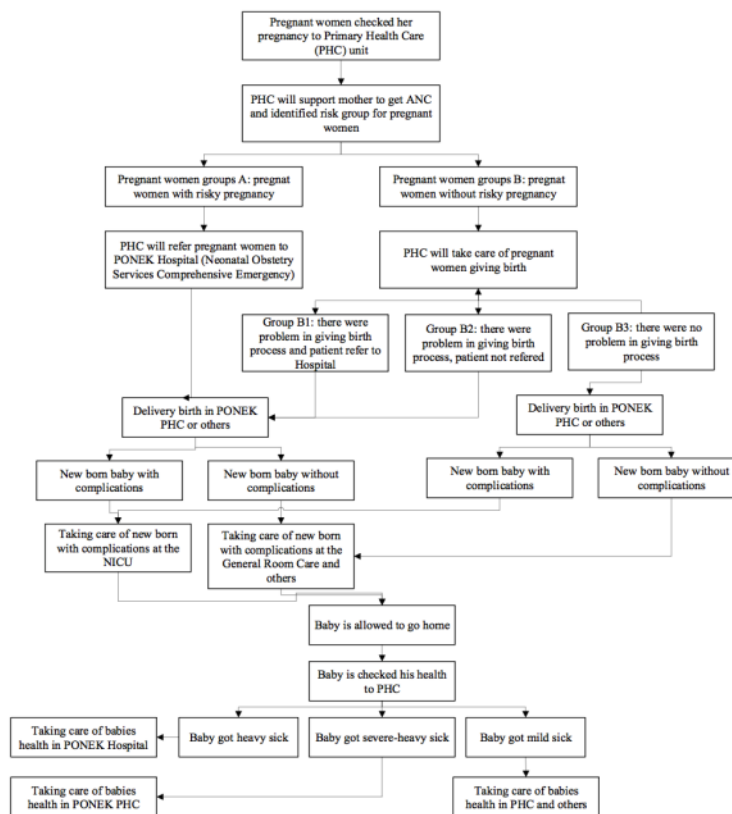

Figure 1. The flow of referral mother giving birth in the city of Surabaya.

Mobile application system referral flow

The results of the FGD with the Health Office, Head of PHC, Penakib of Surabaya resulted in an agreement on the referral flow of the Mobile Application referral system. The flow is described in Figure 2. PHC (midwifes) as a unit that conducts referrals, informs the details of the patient's condition through a mobile application. The hospital will accept or reject patient referrals based on the conditions of the facilities available at the hospital. The hospital will refuse if the facilities at the hospital are fully occupied by other patients or if the hospital is experiencing limited human/facilities resources. If refusing a referral, the Hospital must fill in the reason for the refusal. The main hospital must not refuse referral patients. The main hospital is the last referral level hospital if other hospitals are unable to take the referral patient's condition. Although it is based on an online application, while using this mobile application system midwives still should make offline calls to hospitals that have positively received patients for more detailed information about patients.

Compilation of the Mobile Application

The results of the development of a mobile application begin with an in-depth interview to identify information needs both with experts and practitioners at the primary health center and hospital. Figures 3 and 4 show the results of the mobile application interface. This mobile application has 3 role accounts, namely the sender of the referral (primary care center), the recipient (*i.e.*, the hospital) and the health district officers as controller.

Mobile Application Trial and Evaluation

Trials were conducted with role simulations to detect errors that occur in mobile applications. Role simulations included a midwife sending referrals and hospitals that receiving them. This trial process found some bugs in the application, so it still needs some improvements.

Discussion

The first step in this research is to identify problems that occur in the process of referring of pregnant women. Based on interviews with several midwives and heads of PHC, we concluded that there were some problems in this referral system in the city of Surabaya. One of the problems is the communication process between PHC and Hospitals. This communication problem causes delays in the referring process, which can increase the risk condition of pregnant women. This communication problem was also influenced by family decisions. The role fo the family in making decisions for patients represents a cost for the health services. Some patients' families have not registered as members of the BPJS yet: BPJS is a type of social insurance that is mandatory for all Indonesian citizens. They hamper the process of administering health care if they are not registered yet. There are some patients who also have no resident status, so the administrative process is increasingly hindered. Opportunities to obtain health services are the same for all occupations and not based on the patient's economic status,[4-6] but they still need to be registered as citizens to have an official iden-
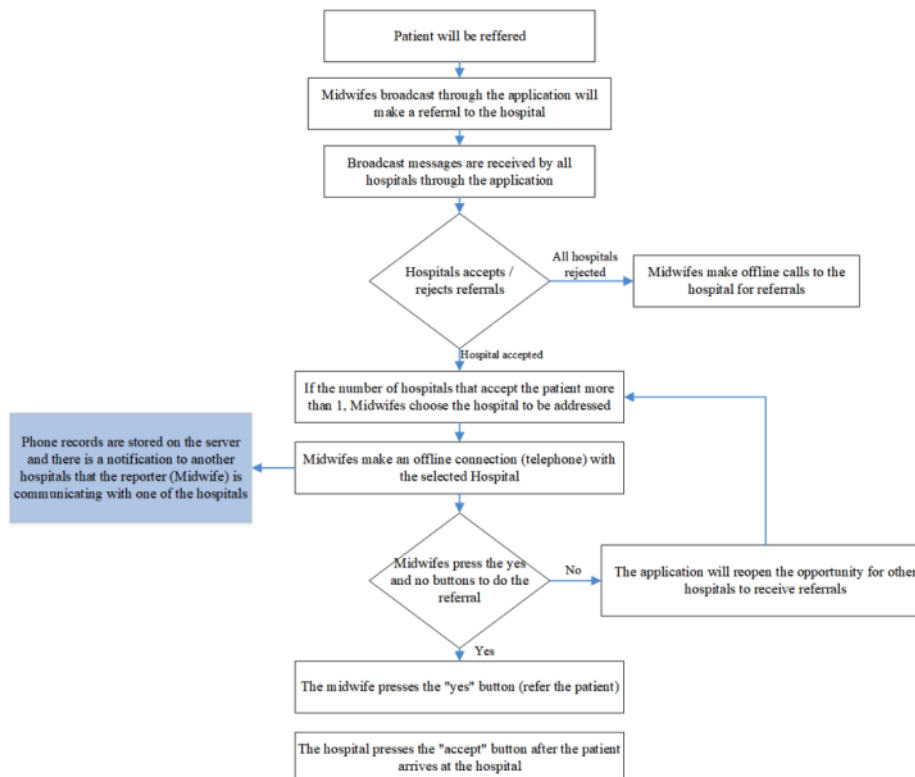

Figure 2. The flow of referral mothers giving birth in a mobile application

tity.[7] Discipline in payment of BPJS's premium is a major concern in the delivery of health services. This condition is also one of the problems in the referral process.[8] Being late in making decision of asking for medical care is one of the reasons of the referral process being blocked.[5] In our study among the causes of maternal death we found 3 delays (late decision making, late arrival at the health facility and delay in receiving medical assistance).

The city of Surabaya adheres to a referral system flow for pregnant women based on the referral flow established by the Ministry of Health. Regulation of the referral system established by the government can reduce maternal mortality because it has clear rules for all stakeholders involved in the referral flow.[7] There are differences in the flow of referrals for women at high maternal risk and those without maternal risk. Risk assessment is based on the Pudji Rokhdjati Score Indicator.[9] The difference in the flow of referrals of pregnant women with risk and without risk is based on the suitability of the facilities owned by the health care center for the needs of pregnant women facilities. The level of the hospital must be in accordance with the level of needs of pregnant women in their pregnancy conditions.[10]

The mobile application that has been compiled based on the results of identification of the need for referral flow and information needs is expected to facilitate communication between PHC and hospitals. Discussions with midwives, head of PHC and obstetricians gynecologists have produced indicators of the patient's condition that must be communicated to the hospital chosen as a place of reference. Based on this information, the hospital will be able to identify the needs of the referral patients and be ready to receive them. Based on the trials that have been made, the application still needs improvements.
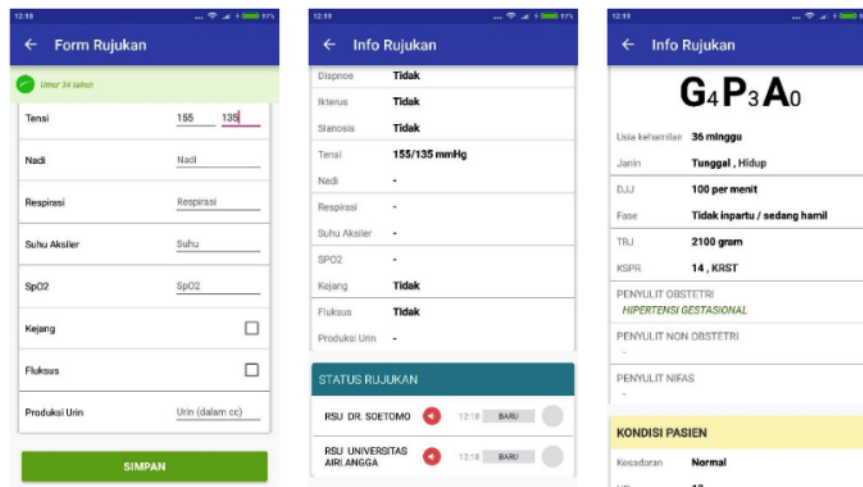

Figure 3. Patient referral form which contains patient's identity and vital conditions in the mobile application
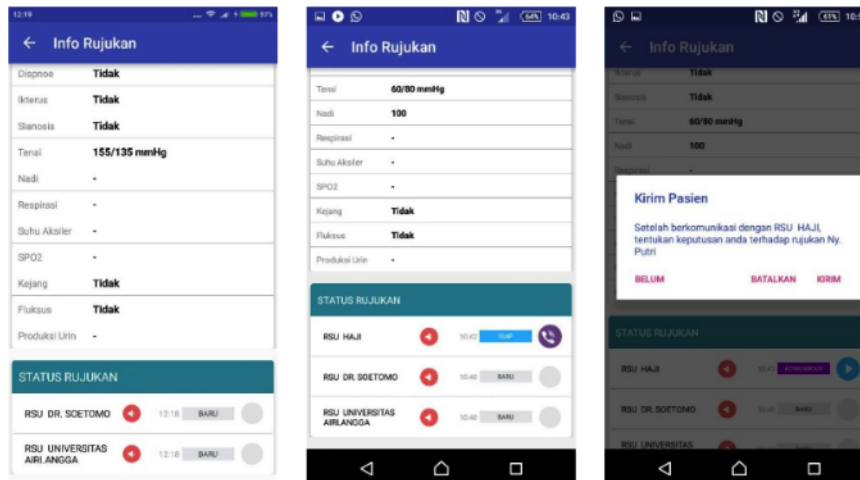

Figure 4. Form send request referrals to the hospital in the mobile application

Conclusions

The referral health system flow in the City of Surabaya is clear and all stakeholders understand the referral flow. The mobile application as a referral communication is expected to facilitate the process of referring system.

Correspondence: Diah Indriani, Department of Biostatistics and Population Studies, Faculty of Public Health, Universitas Airlangga, Jl. Mulyorejo, Surabaya, Jawa Timur 60115, Indonesia.
Tel.: +62315920948 - Fax: +62315924618
E-mail: diah-i@fkm.unair.ac.id.

References

1. East Java Provincial Health. East Java Health Profile. Surabaya: East Java Provincial Health Office; 2018.
2. O'Brien JA, Marakas G. Management Information System. 7th Edition. New York: McGraw-Hill; 2007.
3. Ministry of Health. National Referral System Guidelines. Ministry of Health Office; 2012.
4. Sines E, Tinker A. The Maternal-Newborn-Child Health Continuum of Care: A Collective Effort to Save Lives. Population Reference Bureau; 2006.
5. Gomez P, Metcalf G, Otchere S, et al. Household-To-Hospital Continuum of Maternal and Newborn Care. The ACCESS Program JHPIEGO; 2005.
6. Mehta PK, Carter T, Vinoya C, et al. Understanding High Utilization of Unscheduled Care in Pregnant Women of Low Socioeconomic Status. Women's Health Issues 2017;27:441–8.
7. Kozhimannil KB, Interrante JD, Corbett A, et al. Editor's Choice Rural Focus and Representation in State Maternal Mortality Review Committees: Review of Policy and Legislation. Women's Health Issues 2019;29:357–63.
8. Isah A, Adibe MO, Anosike C, et al. ScienceDirect Willingness-to-Accept and Willingness-to-Pay Ratios of Prevention of Mother-to-Child Transmission Services in a Nigerian Hospital: A Cross-Sectional Contingent Valuation Study. Value Heal Reg Issues 2019;19:112–21.
9. Widarta GD, Ardian M, Laksana C, et al. Deteksi Dini Risiko Ibu Hamil dengan Kartu Skor Poedji Rochjati dan Pencegahan Faktor Empat Terlambat. Majalah Obstetri Ginekologi 2015;23:28–32.
10. Vanderlaan J, Rochat R, Williams B, et al. Associations Between Hospital Maternal Service Level and Delivery Outcomes. Women's Health Issues 2019;29:252–8.

The maternal referral mobile application system for minimizing the risk of childbirth

Sindiani, Khalid A. Kheirallah. "Stress and behavioral changes with remote E-exams during the Covid-19 pandemic: A cross-sectional study among undergraduates of medical sciences", Annals of Medicine and Surgery, 2020
Publication

9	www.upc.edu Internet Source	<1%
10	mjs.um.edu.my Internet Source	<1%
11	"Poster presentation", Kokusai Hoken Iryo (Journal of International Health), 2007 Publication	<1%
12	phdma.odisha.gov.in Internet Source	<1%
13	Dini Rima Fadilah, Shrimarti Rukmini Devy. "Antenatal Care Visits and Early Detection of Pre-eclampsia among Pregnant Women", International Journal of Public Health Science (IJPHS), 2018 Publication	<1%
14	jurnal.syntaxliterate.co.id Internet Source	<1%