Implementation of the Early Warning Application Program for Pregnant Women to Support Health Services in Rural Areas

by Made Kamisutara

Implementation of the Early Warning Application Program for Pregnant Women to Support Health Services in Rural Areas

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Abstract

The development process of digital technology has affected many fields. One of them is health field. Number of health application appears. They can be accessed easily by smartphone or tablet device. For instance, in developed countries, doctors examine and diagnose children's ears using smartphone. He provides the appropriate treatment for their patients through the device. The growing number of mobile applications in health will certainly facilitate patient care. There are currently about 13,000 digital health applications. Nowadays, patients have gradually followed this trend. Rock Health, as a provider of digital health ecosystem services, explains the power of mobile health care as well as the health effects of technology. The digital health care industry has a significant impact on healthcare providers. In this research, the researchers design tools or web-based applications and or sms gate way. The main objective is to monitor early health for expectant mothers and infants who are less likely to receive direct medical care.

Keywords: Early warning software, sms gateway ehealth, expectants mothers health.

1. Introduction

The development of smartphones is very fast in the community. Children and people often do activities using smartphones. By the end of 2015, it was estimated approximately 55 million smartphone users in Indonesia. While total penetration growth reached 37.1 percent. The activities of people on smartphones are varied; from games to business. According to Google Research with TNS Australia states that 50 percent of smartphone owners in Indonesia make the device the main telecommunications equipment; including to access the internet. The development process of digital technology has affected many fields. One of them is health field. Number of health application appears. They can be accessed easily by smartphone or tablet device. For instance, in developed countries, doctors examine and diagnose children's ears using smartphone. He provides the appropriate treatment for their patients through the device. The growing number of mobile applications in the health field will certainly facilitate the treatment of patients (Lowery, 2010).

One aspect in e-Health is the emphasis on the use of mobile device technology for health services. With the use of mobile devices, such as smartphones, health services can reach better to the restricted areas, communities, and health practitioners. Expectants mothers and babies health is a complicated problem whose condition has not improved. Improving the quality of expectants mothers and babies health services is believed to require a conducive socio-political, legal and cultural conditions. Based on Indonesia Demographic and Health Survey (IDHS) in 2007, expectant mother mortality rate in Indonesia was still at 228 per 100,000 live births.

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Various improvement efforts and handling have been done, but it still requires a variety of support. The expectants mothers and babies health program aims to improve health, especially expectants mothers and babies' health optimally. One important element to support the goal is the availability of data and information that is very useful in planning, implementation, monitoring, and evaluation of health service outcomes. Most expectants mothers and babies health programs in health institutions are not yet supported by adequate information systems in terms of recording, processing, and analysis as well as interpretation and reporting.

2. Research Method

2.1. Research Location

The research conducted in the community health clinic Kepanjen Malang Regency and Health Office of Malang Regency. It's done for 2 Years. The sample of the study was pregnant women starting from the beginning of pregnancy until the age of 59 weeks along with the puerperal condition for 40 days. For initial application, this application had been tested in one community health clinic that was Community health clinic Kepanjen Malang.

RAP (Rapid Assessment Procedure), this research was an evaluative observational research using cross-sectional design. This research used quantitative and qualitative methods. Quantitative data related to the implementation of Expectant mothers health monitoring systems, including inputs, processes and outputs. Inputs related to available resources and supporting facilities / infrastructure. The process related to how the Expectant mother health surveillance system was implemented. While output was related to the availability of valid data / information as a result of monitoring and utilization of data for decision making. Qualitative data was also be collected to support and deepen the review related to program performance and other sectoral linkages.

Subject of the Study, The population of this research was the provider related to expectant mother health monitoring, i.e. midwife in village, midwife of Community health clinic and midwife coordinator and staff in Health Office. This research used cluster sampling. It conducted at Community health clinic Kepanjen Malang Regency.

2.2. Data Collection

Data sources included secondary data and primary data. The instruments were documentation, interview, and observation. Data collection conducted by research assistant and assisted by Health Department staff to make it easier to coordinate and approach to research subject.

First, the researchers met the Head of Health Office of Malang Regency to get information about programs and policies related to the expectant mother health monitoring system including capacity building and financing. What programs and policies undertaken by the Malang District Health Office in order to strengthen the expectant mother health monitoring system so as to accelerate the achievement of the objectives.

a. Has the field staff been trained in the expectants mothers and babies' health monitoring system as strengthening and developing skills?

b. Is there local government support for the implementation of expectant mother health monitoring system?

c. What are the constraints faced in implementing expectant mother health monitoring system?

Then, the researchers met expectant mother and babies' health officer to get information on programs and policies related to the expectant mother health monitoring system including capacity building and financing. What programs and policies undertaken by the Health Office of Malang Regency in order to strengthen the health monitoring system Expectant mother so as to accelerate the achievement of MDGs.

2.3. Data Analysis

Data collected from the field, it was entered into the computer. Then, it performed data validation, i.e. checking the completeness of data, perform coding and modification of data in accordance with the needs of analysis. Data analysis was descriptive analysis for quantitative data by looking at the mean and relative frequency distribution. Furthermore, program evaluation was analyzed as follows:

a. Comparing the implementation of expectant mother health monitoring with immunization guidelines;
b. Comparing the implementation of expectant mother health monitoring program in Malang Regency;
c. Assess output by looking at data accuracy related to recording and reporting
d. Assess the utilization of monitoring data for the policy. While for qualitative data was done by descriptive textual analysis to clarify the result of quantitative data. At the Community Health Clinic, the researchers conducted interviews with community health clinic midwives and village midwives associated with the implementation of health expectant mother monitoring systems.
e. Interviews were conducted individually but at the same time. It was intended to avoid any response bias. The information was obtained from the midwives, among others, about the system of recording and reporting and personality issues. Monitoring officers used certain systems in carrying out expectant mother health monitoring. They recorded the indicators present in expectant mother health monitoring. Getting information about pregnant women was newly detected high risk pregnancy signs and recording and reporting for expectant mother mortality and infant mortality. Conducting expectant mothers health monitoring training as well as reports submitted to the Community health clinic were the results of monitoring or projection. Provision of facilities and infrastructure to monitor expectant mother health should be met. If there were obstacles encountered in the field during carrying out expectant mother health monitoring.
f. In addition, researchers also conducted observations to collect information about how providers recorded and reported, facilities and infrastructure to support the implementation of health monitoring expectant mother.

2.4. Implementing Diagram of The Early Warning of Maternal Health

The process of this research activity can be described in diagram as follows:

The process of making this application is actually based on complaints that many pregnant women experience in remote areas due to the difficulty of reaching health services provided because topographically these remote areas are quite difficult to reach from large urban areas. Therefore we need a tool and application that can be run online to find the right solution in facing and dealing with health problems, especially for pregnant women.
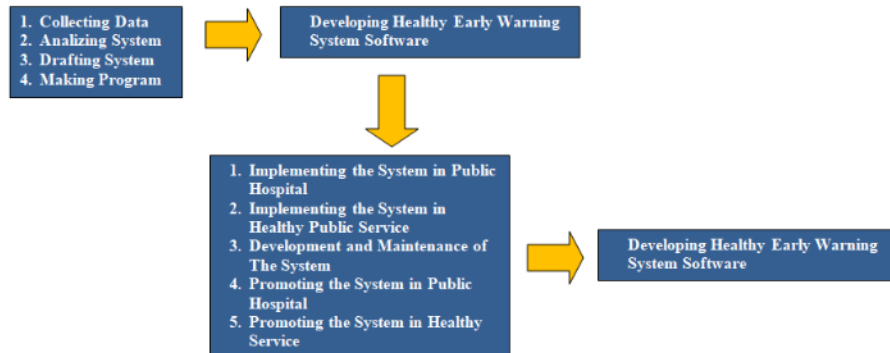
Fig 1. Diagram of Healthy Early Warning System for Expectants mothers and babies

Through the diagram above, there are various stages that must be done carefully in an effort to build a service through a device that runs online using both SMS and web access. The most important and crucial thing here is how the process of implementing this application is able to properly reach pregnant women who are experiencing health problems, even though they are only accessed via mobile devices. Some of the problems that have arisen have been corrected properly and accurately. At the time the FGD was held, several interested parties were present and provided input in the process of perfecting this tool so that later when it was implemented there was absolutely minimal disturbance. And the most important thing is being able to answer the needs of health service centers when they handle health services for pregnant women whose locations are quite remote from the location of hospitals or health service centers in urban areas.

The process of developing this application has received pretty good input from several Community Health Service Centers and hospitals as well as the local City Health Office, namely the city of Malang and the city of Surabaya. They have high hopes for the development of this application so that later it can provide a good solution for health care workers for pregnant women.

3. Result and Discussion

3.1. Monitoring of Expectant Mother Health Level

In 2000, the UN Millennium Summit established 8 general development goals adopted from the United Nations Millennium Declaration. There were 193 UN member states and 23 international organizations agreed to achieve the MDGs goal by 2016. These eight goals were eradicating extreme poverty and hunger; achieve basic education for all; promoting gender equality and women's empowerment; reduce child mortality; improve maternal health; combating HIV / AIDS, malaria, and other infectious diseases; ensuring environmental sustainability; developing a global partnership for development. The progress towards achieving this MDGs objective needs to be assessed with a number of technical indicators that have been formulated in conjunction with the MDGs framework itself. Systematic assessments made by each country will provide an empirical picture that makes the measurement clear and targeted.

Data from the Health Service of the Republic of Indonesia showing the decline in expectant mothers rate from 1991 to 2015 (Figure 2).
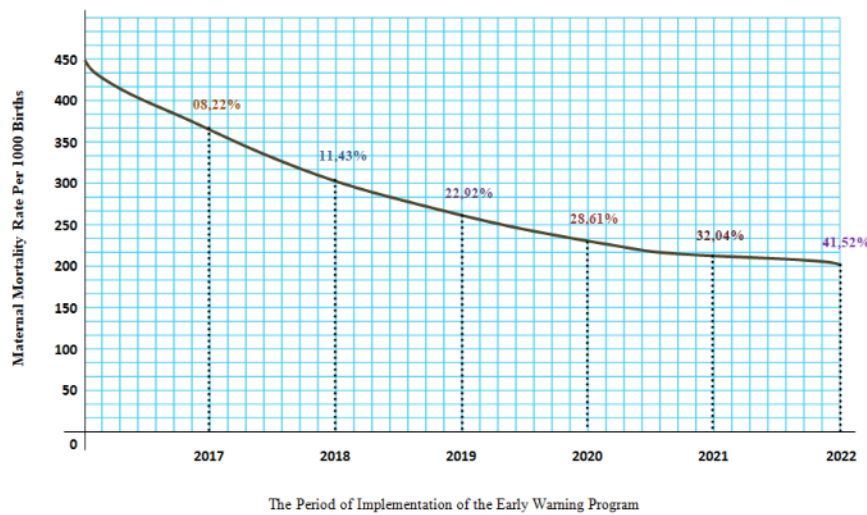

Fig. 2. Trend of Expectant Mothers Mortality Rate

Impact indicators are measures where the overall objectives of the system have been achieved, including changes in cases of death from epidemic diseases, changes in morbidity patterns, changes in health workforce behavior in the implementation system, and changes in health-related behaviors within a population target (Nugroho, 2015).

3.2. Application Home Page

The application for early warning of pregnant women's health that has been completed and has been tested for five years in three separate locations at the health service center has a display like the image below.

Fig. 3. The front view of the early warning application for the health of pregnant women

Evaluation stages of the surveillance system are as follows:

a. What are the goals and objectives of the surveillance system? Are they already achieved?
b. What is the importance of public health to disease or health events in the implementation of surveillance?
c. How does the system work?
d. What are the resources needed?
e. What does the system contain? Does the system match the data source?
f. Are there communications and feedback between different administrative levels?
g. Does the system provide useful data? Does it lead to public health action?
h. Are each of the findings described and used by every policy maker?

The purpose of the evaluation of a public health surveillance system is to ensure that public health-focused issues are effectively and efficiently monitored. Public health surveillance systems should be evaluated periodically to determine how well the system is functioning to meet established goals and objectives. The evaluation findings should result in specific recommendations for improving the quality, efficiency, and usefulness of the surveillance itself. In addition, public health surveillance systems should be monitored regularly to ensure that the system always reaches its target (Lowery, 2010).

Monitoring is the process of collecting data regularly and measuring changes to a process. In a public health surveillance system, monitoring involves routine collection and analysis of indicators to measure how well the surveillance system achieves its objectives. Evaluation, on the other hand, involves the use of specific study designs to assess the relevance, effectiveness, and influence of surveillance systems on a regular basis. Evaluations are often conducted in response to changes in the performance of public health surveillance systems. Monitoring and evaluation of outcomes is expected to increase surveillance activities. When the results of routine monitoring are used

to track the impact of public health surveillance systems that is when monitoring can be considered an ongoing evaluation (Lowery, 2010).

3.3. Design of SMS Gateway Based Application

Short Message Service or SMS is a service used in the system of sending and receiving text between mobile phones. This technology was introduced in 1991 in Europe (Murhada, 2014) and later became the standard for GSM-based mobile communications. SMS is widely applied to mobile communications systems. It allows users to deliver alphanumeric messages between customer terminals or between customer terminals with external systems such as e-mail, paging and voice mail. SMS Gateway is a tool that has a function as a link or a bridge between applications or systems with mobile phones (Sunto, 2015). There are 2 kinds of Gateway sms; namely SMS Gateway in the form of hardware and software. In the SMS system, the main mechanism in the system to send short message from one customer terminal to another terminal (Ignatius, 2015). It can be done because an entity in the SMS system called Short Message Service Center (SMSC), also called Message Center (MC). SMSC is a device that performs the task of store and forward traffic short message. Ordinary SMSC always use Signal Transfer Point (STP).

In developing the design of this application, various sources who have an interest in all forms of efforts to deal with the health of pregnant women have been involved with the team in discussions, FGDs, field visits to several health service centers in order to obtain valuable input. The main goal is that the information we get is able to provide a complete picture of an application that is able to answer problems in improving health services for pregnant women in various locations, especially those in remote areas and far from health coverage.
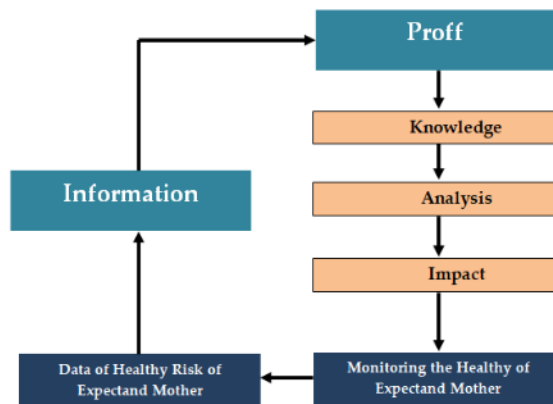

Fig 4. Cycle of Monitoring the Healthy of Expectant Mothers & Babies (Sukarni, 2013).

The process of receiving information as shown in Figure 3 above through an implementation cycle with a mechanism that is not too complicated is able to provide sufficient information to the management of health services. Information sent by pregnant women who experience health problems can be easily controlled online, via SMS or through web-based applications. This factor makes the process of sending and receiving information about health problems quickly detectable by health workers. On the other hand, there are progress and benefits that are faster for health care workers compared to using the old method manually and without using mobile-based applications or internet-based applications. This mechanism provides many benefits and advantages for families who want to get health services quickly when they need these services quickly when a family member is pregnant and has health problems.

3.4. Implementation Mechanism of Early Detection for Expectant Mothers Health Disorders

The main output of this application was as follows:

a. Expectants mothers and babies health monitoring activities were capable to generate valid data
b. Expectants mothers and babies health monitoring activities were able to detect high-risk pregnant women early
c. Data of expectants mothers and babies health monitoring could be used for decision making

Each area that becomes the reach of services for health problems for pregnant women will be the main focus of services from the nearest health service center and hospital. Thus, if information is received through the application, health workers will monitor and see as well as provide appropriate follow-up for patients, namely pregnant women who need immediate care because their pregnancies experience health problems. With this two-way communication, it will be easier for the hospital or health service to monitor all pregnant women who need the particular type of service they want. Hospital staff have been trained to understand and master this application and operate it online through the main server in the hospital or at least a public health center. So that pregnant women who are in remote areas are easy to handle if they need health services.

Through the display of the image below, the success rate of implementing the early warning program for pregnant women in several regions can be measured based on the ability of officers to operate this online-based application.
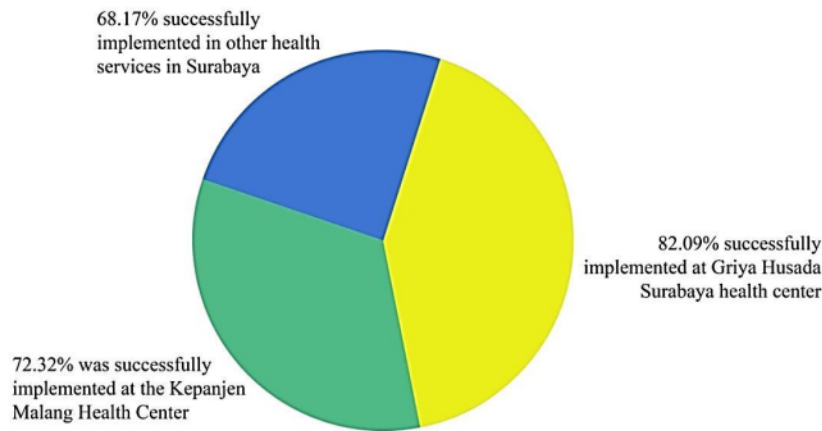

Fig 5. The success rate of implementing the early warning application in three different places

By looking at Figure 5 above, the process of implementing the early warning application for pregnant women's health brings significant benefits to the three different locations mentioned above, because it is able to provide added value to the service process and handling problems related to the health conditions of pregnant women. With this application, all types of complaints felt by pregnant women can be handled more quickly through the information entered in the early warning application for the health of pregnant women. So that disorders that are handled more quickly do not endanger the health of the fetus in the womb.

In order for this application to run successfully, the community health clinic Kepanjen Malang must perform the stages of activity in the region in a focused and periodical in the form as follows:

a. Implementation Early Warning Health system expectants mothers and babies at Community health clinic Kepanjen and Health Office of Malang Regency,
b. Development and Maintenance Early Warning System of expectants mothers and babies health,

c. Socialization Early Warning System of Expectants mothers and babies Health at Community health clinic Kepanjen and Health Office of Malang Regency.

Data collector of this application was Community health clinic Kepanjen Malang because health office of Malang Regency had authority. Object data collection was the health condition of pregnant women aged 0-59 weeks who had health problems to the condition of pregnancy. The executor of data entry about everything related to the health of pregnant women are nurses and midwives who worked in Community health clinic Kepanjen Malang. The data was the number of pregnant women, the illnesses suffered by pregnant women and the number of babies born. The data collection process started from the neighborhood level, then the hamlet to the urban village level in the sub-district of Kepanjen Malang. By filling in the data, the type of pregnant women's health disorder could be monitored early and she could get proper treatment. Charging data through sms gateway would be more time efficient, faster and more efficient. Output of the results of data filling could provide advice to community health clinic Kepanjen especially consideration in making decisions on priority handling of health problems of pregnant women immediately. It prevented pregnant women's death caused by health problems. Flow of data filling conducted by health community health clinic officer could be seen in figure 4 above.

All the data of the main server could be important information for the community health clinic to monitor and improve services to pregnant women patients with diseases that suffered. Early detection process using early warning system could be a breakthrough for community health clinic in doing early action to health trouble suffered by pregnant mother. With this application, local government, health service Malang regency, could monitor and trace the existence of pregnant women who had health problems pregnancy with more intensive.

3.5. Comparing to Other Researches

Some other research results that can be used as comparisons in the same field are as follows:

a. Trenggalek has implemented EWARS since 2013. EWARS has excellent accuracy and complete report. Accuracy and completeness of reports were indicators for determining the performance of public health centers. The purpose of this study was to analyze the performance of EWARS PHC in the health office in 2016. It reviewed the accuracy and completeness of the report. This study was an observational study. It used evaluative design. The subjects of this study were the EWARS holder surveillance system at 22 PHC and EWARS health workers at the Health Office of Trenggalek. Data collection techniques used primary data and secondary data. The instruments were questionnaires and observation sheets. Processing techniques and data analysis were descriptive. The results of this study showed that the accuracy of the report in Trenggalek in 2016 showed an average of 79%, while completeness of the report in Trenggalek in 2016 amounted to 98.5%. The conclusion of this research was the performance of EWARS PHC was good because it had reached 90% target. Therefore, it needed to evaluate the women officers who aged 26-45 years old and men officer who had experience for ≥2 years (Anggraini, 2017).

b. Boyolali district implemented Early Warning Alert and Response System (EWARS) to certain diseases outbreaks. The timeliness and completeness of EWARS reports was good. However, the existence of EWARS could not hinder the districts from the disease outbreaks. Moreover, the type of disease increase after implementing EWARS. This study aimed to evaluate the information utilization of the EWARS related to the control of disease outbreaks. It used qualitative method by exploratory case study design. The sample was purposive sampling. They were district surveillance officer/DSO, 29 surveillance officers at the Public Health Centers (PHCs), a chief of Prevention and Surveillance Section of District Health Office, a chief of Communicable Disease Control of District Health Office. Data collection techniques were interviews, Focus Group Discussions (FGD), direct observation and participant observation. Data analysis was conducted by pattern matching technique. The results showed that the data input for the EWARS came from the village midwife, village health posts, satellite and main public health centers. EWARS data processing did not performed well in both the district level and health center level. Outputs of EWARS were not presented for decision making processes. Timeliness of reporting was low (43%) and it tended to decrease. Completeness of reporting had reached the target (81%), but there was a tendency to decrease. Analysis and interpretation of data

EWARS were done incidentally. Feedback reports were submitted three monthly (Kristani, Kusnanto, & Probandari, 2016).

c. Stroke is a neurological disease that incidence increase from year to year. It causes disability and death worldwide. Stroke disease is caused by many factors. This research was a qualitative research. It conducted for one year. The research design used prototype method. The prototype method began with the identification of needs, mapping, and inference mechanism. Identification of needs was based on the literature review and discussion. The literature review of 15 sources consisted of article journals and books. They were compared, contrasted, criticized, synthesized and summarized. Stroke risk factors discussion were carried out with experts who were neurologists. The results showed that identification of factors that caused stroke consisted of hypertension, high glucose and blood cholesterol, heart disease, behavioral factors such as smoking behavior and alcoholism, stress and other causes. The risk factors of stroke were then performed mapping in the form of mobile application prototype through inference mechanism. The output of this research was prototype early warning systems (E-WARS) for early warning of stroke incident. The prototype results were expected to be used in operations into mobile applications that were beneficial to the public, in particular for self-control and personal risk factors for stroke. It was intended for early screening and early warning of the risk of stroke (Erawantini & Karimah, 2017).

4. Conclusion and Recommendation

The conclusion of this study is as follows:

a. The role of the government in reducing the incidence of maternal mortality since 1991 requires a reliable program to detect early diseases that can interfere with the health of pregnant women. On the other hand, the emergence of early warning application program will greatly assist government programs run through community health clinic and integrated service station in an effort to reduce maternal and infant mortality rate. This application is expected to help the government's performance to reduce maternal and infant mortality rates.

b. The level of readiness of application program implementation is quite high because it is very familiar applied in the environment of community health clinic and integrated service station. Medical personnel can monitor and collect authentic data to minimize maternal and infant death rates due to health problems that often threaten the life safety of pregnant women and infants. Through this application program, the government will be able to accelerate the level of service and its role and responsibilities in the future in order to help handle the health of pregnant women and their babies. With the help of sms gateway and web base, it can be applied easily. Currently, electronic devices and information technology is growing rapidly so it supports the application of this application program that can cover a wide area because it runs web-based and mobile-based devices.

Based on the conclusion, we recommended as follows:

a. Expanding socialization activities that must be done by community health clinic and integrated service station in sub-district, urban village to the smallest area of hamlet and neighborhood. The objective is that the distribution of expectants mothers and babies care handling with pregnancy health problems can be faster and more accurate in the monitoring of pregnant women and their infants. It needs policy to develop the program to be more flexible so easily accessible by users..

b. After this application program successfully applied at the level of community health clinic and integrated service station, the researchers hope this application can be developed again especially in the health field. Another program that can be developed from this application program is an early warning application program in monitoring the health of infants up to the age of 36 days is calculated from the baby's birth. Infants are prone to health problems so that in addition to the safety of pregnant women can be well controlled, health and disruption of infancy until the age of 36 days can also be carefully controlled.

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