

Personal Health Care Framework for Children

Nina Sevani

Department of Information Technology
Krida Wacana Christian University
Jakarta, Indonesia
nina.sevani@ukrida.ac.id

Abstract— Child health care requires intensive and careful attention. It is associated with limited capabilities of a child, especially a child with special condition, such as baby, toddler, and sick child, that has many limitation capabilities to communicate, to move, and to think. Moreover, children also has susceptible immunity system. The lack of care and monitoring health care for children can be caused by busy parents, the lack of parent's knowledge about health care, the lack of parent's awareness to monitor a child's health, that eventually can be some cause of disruption in children growth and development and health care process. This paper proposes a holistic health care framework that can be set according to child's condition and enable to distribute information accurately, directly to parents, person who take care the child, and pediatrician or hospital. Health care's reminder and information dissemination system will be directly sent to parent's or nanny's smartphone. A single click concept also enable parents to call pediatrician or hospital immediately in an emergency condition. All of child's daily data, included food, activity, medicine, and their treatment, will be recorded as an Electronic Medical Record (EMR) and displayed as a chart, to simplify parent and pediatrician in monitoring child's health condition. At the end, the use of this holistic framework also prevent the child from many harmful condition for their health, such as drugs complication, error on diet and activity, inaccuracy of health care needed.

Keywords— health care, EMR (Electronic Medical Record), children, framework

I. INTRODUCTION (HEADING 1)

Health care for children, which encompasses the physical and mental aspect, is one of parent's duties. Health care for children includes the growth and development processes, maintenance diet and activity, treatment of diseases and consumption of medicines, and preventing the occurrence of contraindications. Children, especially those who are under five years of age, need intense caring due to their limited ability to communicate with others and their weaker immunity system. This condition can be more complex in children with special needs, such as sick children who need routine medicine and special medical devices, or children who need special treatment [1]. Other problems may arise if the child has to be taken care of by others, like a housemaid or nanny.

Data in Indonesia show that the mortality rate of children under five years old has decreased significantly for the last two decades, from 385,000 in 1990 to 152,000 in 2012 [2]. However, this does not mean that the work is done because there are still 400 children die in Indonesia everyday. Generally, the causes of their deaths are diseases that are easily treated, such as diarrhea and pneumonia [3]. This condition happens because of the lack of monitoring process, which can be caused by poverty, busy parents, and the lack of parent's knowledge to monitor a child's health. The use of information technology, implemented in the form of Personal Health Care (PHC) for children, especially for toddler and children with special needs, can be used to overcome monitoring problem caused by busy schedules of parents and lack of parent's knowledge.

The PHC will be equipped with many features and capabilities, such as a reminder and monitoring system, and also automatic call to professional health care, based on the patient's Electronic Medical Record (EMR). The reminder system also provides information about the child's growth and development and information about medicine and treatment needed. Information about medicine and treatment of a disease can be used to prevent medication errors caused by the absence of pediatrician's supervision and the use of drugs purchased at pharmacies freely [4].

Some problems related with treatment's supervision are irregular drug delivery, which can be overcome with a reminder system [4,5,6], provision of information about drugs and the dangers of uncontrolled drugs for a child, the lack of daily monitoring about children's growth and development, the lack of professional health care and pediatrician's supervision. Compared with the manual system, the reminder system can be used to decrease health care costs [4,6,7], because of its characteristics that can reduce the use of paper and human intervention. Eventually, by the nature of the system that can be adjustable with the user's needs, the reminder system can help to improve human's life quality.

The aim of this paper is to propose a framework to support a holistic health care for kids, parents, and pediatricians. Using this framework it is expected that there will be a coordination between the parents and other relevant persons who take care the children and conduct intense monitoring on the children's

condition. This framework also can be used to prevent things that can be harmful for children's health, grow, and development.

II. RELATED WORK

Public health services, especially those related to children's health, are a major concern for various groups of people, from government to parents. Children's health and growth can be monitored from their health record. Electronic Medical Record (EMR) as one of the developments in health care technology, can be used to improve health care quality [8,9,10]. EMR can make processing and distributing data faster, prevent data duplication, and minimize human error. Data are easier to be recorded, managed, and are searchable [9,11,12,7]. Implementation of EMR in clinic and hospital gives doctors and nurses more time to spend with the patient, which can make their relationships stronger. Eventually, the implementation of EMR in clinic and hospital will enhance the efficiency of public service [10].

The enhancement of public health services is also done by allowing patients access to information and to contact clinic or hospital. As an example, the implementation of a single click system through smartphone to help patients to get ambulance services in the case of emergency situation. Single click concepts also make the patient contactable by the hospital. With this concept, patients does not need to remember and look for hospital telephone number in case of emergency situation [13].

The reminder system also can be used to enhance public health services. This reminder will be sent automatically by hospital or clinic to distribute information or alert about a treatment schedule. This reminder can be useful for home care without direct supervision from professional health care [5], continuous care [14], or to make a reminder about the patient's next appointment [6]. This system can be implemented with a client-server model [14]. At the end, the use of electronic system, including remainder system can reduce health care cost [4,6,14].

III. FRAMEWORK DESIGN

This chapter will explain the design of the proposed framework, including the architecture, the workflow (how to use and who can use), and the input, process, output of the system. The uniqueness of the framework will also be described.

A. Architecture

Figure 1 illustrates the framework architecture. There are two actors in this architecture, namely the User, which is the patient or parent, and the Hospital or Clinic, which is the medical service provider. Children as another user can get the services offered through their parents or nanny, due to their limitation to operate smartphone independently. To start, the user has to register to use the features in this framework by contacting th administrator or

the hospital staff. The registered user will then get reminder and information, either regularly or incidentally. They can also monitor the health conditions of their children from the health condition chart produce by the EMR.

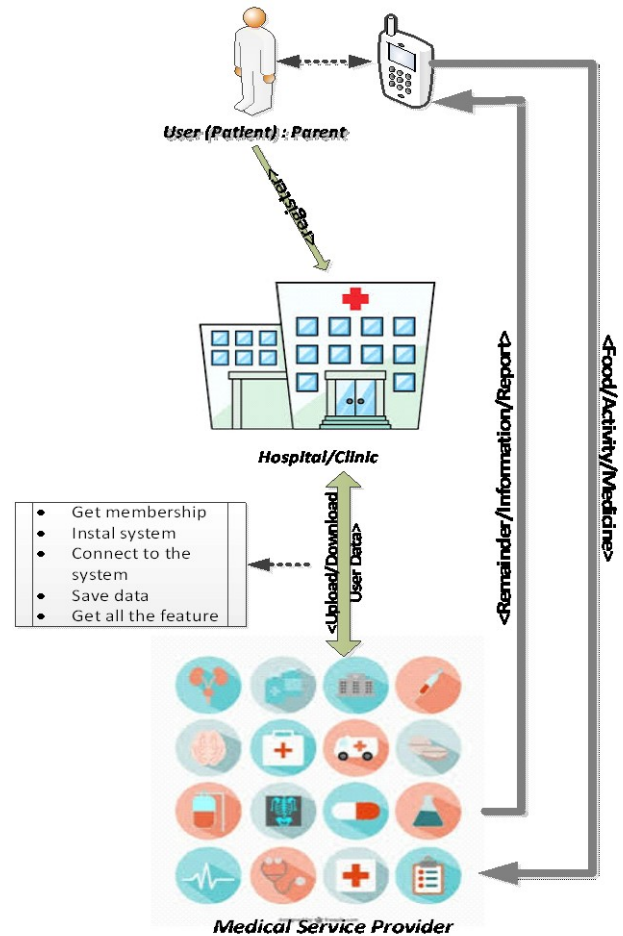


Fig. 1. Framework Architecture

Hospital or clinic takes up the role as the medical service provider that saves all the patient's data in the form of EMR. Medical Service Provider will save and process patient's data in their server, and send reminders to the patient. The server also responds to user's request, such as monitoring request, information request, and change status request. Figure 2 show the workflow process in the server.

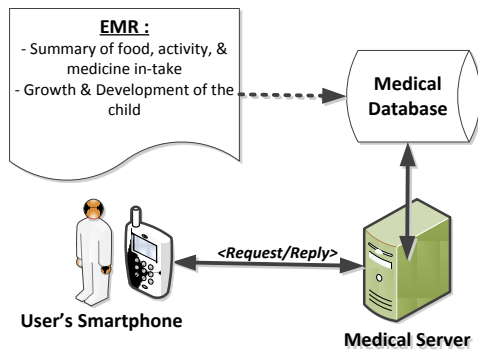


Fig. 2. Workflow Process in Server

B. Input/Output Diagram

Figure 3 describes the input, process, and output of the framework. This framework will distinguish child's status to healthy child (normal activity) and sick child (certain condition). Parents or staff at the hospital will input this status as an indicator to start the process.

There are three types of inputs, namely initial, regular, and daily inputs. Initial input will be done by the administrator or staff at the hospital, once to register the child into the system. Regular inputs are done when the child is sick or at regular times to monitor growth and development of the child, such as every month or every time they visit at doctor. Daily inputs are done by parent or the baby sitter.

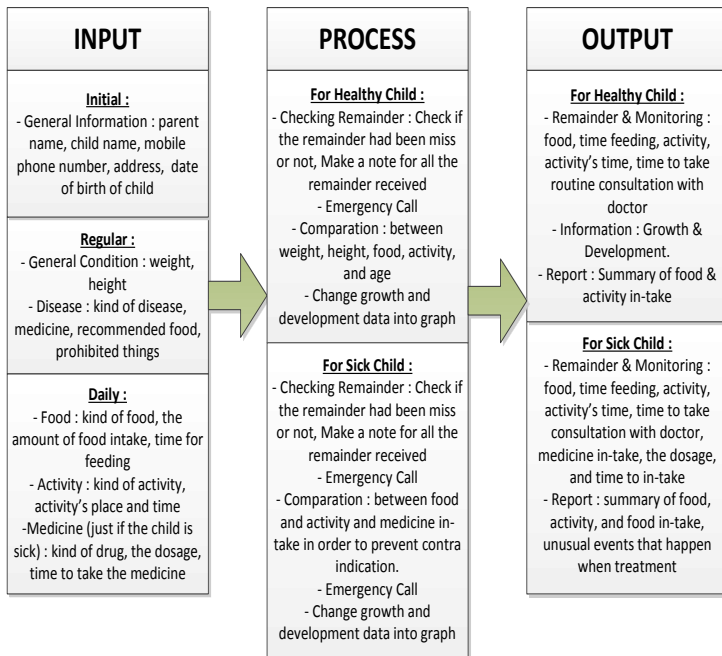


Fig. 3. Input, Process, and Output Diagram

C. Uniqueness of The Framework

The proposed framework has the following uniqueness as compared to the existing monitoring system, such as :

- Integration between EMR and PHR.

Primary Health Care (PHR) is a part of essential health care in a country that bring health care as close as possible to people's lives. PHR is formed to be accessible by individual and family in community through mechanism that can be used by them with affordable prices. Based on the aim, PHR used to support community to solved their health care problems, through supporting, prevention, curing, and rehabilitation [15].

The framework proposes integration between EMR and PHR with features that will store and organize all patient's data electronically. This allows for a paperless and private monitoring system. Moreover, using EMR, parents can see their children's growth in charts. It will be easier for parent to evaluate their children growth.

This feature also provides information about ideal conditions for children, in regular or occasional basis, such as the ideal weight and height for children, children capabilities at their age, and how to choose food and activity for children based on their age and health conditions. The system will create account to every children registered in the system. This information will be sent to the parent's or baby sitter's mobile phone.

Other features will ask parent or baby sitter to make a note about what food, what medicine and the dosage, and what activity done by the children the whole day. This note will be compiled and presented as a graph. Through this note, the system will also proceed if there are some contra indicators between medicine in take or food.

- Customizable

The framework also allow for customization according to patient's need. If the patient does not need a medical treatment, the system can be set to give information, reminder, and monitoring of daily activity and food consumption. On the other hand, if the patient also needs medical treatment, the system can be set to give reminder and monitoring medicine in-take.

- Combine system remainder, monitoring, and automatic calling to a professional health care.

The automatic calling function facilitate patient to get quick help from a professional health care when a patient has trouble with their treatment, such as accidents or issues with medication. With the concept of a single click, the patient does not need to remember phone numbers [13]. All of these functions will be implemented using a client-server model, where the server contains two

modules, namely the web module and SMS gateway module [14].

This framework is not disease-specific, similar with the application designed by Dalgaard, Gronvall, dan Verdezoto (2013), so it can used for many forms of health care, such as disease treatment, daily activity, daily food consumption, and special call to the hospital or professional health care. In short, this framework supports medical management activity at home that involve parents or others who care for children, hospital or clinic where children treated, and pediatrician.

D. Advantages and Disadvantages of the Framework

By analyzing the functions of all features proposed in the framework, Table 1 will summarizes the advantages and the disadvantages of the framework.

TABLE I. ADVANTAGES AND DISADVANTAGES

Advantages	Disadvantages
<ul style="list-style-type: none"> • Decrease administration task for administrator or hospital staff, by helping them to distribute, process, present, and store patient's data. • Enhance time for processing of patient's data. • Diminish human error in storing, retrieving, and processing of patient's data. • Propose two-way communication, between user and hospital. • Can be used as a preventive action to take care children health. 	<ul style="list-style-type: none"> • Need a reliable internet or telecommunication service provider to make the system operates optimally. • Need additional skill to operate the monitoring and reminder system. • Can-not cope with the issues of neglect from parent or other person who take care of the child. • Need more time for administrator or hospital staff to enter and maintain data.

IV. CONCLUSION

Child's health care need participation from many party, such as parents, nanny, and pediatrician. Therefore, the use of a PHC's framework to maintain child's health that can be customized according to child's health condition allowing the treatment process is done holistically. Besides function to monitoring health along growth and development condition of a child, the use of the PHC also give reminder of actions to be performed and the time to be performed related with child's health. This reminder will help parents and person who take care of the child about important time according to child's condition, such as feeding time, time to take some medicine, time to do some treatment, time to do some activity, and doctor's appointment. The PHC's framework also help to distribute health care information of children, that could be needed by less experienced's parents or by parents who has a child with special condition, like a sick's child, baby or toddler. A single click

concept offered by this framework that simplify process to contact a professional health care directly also make the provision of assistance to children in emergency situations became faster. A single click allow user do not need to remember the phone number, prevent to call wrong number, and allow user to skip procedural question from the hospital to get their service. The integration of a single click concept with reminder and dissemination function will helping parents to prevent harmful activity for a child, such as drug complications, error in the provision of medicine and food, inappropriate activities, which can ultimately affect growth and development process, even mortality.

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