Children Vaccination Reminder Via SMS Alert

Asam Hamed Abbas
School of Computing
University Utara Malaysia
Kedah,Malaysia
essamiraq2010@yahoo.com

Yuhanis Yusof
ITU-UUM CoE For Rural ICT Development
University Utara Malaysia
Kedah,Malaysia
yuhanis@uum.edu.my

***Abstract*-This study presents a model for children vaccination reminder using short message service (SMS). The model consists of data flow in reminding parents of their children vaccination schedule. Existing practice on vaccination schedule is via written appointment. Nevertheless, such approach may not be sufficient as parents may forget due to a tight work schedule and daily routines. The proposed model was evaluated by allowing selected respondents to use to the developed prototype. Results show that respondents do agree on the benefit of having reminder send via SMS. In addition, all of the respondents feel that the proposed system is useful.**

***Keywords*-information retrieval; mobile application; reminder system**

I. INTRODUCTION

Prevention of disease is the key to public health. It is a general saying that "prevention is always better than cures". Vaccines protect people from catching specific diseases. Vaccines also help preventing the Spread of infectious diseases in a country. Such diseases include polio, whooping cough, diphtheria, measles, rubella (German measles), mumps, Haemophilus influenza type b (Hib) and tetanus [1].

Parents are constantly concerned about the health and safety of their children. Therefore, they take many steps in order to prevent their children from catching a disease. One of the options is vaccination. Vaccine works to protect infants, children and even adults from illnesses and death caused by many infectious diseases. Vaccination has its own time, period and schedule. The dosage of vaccination remains the same among babies but may be different for adults [2].

Reminder systems have been in use for several decades, except for the more sophisticated computerized phone reminder systems, and are not complex either to initiate or to operate. Reminder systems can work through a variety of mechanisms meant to prompt the patient, including phone calls (by clinic staff, computer, through patient portals, or through centralized programs), letters, postcards, and e-mail. While all types of reminder systems are effective, telephone reminders have been found to be most effective, but also the most expensive compared to postcard and letter reminders [3].

Short message service (SMS) is an important and useful service included in mobile phones. It is offered in all types of mobile phones as it is easy to use and can operate with minimal cost [4]. SMS permits users to communicate non-verbally, saying themselves through coalitions of alphanumerical symbols with a largest of 160 characters per single SMS message. SMS has entered global links because SMS is an inexpensive, fast and efficient means of connection between people of any distance [5].

Reminder system

The recent growth of mobile phone usage is a phenomenon that crosses all age and gender boundaries. More than just the latest electronic gadget, mobile phones have become integral parts of our business and personal lives [6]. According to the Hand phone User Survey by Malaysian Communication and Multimedia Commission (http://www.skmm.gov.my), fourteen percent of people who are under 20 years old owned mobile phones. Nearly 73.4 % of people living in Malaysia between the age of 20 and 49 years owned or used a mobile phone. The ownership drops drastically to 11.8 % for people 50 years old and above [7]. Hence, using a reminder system through mobile phone messaging service may benefit the community especially those parents who are between 20 and 49 years old.

According to Salameh, Alkafagi, Khunsri & Habbal [8] a web-based system has been developed to ensure pregnant mothers be notified regarding their pregnancy progress by sending SMS message. The design and development of the system which is named Pregnancy Progress System (PregProSyst) are outlined.

Zhao, Chen & Liu, [9] a system for fall detecting using off-the-shelf electronic devices to detect the fall. They use a smart phone with an embedded tri-axial accelerometer sensor. Data from the accelerometer is evaluated with a decision tree model to determine a fall. If a fall is suspected, a notification is raised to require the user's response. If the user's body is hurt and cannot

respond, the system alerts pre-specified guardian with a message via SMS. Therefore, the fallen man can be cared for immediately.

This paper reports on the design and development of a model, which is named Children Vaccination Reminder System Via SMS Alert (CVRS-V-SMS-A). In addition, an initial test with potential users including parents is also presented.

This paper includes of four sections. It begins with this section that discusses the important of vaccine for children and a brief literature on reminder system. The next section expands on the design and development of CVRS-V-SMS-A. It is followed by a brief explanation on the implementation and evaluation of CVRS-V-SMS-A. Finally, is the concluding section that presents recommendations for future work.

II. DESIGN AND DEVELOPMENT

Collect the data for CVRS-V-SMS-A in terms of information to be communicated to parents, the system was ready to develop. These reports focus on design and develop a prototype for the proposed model of a CVRS-V-SMS-A. Both design and development of the system are discussed in the following subsections.

A. Design

CVRS-V-SMS-A works on architecture as shown in "Fig. 1".

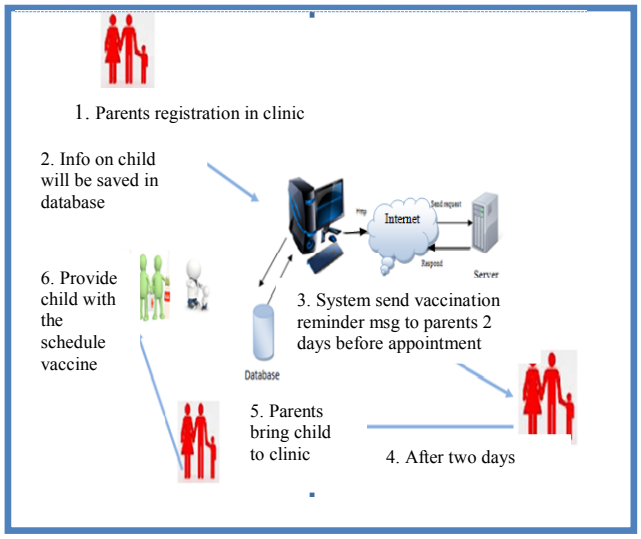

Figure 1 CVRS-V-SMS-A Architecture

"Fig.1" illustrates how the children vaccination reminder system via SMS alert operates. First, parents who decided to use the system will register in any participating health center (or clinic). Registration will be done by the workers of the participating health centers or clinics. During the registration, information on the parents and child will be stored. This includes data on parents mobile number and date of birth of the registered child. A reminder will then be sent to the registered mobile number two (2) days (this is based on a default setting) before a vaccination is scheduled for. The SMS received would contain information on the child's name, type of vaccine to be taken and the date of the scheduled appointment

B. Development

In this study, the prototype was developed using Visual Basic.Net 2008 and SQL server 2008 environment (Ado.net). The work of Visual Basic 2008 with (Ado.Net) has provided two new techniques, and using both techniques will be important for programmers. Those techniques use (language integrated query) and (Ado Net. Entity Frame Work). The first technique provides the ability to write queries and object to oriented data bases directly within the code Visual Basic. The second technique provides model objects which are new and powerful; has new features and tools to make the databases free[10]. Table. 1 contains development environment used in developing the CVRS-V-SMS-A-V-SMS.

TABLE .1 PROTOTYPE DEVELOPMENT ENVIRONMENTS

Program language	VB.Net 2008
Server	SQL server 2008, Net2sms.net server
Database	SQL server 2008
Operating System	Windows 7 Home Premium

III. OPERATIONAL FUNCTION OF THE PROTOTYPE

Prior to using the CVRS-V-SMS-A-V-SMS, users need to log-in. Only authorized users (people working in the health center/ clinic) are able to use the system and this is due to security purposes. A user needs to provide a user name and password. If both of the information are correct, then the system will display the main page, else if is incorrect (as shown in "Fig.2") the system will display an error message ("The UserName or Password you entered is invalid . Click ok to re-enter").

Figure 2 CVRS-V-SMS-A Login Page

"Fig .3", illustrates the main page for Children Vaccination Reminder System Via SMS Alert. This main page consists of two components (Child Info and New user). The send message page for Children Vaccination Reminder System Via SMS Alert will be displayed when user clicks on the Child Info button. Registration of new users (i.e parents) can be made by clicking the New User button.

In the Child Info page, a user can add new child or change information on existing child. When a reminder has been send to a user, the system will display a message ("OK 000, message has been sent,[1] ID: 205735") "Fig .4", This message is from the service provider. In addition, the system will display on 'list box' some info about the child, to whose parents the message was sent, such as name, age, hand phone, and type of vaccine.

Figure 3 CVRS-V-SMS-A Login Page

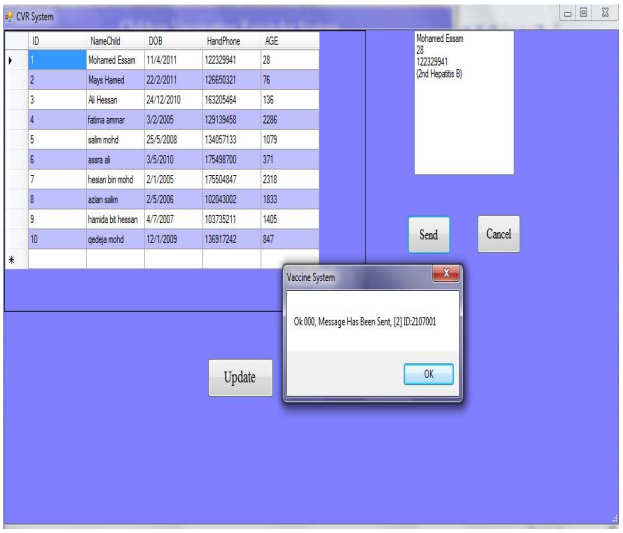

Figure 4. CVRS-V-SMS-A send message page.

The alert message will be sent to parents' mobile phone from the system two days before the vaccination date, and it contains name of the child, type of vaccine, date and name of the health center. "Fig. 5", illustrates an example of a message received by the registered parent.

Figure 5. CVRS-V-SMS-A received message on mobile

IV. EVALUATION

The developed prototype has been tested by 31 respondents. The age of the respondents are as shown in Table 2. A total of 16 respondents have

two children (51.6%), while eight have one child, and seven of them (22.6%) have more than two children.

TABLE 2: RESPONDENTS AGE

Age	Frequency	Percentage (%)
20 - 30	14	45.2%
31 - 40	16	51.6%
+40	1	3.2%

The undertaken evaluation also reveals that 64.5% of the respondents sometimes forget their child's vaccination date (refer to Table 3).

TABLE 3: RESPONDENTS VIEW ON FORGETTING VACCINATION APPOINTMENT

	Frequency	Percent
Always	2	6.6
Sometimes	20	64.5
Never	9	28.9
Total	31	100.0

It is also learned (refer to Table 4) that parents do agree on having a reminder to be sent to their mobile phone. A total of 22 respondents prefer to receive SMS as the alert mechanism for reminding them on their children vaccination appointment. On the other hand, only 1 person likes to be reminded personally by the doctor.

TABLE 4: RESPONDENTS CHOICE ON MODE OF REMINDER

Mode of reminder	Frequency	Percent
Via SMS	22	70.9
Appointment included in child's health book	8	25.8
By the doctor	1	3.3
Other means	0	0
Total	31	100.0

The response on the proposed alert system is good as all of the respondents do think that the proposed approach of sending a vaccination schedule reminder via SMS is useful. A percentage of 45.2% of parents think that the system is very useful and 54.8% conclude it to be useful (refer Table 5). Such results suggest the importance of this study and the possibility of its application in health centers.

TABLE 5: RESPONDENTS PERCEPTION ON CHILDREN VACCINATION REMINDER SYSTEM VIA SMS ALERT

Perception	Frequency	Percent
Very useful	14	45.2
Useful.	17	54.8
Not useful	0	0
Strongly not useful	0	0
Total	31	100.0

V. CONCLUSION

The use of mobile phones increased as the number of users has dramatically risen; where mobile phones have become part of peoples' lives. (CVRS-V-SMS-A) can be applied in a health centre and the parents who need this service can register all the required information about their children in a health centre. The goal of this project is to help parents to receive SMS messages that provide time specific information about their children vaccination appointment for their children. (CVRS-V-SMS-A) may help parents in ensuring that children vaccination is taken as scheduled. This would lead to immunize children against diseases and prevent the spread of diseases.

REFERENCES

[1] Kevin M. Malone And Alan R. Hinman. (2003, May) CDC.gov. [Online]. http://www.cdc.gov/vaccines/vac-gen/policies/downloads/vacc_mandates_chptr13.pdf

[2] Lance E. Rodewald. (2005, April) Childhood Immunization. [Online]. http://www.child-encyclopedia.com/documents/RodewaldANGxp.pdf.}

[3] Peter G. Szilagyi, Clayton Bordley, Julie C. Vann,

and Peter A. Margolis, "Effect of Patient Reminder/Recall Interventions on Immunization Rates," *JAMA*, pp. 1820-1827, 2000.

[4] Beh Kok Sang, Abdul Rahman Bin Ramli, V Prakash, and Syed Abdul Rahman Bin Syed Mohamed, "Sms Gateway Interface Remote Monitoring And Controlling Via Gsm Sms," *IEEE*, pp. 84-87, 2003.

[5] Christine Soriano, Gitesh K. Raikundalia, and Jakub Szajman, "A Usability Study Of Short Message Service On Middle-Aged Users," *ACM*, 2005.

[6] Nasir and Hazrina Hassan and Nazean Jomhari, "The Use of Mobile Phones by Elderly: A Study in Malaysia Perspectives," *Journal of Social Sciences*, no. 4, pp. 123-127, 2008.

[7] Malaysian Communications and Multimedia Commission. (2009) Malaysian Communications and Multimedia Commission. [Online]. HYPERLINK "http://www.skmm.gov.my" http://www.skmm.gov.my

[8] Anas A.Mohammad Salameh, Alaa A Alkafagi, Chulawadee Khunsri, and Adib M.Monzer Habbal, "Web Based Support for Pregnant Mother," in *Proceeding of the International Conference on Advanced Science,Engineering and Information Technology 2011*, Putrajaya, 2011, pp. 307-310.

[9] Liujun Zhao, Xin Chen, and Jianwen Ding, "Interference Clearance Process of GSM-R network in China," *IEEE*, pp. 424-428, 2010.

[10] Micael Halvorson, *Microsoft visual basic 2008 step by step*. Washington, USA: Microsoft Press., 2008.