Customization of Rheumatic Heart Disease Surveillance Program for Mobile Application

A dissertation submitted in partial fulfillment of the requirements for the award of

Post-Graduate Diploma in Health and Hospital Management

By

Keneikhrienuo

International Institute of Health Management Research

New Delhi -110075

May, 2013

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Date: May 7, 2013

HISP INDIA SOCIETY FOR HEALTH INFORMATION SYSTEMS PROGRAMMES

April 7, 2013

To Whom It May Concern

This is to inform, that Ms. Keneikhrienuo, student at International Institute of Health Management Research (IIHMR), New Delhi, has successfully completed internship with the Society for Health Information Systems Programmes, India (HISP India) working with various Indian states in setting-up e-Health systems, from January 2013 to March 2013. Her contributions have been in Customization of Rheumatic Heart Disease Surveillance Program using Mobile Application.

She came across as a good team member with potential of being an asset to the organisation her works. I wish her good luck.

(Sundeep Sahay)

Certificate of Approval

The following dissertation titled "**Customization of Rheumatic Heart Disease Surveillance Program for Mobile application**" is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

Name	Signature
Avanish Kr. Singh.	
Anandh. Ramadoss	

Certificate from Dissertation Advisory Committee

This is to certify that **Ms Keneikhrienuo**, a graduate student of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. She is submitting this dissertation titled **"Customization of Rheumatic Heart Disease Surveillance Program for mobile application"** in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management.**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

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ABSTRACT

Background: Mobile phone based reporting of suspected cases of rheumatic fever/rheumatic heart disease has the potential of improving control of rheumatic heart disease in children. This technology is promising as it is relatively inexpensive, can solve the problem of internet availability and may offer the ability to conduct timely diagnosis of rheumatic heart disease. To develop this desired solution of using mobile application for surveillance of RF/RHD cases requirements were gathered from the various stakeholders. This study is a qualitative study aimed at describing how the requirements were gathered for customizing the RHD program for mobile application.

Objective:

To gather requirements to customize the Rheumatic Heart Disease Surveillance Program for Mobile.

Specific objectives:

- To identify who are the users
- To understand what they want to do with the system
- To understand where will it be used
- To train the users

Methodology: Qualitative method through unstructured interviews and meetings.

Results and conclusion: A total of thirteen requirements have been identified of which seven has been categorized as of high priority. Identifying the right patient (student), receiving the right prompts and alerts for the right follow up stage and providing adequate training to the teachers were identified to be of high importance. As the need to assess the technical competency of the users was deemed to be of high importance, trainings were conducted in the schools selected for the pilot project. Altogether 33 teachers received training on how to use the mobile application for reporting the suspected cases of RF/RHD.

Observations from the training sessions:

1. Only NSS teachers (2 in each school) cannot do the reporting alone for about approximately 250 students in each school.
2. Compatibility issues of the handsets.
3. Some users showed difficulty in reading the application which is in English.
4. Literacy level of the parents is low.
5. Difficulty likely to be faced by the teachers while doing the follow ups.
6. There is no feature for user authentication in the application apart from the Unique ID of the child.

Based on the above mentioned observations from the training sessions recommendations were made which were to be incorporated into the requirements gathered to develop the desired mobile application. The recommendations are:

Recommendations:

1. Should involve class teachers and not only NSS coordinators for reporting because the cases to be handled is likely to be too much for only 1-2 persons and the follow up process will be too cumbersome since there is only one or two NSS members in each school.
2. The application should be able to run on smart phones.
3. Option for the application in Hindi should be made available.
4. User Authentication- there should be user authentication feature in the application for data privacy and security.
5. Involvement of parents from stage one leaving only the registration responsibility to the teachers.
6. Use of prerecorded voice instead of sms to the parents (in case the parents are illiterate) for the follow up reminders.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to Prof. Sandeep Sahay, president HISP, India for giving me the opportunity to work with the dedicated staff of HISP, India where my dissertation study was undertaken.

I hereby express my deep gratitude towards **Ms. Arunima S Mukherjee**, Project-Lead Coordinator, HISP india, and my internal mentor **Prof. Anandhi Ramachandran** for their valuable guidance, support, interest, involvement, encouragement and advice which inspired me to work on this project.

I would also like to thank my family and friends for their cooperation extended to me at all the times which made it possible for me to complete my dissertation.

Thank you

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ABBREVIATIONS

RF – Rheumatic Fever

RHD – Rheumatic Heart Disease

H.P. – Himachal Pradesh

m-health – Mobile health

HISP – Health Information Systems Program

HOD- Head of Department

IGMC- Indira Gandhi Medical College

IEC – Information Education Communication

BCC – Behavior change communication

G.S.S.S. - Government Senior Secondary School

N.S.S. – National Service Scheme

S.O.P- Standard operating procedure

F.A.Q- Frequently asked questions

SMS – Short message service

FSNIS – Food Security and Nutrition Information System

DQA- Data Quality Analysis

PART 1 : INTERNSHIP REPORT

CHAPTER-1

ORGANIZATION PROFILE

H*i*SPindia is a not-for-profit NGO specializing since more than a decade in designing and implementing solutions in health informatics for the public health sector in Indian states, and also recently in Bangladesh and Sri Lanka. It is not a solely technology focused organization, but a multi-disciplinary organization concentrating on the domains of public health and informatics. The organization has a strong commitment to free and open source technologies, and works with a global perspective of the **Health Information Systems Programmes (HISP) network**, coordinated by the University of Oslo, Norway, and is active in more than 20 countries in Africa and Asia. H*i*SPindia has a registered and head office in New Delhi, and project offices in Kerala, Himachal Pradesh, and Punjab. The team members are intensively travelling to different parts of the country to provide technical support services.

1.1 VISION

"To enable and coordinate a network of excellence in public health informatics, specializing in integrated health information architectures, with a geographical focus on South-East Asia."

1.2 HISTORY

In 1999, an informal group of idealists got together to start a project in a primary health centre in the remote villages of Kuppam, Chittoor district in Andhra Pradesh. These efforts were supported by the University of Oslo, Norway, and had initial partnerships with IIM Bangalore and ASCI Hyderabad. During the first five years, it remained focused on Andhra Pradesh and carried out implementations of the first version of the DHIS software application. From 2005, it

started to work in the State of Kerala first in one facility and by 2008 all the facilities were reporting data in the DHIS2. The DHIS2, which is a global standard today for facility reporting, took birth in a clinic in Kerala in 2006. The achievements in Kerala prompted the state of Gujarat first, and then Jharkhand and Madhya Pradesh to initiate DHIS2 implementations. This led to collaboration in 2008 at the national level with National Health Systems Resource Centre (NHSRC) to provide technical support on DHIS2 nationally. About 25 states took up DHIS2 in 2008. Today, HISP has gained international recognition, and has also been invited to provide technical support in Bangladesh, Sri Lanka, Rwanda, and Philippines.

1.3 GEOGRAPHICAL COVERAGE

With a 30 team members, HISP has a strong national and global coverage of work. In India, it has worked in at least 90% of the states, and currently has a presence in about 20 states. Internationally, H*i*SPindia has worked in Bangladesh and Sri Lanka, and on an individual basis, experts have contributed to Global HISP activities in various countries including Vietnam, Tanzania, Zanzibar, Ethiopia, Mozambique, South Africa, and those in West Africa.

Work plan:

Activities	January		February				March					April			
	W 2	W 3	W 4	W 1	W 2	W 3	W 4	W 1	W 2	W 3	W4	W 1	W 2	W 3	W 4
Introduction to DHIS2	■														
Report Testing of DHIS2- Haryana		■													
Report Testing of DHIS2- H.P.			■	■											
DQA for FSNIS					■	■									
Finalization of Dissertation topic							■								
Preparation of use cases for RHD program							■	■							
Preparation of Database for RHD program on DHIS2								■							
Preparation of Test scripts and data dictionary									■						
Testing of mobile application										■					
Questionnaire for dissertation case study											■				
Preparation of user manual and SOPs											■				
Training of users												■			
Report preparation													■	■	
First draft of dissertation report															■
Finalization of Dissertation report															■

Table 1: Work plan

Duties performed and learnings:

1. Report testing for DHIS2- Haryana and DHIS2 Himachal

- Report generation
- Variance in the data entry form and report format
- Variance in the testing instance and baseline
- Variance between Haryana & Himachal DHIS2

2. Data quality analysis for FSNIS

3. Updating the database of cancer awareness campaign.

3. Documentation /note taking /write up of the workshop

4. Requirements gathering for RHD program

5. Customization of RHD surveillance program for mobile:

- Preparation of test scripts for Mobile application and DHIS2 mobile tracker
- Preparation of user manual & SOPs for RHD program
- Testing of the mobile application for RHD program.
- Training of school teachers on mobile application.

Learnings:

During my training I was introduced to the DHIS2 software.

- The objective, design and working of the software. How to do the analysis in the DHIS2
- How to add a person/organization units to the program, design the forms and generate various reports. For ex. GOI reports, NRHM reports etc.
- How to set the validation rules. And how to test the validation rules.
- How to assign a program to an organization unit.

I also learnt how to customize a program for mobile application

- Importance of understanding the requirements and techniques to gather requirements.
- Importance of identifying who the users are? What is the level of technical competency of the users?
- How to organize and conduct trainings.

Part- 2 Dissertation

CHAPTER 1

1.1 INTRODUCTION

Rheumatic Heart Disease (RHD) is a chronic heart condition caused due to rheumatic fever that generally affects children and adolescents because of a vulnerable immune system. A throat infection (caused due to streptococcus bacteria) is the root cause of the disease. The bad news is incidence of RHD is much higher in India than the rest of the world. In India, 47 - 59% of all cardiac admission to hospitals in major urban centers are said to be attributed to Rheumatic Heart Disease [1]. The timely identification of Rheumatic Heart disease in children has become inevitable for the control of Cardiac problems in the Adult population.

Under the current systems in India, patient data from regional and community health centers is gathered using paper-based forms and procedures. These forms are then sent to regional health officials where data analysis is carried out by qualified staff to identify potential disease outbreaks. Notifications are then issued from the regional health administrations to local authorities, again using paper-based reporting methods. Under the present system it can take up to 30 days for information to move through these various steps, leading to delays in both outbreak detection and notification [2].

Leading experts in the field of bio surveillance and health informatics have argued that improvements in disease detection and notification can be achieved by introducing more efficient means of gathering, analyzing, and reporting on data from multiple locations [3].The introduction of new information and communication technologies (ICTs) is regarded as a central means to achieve these efficiency gains. The primary objective of the Rheumatic heart disease surveillance program is to bridge this existing gap between the healthcare system and the community through the use of information technology. The RF/RHD surveillance program is a pilot study that involves the use of mobile phones for reporting the suspected cases of RF/RHD to the local health officials. A key aspect of this

program is involvement of the school teachers for reporting the suspected cases. Once in digital form, patient data can be transmitted immediately to a central server where rapid analysis can take place. Thus timely intervention can be taken to control RHD in children.

1.2 REVIEW OF LITERATURE

1. Prevalence of Rheumatic Heart Disease in School Children in Bikaner: An Echocardiography Study; KL Periwal, BK Gupta, RB Panwar, PC Khatri, S Raja, R Gupta. This study was undertaken to determine prevalence of rheumatic heart disease (RHD) using clinical and echocardiographic criteria and to study influence of socioeconomic status (SES).The study area was set in a school in a north-western Indian town. 3292 school children, age range 5-14 years, in two private schools, ten middle SES government schools and six low SES government schools were invited to participate in the study. 3002 (1837 boys, 1165 girls) were clinically examined (response 91%) of which 1042 were in private schools, 1002 in middle SES schools and 958 in low SES schools. Prevalence of cardiac murmurs and RHD based on clinical diagnosis was determined in school by a trained team of physicians. A significant cardiac murmur was observed in 55 subjects (18.3/1000) with similar prevalence in boys (20.7) and girls (14.6). The study concluded that there is a low prevalence of RHD in school children in this region compared to previous Indian studies. Cardiac murmurs are more prevalent among low SES children

2. Collecting Integrated Disease Surveillance and Response Data through Mobile Phones. **Luba Pascoe, Juma Lungo, Jens Kaaboll, Ismael Koleleni. Dar Es Salaam University College of Education**, **P.O Box 2329, Dar es salaam, 255, Tanzania** This study focuses on improving the routine reporting of health data by identifying the challenges associated with timely reporting of routine data from the primary health facilities to the district and determines how mobile phones can be used to overcome the problem and thus enhance information use for action at all levels of the health system. Findings have indicated that, timely reporting of routine health data face challenges such as poor infrastructure, remoteness of the health facilities from the district where they have to submit their reports as well as transport costs that health workers have to incur in order to submit their report.

Facing these challenges, this research revealed that the use of mobile phone application built in the District Health Information System database can provide an easy, cost effective and reliable means for reporting of health data. Over a period of 5 months, the data completeness and timeliness improved from 50% to 89%. This implies that the routine reporting of around ten data elements through mobile phones is feasible. The study recommends rigorous supervision, which among other things checks for data quality and correctness

3. Using Mobile Phones in a Real-time Biosurveillance Program: Lessons from the frontlines in Sri Lanka and India. Gordon A. Gow Associate Professor University of Alberta CANADA and Nuwan Waidyanatha Senior Researcher, LIRN Easia 12 Balcombe Place, Colombo 08 Sri Lanka. The Real-Time Biosurveillance Program (RTBP) is a multi-partner research initiative to study the potential for new Information and Communication Technologies (ICTs) to improve early detection and notification of disease outbreaks in Sri Lanka and India. A key component of this project involves frontline data reporting using mobile phones to overcome problems of Internet-access in remote locations. The mobile phone offers an innovative and potentially effective means of digitizing patient records to support real-time Biosurveillance programs in developing countries. The project team has recently concluded a formative evaluation of the digitization process using the evaluative framework based on four indicators of usage and proficiency related to Wagner's acceptability attribute: real-time vs other time submission patterns (latency); corrupt and clean records (quality); results from a certification and testing exercise conducted with frontline healthcare workers (reliability); and observations of and interviews with healthcare workers to determine impact on data collection procedures (portability). Initial findings suggest that younger healthcare workers are more likely to adopt and use the mHealth Survey application as compared with older, more mature healthcare workers. However, there appears to be a significant tradeoff in terms of data quality between these two groups, with more mature health care workers providing more accurate and comprehensive records than their younger counterparts. Initial findings also suggest that minimizing impact on current workflow is a key consideration with the introduction of a mobile phone-based data entry system. However, the additional human resources necessary to support this system in the form of a data entry clerk or assistant may offset any efficiency gains or improvements in data quality that would otherwise be achieved with real-time data provision.

1.3 OBJECTIVE

To gather requirements to customize the Rheumatic Heart Disease Surveillance Program for mobile.

Specific objectives:

- To identify who are the users
- To understand what they want to do with the system
- To understand where will it be used

CHAPTER 2

DATA AND METHODS

(REQUIREMENTS GATHERING ANALYSIS)

Site and timeline: HISP, India office, Shimla

(7^{th} January to 7^{th} April), 2013

Data collection method: Qualitative method –Unstructured Interviews and meetings

2.1 SCOPEOF THE PROJECT

The scope of this project 'Customization of Rheumatic Heart Disease Surveillance Program for Mobile' is to customize the program for mobile application to serve the purpose of reporting of suspected cases of rheumatic fever and rheumatic heart disease in school going children. This project is purely a qualitative study based on observation techniques and discussions.

2.1.1 Objective

To gather requirements to customize the Rheumatic heart disease surveillance program for mobile.

2.1.2 Introduction/Project concept

The prevalence of RF/RHD in the most vulnerable group i.e. school children between 5 to 15 years of age is still unacceptably high. RHD is encountered in 1 to 5.4 per 1,000 in large samples of school children and RF in 0.3 to 0.5 per 1,000 children. There appears to be no obvious decline in its prevalence in school children over a 20 year period [4]. Thus timely diagnosis of rheumatic fever at the initial stages is crucial to control rheumatic heart disease. The rheumatic heart disease surveillance mobile application will provide timely reporting of suspected cases of rheumatic heart disease so that timely intervention can be taken.

2.1.3 Exclusions

- The prototype of this project has to be completed by 30th April, 2013 after which the pilot of this project will be implemented.
- The resources used for this will be limited to only the five schools selected for this pilot.
- The mobile application will be used only for reporting of suspected cases and not for diagnosis.

2.1.4. Limitations

- This is only a qualitative study based on observation techniques and discussions.

2.2 IN SCOPE OF THE PROJECT

- The training of the school teachers will be provided by the HISP, India Team.

2.3 OUT OF SCOPE OF THE PROJECT

- The medical treatment and follow ups for the same for any child diagnosed with Rheumatic fever/rheumatic heart disease will be the responsibility of the parents/guardians of the child and not the project team.

2.4 STAKEHOLDER ANALYSIS

Position	Role	No. of Stakeholders
HOD cardiology, IGMC, Shimla	Provide patient care	1
State program officer	Provide coordination between the health and education department.	1
HISP, India	Provide trainings and technical support	4
School teachers	Provide IEC and BCC to the community and reporting of cases.	10 (2 from each of the 5 schools selected).

Table 2: Stakeholder analysis

****Stakeholders defined as per the requirements for the pilot study.**

2.5 TOOLS TO GATHER REQUIREMENTS

The requirement gathering tools used for the project are namely interviews and meetings. The tools used were:

- **Interviews –** Unstructured interview was conducted which helped in gaining much data through informal conversations.
- **Meetings** – Meetings with the various stakeholders which provided a platform for the stakeholders to give their inputs for the desired solution.

Topics discussed:

- Time span of pilot project
- Number of Follow up stages
- Number of alerts to be sent
- Number of alerts to be sent for each stage
- Involvement of parents
- Technical competency of users
- Trainings
- Who will be involved in the reporting during the pilot phase?

2.6 REQUIREMENTS GATHERED AND THEIR CLASSIFICATION

Requirement ID	Explanation	Priority	Functional/ Non-Functional
R1	Patient Details	High	Functional
R2	Updating of Patient Records	High	Functional
R3	Prompts	High	Functional
R4	SMS Alerts	Medium	Functional
R5	User- Friendly Interface	High	Non-Functional
R6	Good network connectivity	Medium	Non-Functional
R7	Training of teachers	High	Non-Functional
R8	Maintenance of server	Medium	Non-Functional
R9	High Bandwidth	High	Non-Functional
R10	Compatility of application with the handset	Medium	Non-Functional
R11	Maintenance of register in the schools	Medium	Non-Functional
R12	Modem and desktop	Medium	Non-Functional
R13	SMS Package	Low	Non-Functional

Table 3: Requirements gathered and their classification

2.7 Features and Data elements

Client End:

1. User should be able to locate and open the RFHD Tracking application on mobile phone.

2. User should be able to see following options when opening the application:

    2.1. Student registration

    2.2. Update student details

    2.3. RHD stages

        2.3.1 Initial screening

        2.3.2 RHD

        2.3.3 Sore throat 1

        2.3.4 Sore throat 2

        2.3.5 Sore throat 3

    2.4 Update Stage Information

        2.4.1 Initial screening

        2.4.2 RHD

        2.4.3 Sore throat 1

        2.4.4 Sore throat 2

        2.4.5 Sore throat 3

    2.5. Settings

3. Alerts

2.1 Student Registration

Person attributes	Data type	Data field
Education block Code	Alphanumeric	Free text
School Code	Alphanumeric	Free text
Student Name	Characters	Free text
Father Name	Characters	Free text
Date of birth	Numeric	DD/MM/YYYY
Gender	Male / Female	Radio button
Class	Numeric (01 to 12)	2 digits
Contact Number	Numeric	10 digits

Table 4: Student registration

After successfully registration, a SMS is sent to the teacher with UID. The teacher needs to store the UID mapped to the student somewhere for further reference.

2.2 Update student details

Table 5: Update student details

Person attributes	Data type	Data field
Unique ID	Numeric	Free text
Education block Code	Alphanumeric	Free text
School Code	Alphanumeric	Free text
Student Name	Characters	Free text
Father Name	Characters	Free text DD/MM/YY
Date of birth	Numeric	YY
Gender	Male / Female	Radio button
Class	Numeric (01 to 12)	2 digits
Contact Number	Numeric	10 digits

2.3.1 RHD Stage – initial screening

Data elements	Data type	Data field
Unique ID	Numeric	Free text
Sore throat with fever	Yes /No	Radio button
Joint pain	Yes /No	Radio button
Breathlessness	Yes /No	Radio button
Abnormal movement of Arms	Yes /No	Radio button

Table 6: Initial Screening

1.1 If any /all of the three symptoms (joint pain, abnormal movement of the arms, breathlessness) is "yes" a prompt which reads "**Please refer the child to IGMC "** will appear on the screen. A sms will be sent to the parents "**Dear Ma'am/Sir, during the screening of RF/RHD at the school, your child showed symptoms of Rheumatic Hearth Disease. Please take your child immediately to IGMC.** "

(Or)

1.2 If only sore throat is "yes" a prompt which reads **"Please refer the child to any doctor"** will appear on the screen. A sms will be sent to the parents "**Dear Ma'am/Sir, during the screening of RF/RHD at the school, your child showed symptoms of Rheumatic Fever. Please take your child immediately to any doctor**".

2.1 A confirmation message containing the unique ID of the child should be received on the users (teacher) mobile.

2.3.2 RHD

Data element	Data type	Data field
Unique ID	Numeric	Text Field
Is medical attention sought?	Yes/No	Radio Button
Is child diagnosed with RF/RHD?	Yes/No	Radio Button
Is child diagnosed with any other disease?	Yes/No	Radio Button

Table 7: RHD

The two last data elements are only shown if question 2 is answered yes (sought medical attention).

"Is medical attention sought = no":

This stage can be repeated two times: after 2 weeks and after 2 weeks if medical attention is not sought. A prompt will appear saying "Counsel Child for seeking medical advice". In addition, a sms will be sent to the parents to put pressure on them to take their child to IGMC**:**

Dear Ma'am/Sir, during the screening of RF/RHD at the school, your child showed symptoms of Rheumatic Hearth Disease. Please take your child immediately to IGMC.

"Is medical attention sought = yes":

"RF/RHD = yes"

A prompt saying "Counsel for compliance for 3 weekly injections and oral medications" is shown.

"RF/RHD = no"

A prompt saying, "No further follow up is required".

2.3.3 Sore throat 1-3

Data elements	Data type	Data field
Unique ID	Numeric	Text field
Joint pain	Yes /No	Radio button
Breathlessness	Yes /No	Radio button
Abnormal movement of arms	Yes /No	Radio button

Table 8: Data elements for Sore throat 1-3

***** This stage can be repeated three times: after 2 weeks, after 2 weeks and after 4-6 months.**

If any of the questions are answered "yes" a prompt saying: "**Please refer the child to IGMC**" is shown. A sms will also be sent to the parents saying: **Dear Ma'am/Sir, during the screening of RF/RHD at the school, your child showed symptoms of Rheumatic Hearth Disease. Please take your child immediately to IGMC.**

2.4.1 Update stage information – stage 1 initial screening

Data elements	Data type	Data field
Unique ID	Numeric	Free text
Sore throat with fever	Yes /No	Radio button
Joint pain	Yes /No	Radio button
Breathlessness	Yes /No	Radio button
Abnormal movement of arms	Yes /No	Radio button

Table 9: Data elements for Update stage information- Initial screening

2.4.2 Update stage information – RHD

Data element	Data type	Data field
Unique ID	Numeric	Text Field
Is medical attention sought?	Yes/No	Radio Button
Is child diagnosed with RF/RHD?	Yes/No	Radio Button
Is child diagnosed with any other disease?	Yes/No	Radio Button

Table 10: Data elements for Update stage information

2.4.3/4/5 Update stage information –Sore throat 1-3

Data elements	Data type	Data field
Unique ID	Numeric	Text field
Joint pain	Yes /No	Radio button
Breathlessness	Yes /No	Radio button
Abnormal movement of arms	Yes /No	Radio button

Table 11: Data elements for Sore throat 1-3

2.5 Settings

Enter server number: User has to enter the server number i.e. long code or short code in to the application to send the sms .It is a one time activity.

3.1 Alerts

3 days prior the end of each stage an alert **"update the follow up status"** will be sent to the user (teacher) with the unique ID of the child whose follow up is pending.

2.8 USE CASE:

Req. No.	Release		Source	Feature
01				Locate the application in the mobile phone

Once the application is installed on the mobile , user should be able to locate the application

Preconditions	Success Guarantee
Application must be preinstalled on mobile phone	User is able to locate the application successfully in the mobile phone.

Main Success Scenarios

User is able to successfully locate the application in mobile

Req. No.	Release		Source	Feature
02				Open the application and view the features

Once the user locates the application he should be able to open the application and view the features on the application.

Preconditions	Success Guarantee
The user is able to locate the application in the mobile phone.	User is able to open the application in the mobile phone and view the features.

Main Success Scenarios

1. User is able to successfully open the application in the mobile phone.
2. User is able to open the application in the mobile phone and view the features

Req. No.	Release		Source	Feature
03				Enter the server number into the application

User has to enter the server number i.e. long code or short code into the application to send the sms. It is a onetime activity.

Preconditions	Success Guarantee
The application is installed in the mobile and the server number is given to the user.	The server number is accepted by the application

Main Success Scenarios

1. User is given the correct server number which is either a long code/ short code.
2. User enters the server number.
3 User clicks on the save button to save the server number
4. Server number is accepted by the application.

Req. No.	Release		Source	Feature
04				Register a new child

The user can register a new child by opening the patient form and entering the personal details of the child. Once the form is filled user will send the form to the server.

Preconditions	Success Guarantee
The server number must be accepted by the application. 2. The user must be able to open the patient form.	The user is able to fill the Patient form and send the form to the server

Main Success Scenarios

1. User chooses the patient form from the application.
2. User fills in the details of the child
3. User sends the patient form to the server

Req. No.	Release		Source	Feature
05				Get acknowledgement and unique ID for New registration

The user after sending the form successfully will receive an acknowledgement from the server that the message has been received along with the new Unique ID.

Preconditions	Success Guarantee
The patient form must be sent to the server.	The user receives the acknowledgement message along with the unique ID.

Main Success Scenarios

1. User sends the new patient form to the server.
2. The acknowledgement message along with the new Unique ID is received by the user.

Req. No.	Release		Source	Feature
06				Send form (Edited form or follow up form)

1. The user can edit the form he/she wishes to edit and send the form to the server.

   (or)

2. The user can send the follow up forms to the server after filling up the form.

Preconditions

1. The user must select the form he/she wishes to edit.
   (or)
2. The user must select the form for follow up.

Success Guarantee

User is able to send the form successfully

Main Success Scenarios

1. User enters the unique ID of the child he/she wishes to edit.
2. User selects the stage for which the form needs to be edited.
3. User makes changes to the form he/she wishes to edit.
   (or)
4. User chooses the ID of the child whose follow up is pending.
5. User opens the form and enters the required information.

Regd. No.	Release	Source	Feature
07			Get acknowledgement for edited forms or follow up forms

The server on receiving the edited patient form or the follow up form will send a message to the user acknowledging that the form has been received.

Preconditions

The edited/follow up form must be sent to the server.

Success Guarantee

The user receives the acknowledgement message.

Main Success Scenario

1. User sends the form to the server.

2. The acknowledgement message is received by the user.

Regd. No.	Release	Source	Feature
08			Analyze symptoms (1)

The server will analyze the record of the child and if any/all of the symptoms (i.e. Joint pains, abnormal movement of the arms and breathlessness) is detected it will send an alert "**Refer the child to IGMC** and follow up after 2 weeks" to the user.

Preconditions	Success Guarantee
The server must detect any/all of the three symptoms in the record of the child.	The alert "**Refer the child to IGMC and follow up after 2 weeks"** is sent to the user successfully.

Main Success Scenario

1. The alert "**Refer the child to IGMC**" is sent to the user successfully.

Req. No.	Release		Source	Feature
09				Analyze symptoms (2)

If the user checks sore throat with fever in the patient form a prompt,"**Refer the child to any doctor** and follow up after 2 weeks" will appear on the screen of the user's mobile phone

Preconditions	Success Guarantee
The server must detect sore throat in the record of the child.	The alert "Refer the child to any doctor and follow up after 2 weeks" is sent to the user successfully.

Main Success Scenarios

The alert "**Refer the child to any doctor** and follow up after 2 weeks" is sent to the user successfully

Follow up for child referred to IGMC:

Regd. No.	Release	Source	Feature
O1			Follow up for child referred to IGMC

For any child referred to IGMC the user will fill the following form.

Form no.1

Data element	Data type	Field length
Medical attention sought	Yes /No	Radio button
Medical attention sought, If Yes	Below 2 fields opens	Free text
RF /RHD	Yes /No	Radio button
Other Heart disease	Yes/No	Radio button
If RF/RHD is Yes	Counsel for compliance for 3 weekly injections and oral medications	Prompt appears on mobile screen
If RF/RHD is No	No further follow up required	Prompt appears on mobile screen
Medical attention sought , If No	Counseling patient for seeking advice	Prompt appears

Preconditions

The child must be referred to IGMC

Success Guarantee

The completed form is sent successfully to the server.

Main Success Scenario

1. The completed form is sent successfully to the server.

Regd. No.	Release	Source	Feature
O2			Follow up for child referred to IGMC who has sought medical attention and diagnosed with RF/RHD

If a child who has been referred to IGMC has sought medical attention and diagnosed with RF/RHD,a prompt "Counsel for compliance for 3 weekly injection and oral medications and follow up after 2 weeks" will appear on the screen of the user's mobile phone

Preconditions	Success Guarantee
The child must be diagnosed with RF/RHD	The alert to "Counsel for compliance for 3 weekly injection and oral medications and follow up after 2 weeks" is sent to the user.

Main Success Scenario

1. The alert to "Counsel for compliance for 3 weekly injection and oral medications and follow up after 2 weeks" is received by the user.

Regd. No.	Release	Source	Feature
O3			Follow up for child referred to IGMC who has sought medical attention and not diagnosed with RF/RHD

For any child referred to IGMC who has sought medical attention and not diagnosed with RF/RHD a prompt "No further follow up required" will appear on the user's mobile screen

Preconditions	Success Guarantee
The child must be free from RF/RHD.	The alert that "No further follow up required" is sent to the user.

Main Success Scenario

1. The alert that "No further follow up required" is received by the user.

Follow up for sore throat:

Regd. No.	Release	Source	Feature
01			Follow up for sore throat 1

When a child is detected with sore throat and referred to any doctor, 2 weeks from the date of referral the following form is used to diagnose if the child has any symptom of RHD

Form no.2

Data element	Data type	Field length
Joint pain	Yes /No	Radio button
Breathlessness	Yes /No	Radio button
Abnormal movement of arms	Yes /No	Radio button
If Yes for all OR anyone	Refer to IGMC	Prompt appears on mobile screen
If No	Update the patient status after 2 weeks	Prompt appears on mobile screen

Preconditions

The child must be referred to any doctor.

Success Guarantee

The form is filled and sent to the server.

Main Success Scenario

1. The form is successfully sent to the server.

Regd. No.	Release	Source	Feature
02			Follow up for child diagnosed with any/all of the three symptoms

When a child is diagnosed with any/all of the three symptoms the child is referred to IGMC where the same form (refer to form no.1) is used. **Refer to RHD case no.1**

Regd. No.	Release	Source	Feature
03			Follow up for child not diagnosed with any of the three symptoms(1)

When none of the three symptoms (breathlessness, joint pains, abnormal movement of the arms) is detected in the child a prompt, "Follow up after 2 weeks" will appear on the user's mobile screen.

Preconditions
The child must be free from any of the three symptoms.

Success Guarantee
The prompt appears on the mobile screen

Main Success Scenario
The prompt appears on the mobile screen.

Regd. No.	Release	Source	Feature
04			Follow up for child not diagnosed with any of the three symptoms(2)

3days Prior to the end of the 2 weeks from the follow up alert an alert "update status" is sent to the user.

Preconditions
The follow up of the child pending.

Success Guarantee
The alert to update status is sent to the user.

Main Success Scenario
The alert to update status is received by the user.

Regd. No.	Release	Source	Feature
05			Follow up for child not diagnosed with any of the three symptoms(3)

If the updated status of the child shows any of the three symptoms then the child is referred to IGMC where the same form will be used (form no.1). **Refer to case no.1**

Regd. No.	Release	Source	Feature
06			Follow up for child not diagnosed with any of the three symptoms(4)

If the updated status of the child shows none of the three symptoms a prompt, "follow up after 4-6 months" will appear on the screen of the mobile.

Preconditions
The status of the child must show no symptoms.

Success Guarantee
The user receives the prompt , "follow up after 4-6 months"

Main Success Scenario
The prompt, "follow up after 4-6 months" is received by the user.

Regd. No.	Release	Source	Feature
07			Follow up for child not diagnosed with any of the three symptoms(5)

3days Prior to the end of the 6months from the follow up alert an alert "update status" is sent to the user.

Preconditions
The status of the child must show follow up pending.

Success Guarantee
The user receives an alert to "update follow up status".

Main Success Scenario
The alert to "update the follow up status" is received by the user.

Regd. No.	Release	Source	Feature
08			Follow up for child not diagnosed with any of the three symptoms(6)

If the updated status of the child shows any of the three symptoms a prompt, “refer the child to IGMC” will appear on the user’s mobile screen where the same form (form no.1) will be used.

Refer case no.1

Regd. No.	Release	Source	Feature
09			Follow up for child not diagnosed with any of the three symptoms(6)

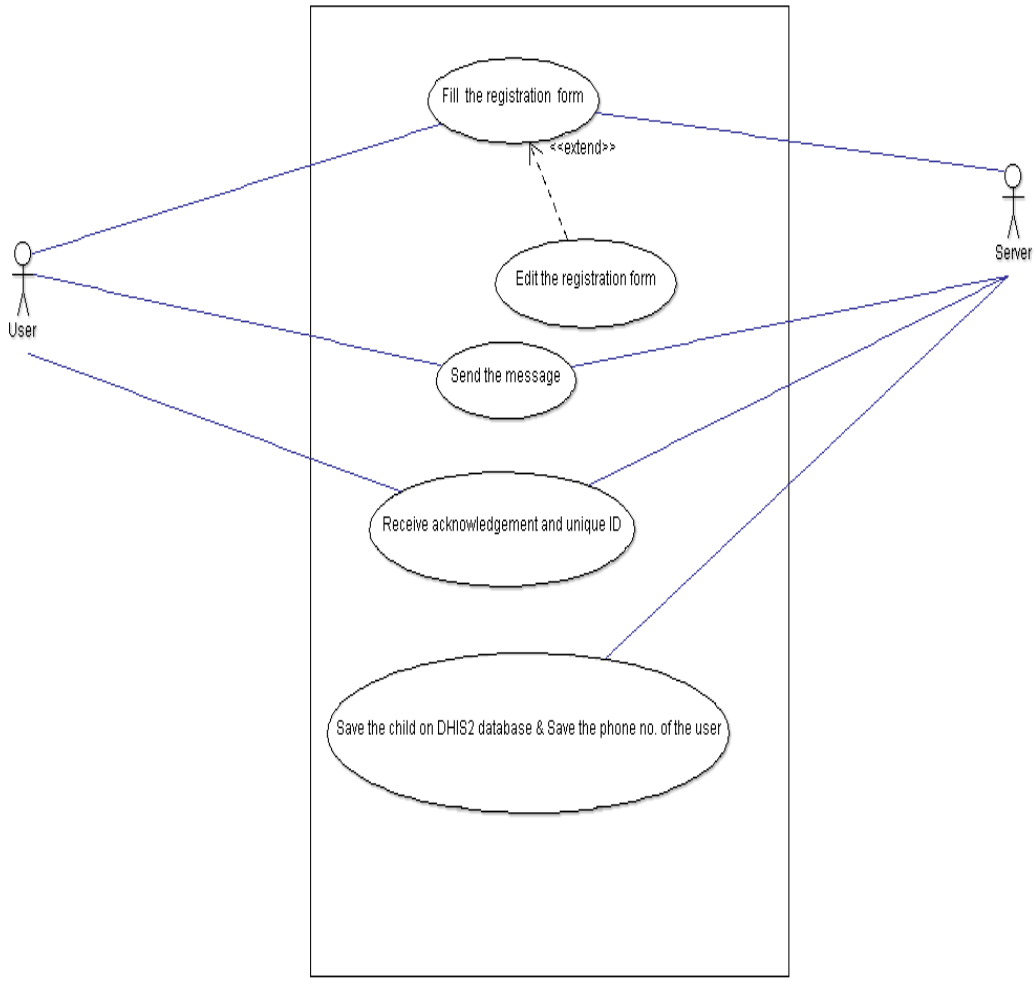
If the updated status of the child does not show any of the three symptoms the server will send an alert to the user that “No further follow up required”.

Preconditions
Status of the child must show no symptoms.

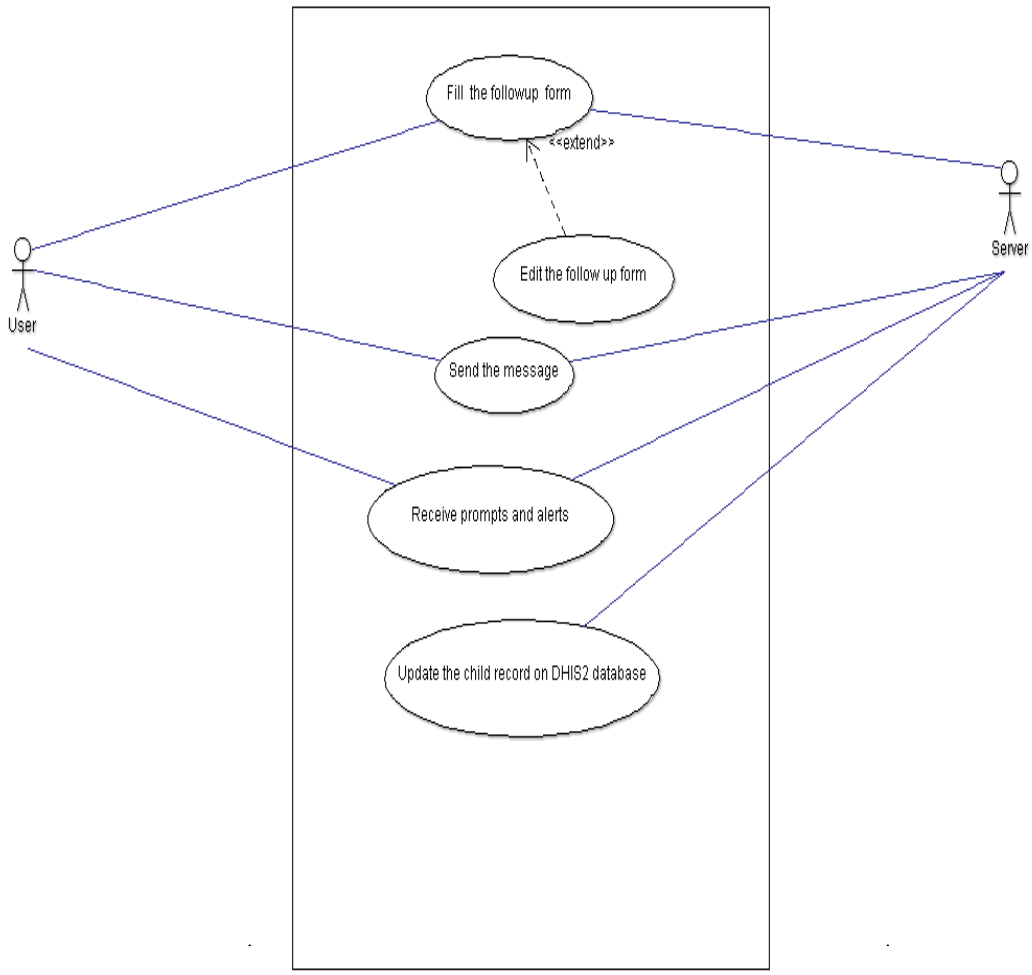
Success Guarantee
The user receives the alert that no further follow up is required.

Main Success Scenario
The user receives the alert to stop follow up of the child.

Use case diagram for Registration process:



Use case diagram for Follow up Process:



CHAPTER 3

METHODOLOGY OF TRAINING OF THE USERS

3.1 Preparation of User manual

Once the application was tested and found free from bugs the preparation for a user manual took place. The purpose of this document is to show the installation & operation of Mobile Based Application of the DHIS mobile tracker for Rheumatic Heart Disease Surveillance Program.

This 25 pages document details the workflow of the entire application which is intended to help the mobile user in easy understanding of the application. This manual guides its users by providing a clear idea about how things have to be done in the application. Each and every step is clearly described in the manual.

3.2 Training preparation checklist:

Action	**Completed**
Ensure photocopy of the order letter to the schools is available.	
Confirm attendees	
Obtain rooster of the attendees for training session	
Provide trainees with any pre training instructions	
Training room equipment	
Ensure that room is able to accommodate all the trainees	
Ensure lighting is appropriate for activities such as note taking, viewing of audio-visual aids, and hands-on training of the mobile application.	
Ensure any sound distractions are eliminated or minimized.	
Arrange furniture to allow all trainees to see the trainer and audio-visual aids.	

Training Software	
Ensure the emulator is working fine and jar file is installed is ready for the new session.	
Equipment	
Ensure all server is working is working properly and the modem is in place.	
Ensure projector is working properly	
Audio-Visual Materials	
Photocopy handouts, including extra copies	
Arrange handouts in order of use.	
Ensure training materials are in place (e.g., presentation notes).	
Secure any additional trainee materials (e.g., User Manual).	
Trainer Supplies - Confirm that the following supplies are available:	
Extension cord	
Pens, pencil & stick notes	
Extra handsets supporting the jar file.	

Table 12: Training preparation checklist

3.3 Training Schedule:

Training session no.	Date	Time	Duration	Location
1	03.04.2013	11 am	2 hours	GSSS Phagli
2	04.04.2013	11 am	2 hours	GSSS Lakkad Bazaar
3	-	-	-	GSSS Chhota shimla
4	-	-	-	GSSS Bolleauganj
5	-	-	-	GSSS Portmore

Table 13: Training schedule

3.4 Training agenda:

Time	Activity
11 am	Introduction of the team & objective of the training session
11:10	Presentation on RF/RHD(clinical conditions)
11:15	Illustrate the Process flow
11:20	Introduction to the mobile application
11:40	Demonstration on the emulator
12:00	Break
12:10	Hands on training
12:50 -1 pm	Open for Discussions and questions

Table14: Training agenda

3.5 TRAINING APPROACH

3.5.1 Aims and Objective

The aim of the RF/RHD training sessions is to create awareness about RF/RHD to the participants and provide them with the RF/RDH mobile application so they can identify and report suspected cases.

Objectives:

- To create awareness about Rheumatic Fever and Rheumatic Heart Disease.
- To make clear the objectives of the program to the participants.
- To provide participants with practical experience by involving them in the hands-on - training.

3.5.2 Training materials

During the training the following materials were used or handed out:

- Presentation
- Demonstration on emulator
- Attendance sheet
- FAQs (handed out)

- SOPs (handed out)
- Training evaluation form

3.5.3 Methodology

1. **Presentation** - it was used to explain the medical aspects of RF/RHD and what the symptoms are. The overall objectives for the programme, and how the application works.
2. **Discussions** - to get the participants views and opinions.
3. **Demonstration on emulator** - it was used to show step-by-step process on to how use the application.
4. **Hands-on-training** - it was conducted to assess the comfort level of the participants in using the application and also to note the issues arising while using the application from the user's perspective.

CHAPTER 4

RESULTS AND DISCUSSION

The requirements gathering process started in the month of January 2013 with an open invitation to the various stakeholders to give their requirements of the desired solution. A number of meetings were also held with the various stakeholders .Surveillance of Rheumatic fever has become a priority in India where it is encountered in 1 to 5.4 per 1,000 in large samples of school children and RF in 0.3 to 0.5 per 1,000 children and there appears to be no obvious decline in its prevalence in school children over a 20 year period [3]. Timely diagnosis of this disease can prevent cardiac problems in the adult population. It has been observed that the current process of paper reporting delays the treatment of suspected cases. Use of ICTs can play a vital role in ensuring timely reporting and ultimately the timely diagnosis of RHD.

The mobile application i.e. the RF/RHD Surveillance application will be used by school teachers for reporting any suspected case of RF/RHD in their students. The teachers will be using the mobile application to register the student in the application and report the case.

A total of thirteen requirements have been identified of which seven has been categorized as of high priority. Identifying the right patient (student), receiving the right prompts and alerts for the right follow up stage , generating accurate results during analysis and providing adequate training to the teachers were identified to be of high importance.

In the process of requirements gathering the need to assess the technical competency of the users was seen as a high priority. Therefore the need to conduct trainings for the users on how to make them more competent to use the mobile application for reporting of cases was suggested. This need transformed into a reality by conducting trainings for the teachers under the pilot project.

The requirements gathered and their classification is shown below:

Requirement ID	**Explanation**	**Priority**	**Functional/ Non-Functional**
R1	Patient Details	High	Functional
R2	Updating of Patient Records	High	Functional
R3	Prompts	High	Functional
R4	SMS Alerts	Medium	Functional
R5	User- Friendly Interface	High	Non-Functional
R6	Good network connectivity	Medium	Non-Functional
R7	Training of teachers	High	Non-Functional
R8	Maintenance of server	Medium	Non-Functional
R9	High Bandwidth	High	Non-Functional
R10	Compatility of application with the handset	Medium	Non-Functional
R11	Maintenance of register in the schools	Medium	Non-Functional
R12	Modem and desktop	Medium	Non-Functional
R13	SMS package	Low	Non-Functional

Table: Requirements gathered and their classification

Evaluation of the training:

The following table shows the total number of teachers and NSS coordinators who participated in each school training.

Date	School	Teachers	No. of NSS coordinators	Total
03.04	GSSS Phagli	16	2	18
04.04	GSSS Lakkad Bazaar	14	1	15

Table 15: Total number of teachers and NSS coordinators

GSSS Phagli. Date: 03.04.2013

Duration	2 hours
Expected number of teachers	20
Turnout	18
Successfully installed application	11
Installation issues	● Smart phones ● No bluetooth ● Not able to run the jar-file ● Not able to locate the jar-file

Table 16: Training evaluation GSSS Phagli

GSSS Lakkad Bazaar. Date: 04.04.2013

Duration	1 hour 30 minutes
Expected number of teachers	20
Turnout	15
Successfully installed application	5
Installation issues	● Smart phone ● No bluetooth ● Not able to run the jar-file ● Not able to locate the jar-file

Table 17: Training evaluation GSSS Lakkad Bazaar

During the training the team was able to install the mobile application on only 50% of the handsets of the trainees which brought to light the issue of compatibility of the application with all kinds of handsets.

A training evaluation form was handed out to the participants to rate their opinion about the training. All the trainees showed a positive response to toward the training. The following table shows the evaluation of the training conducted.

Training feedback form evaluation:

Criteria	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
Training was effective	53%	32%	-	-	-
Instructor was prepared	50%	38%	-	-	-
Length of training was sufficient	34%	50%	-	-	-
Content was well organized	40%	43%	-	-	-
Questions was encouraged	42%	47%	-	-	-
Instructions were clear and understandable	40%	43%	-	-	-
Training met my expectations	34%	50%	-	-	-
Materials provided were helpful	50%	34%	-	-	-

Table 18: Training feedback form evaluation:

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Thirteen requirements were identified by the various stakeholders. Identifying the right patient (student), receiving the right prompts and alerts for the right follow up stage , generating accurate results during analysis and providing adequate training to the teachers were identified to be of high importance.

In the process of requirements gathering the need to assess the technical competency of the users was seen as a high priority. Therefore the need to conduct trainings for the users on how to make them more competent to use the mobile application for reporting of cases was suggested. This need transformed into a reality by conducting trainings for the teachers under the pilot project.The trainings for two schools out of the five schools selected for the pilot study were conducted successfully with all the participants the training sessions showing a positive response to the trainings conducted. Thirty two school teachers from the two schools received training on how to use the application on their mobile phone to report the suspected cases of RF/RHD in their school.

Observations from the training sessions:

1. Only NSS teachers (2 in each school) cannot do the reporting alone for about approximately 250 students in each school: During the monsoon and winter season the cases of sore throat increases which will make it impossible for one or two teachers alone to register and report the sore throat cases. There is a need to involve all the class teachers in reporting. Firstly because it will reduce the work load of the NSS coordinators and secondly because class teachers have better knowledge of their students.
2. Compatibility issues of the handsets: The application could run only on java supported handsets. It could not run on smart phones. Moreover could not install the application on the handsets without Bluetooth since the application could be transferred only through Bluetooth (from a mobile to mobile or from the laptop to a mobile phone.)

3. Some users showed difficulty in reading the application which is in English: some of the teachers teaching Hindi and Sanskrit subjects found it difficult to read the application because it was written in English.
4. Literacy level of the parents is low: Discussion with the teachers gave the knowledge about the literacy level of the parents.
5. Difficulty likely to be faced by the teachers while doing the follow ups: given the hectic schedule of the teachers it was found that it will be cumbersome for the teachers to do all the follow ups for a child registered in the program. Thus the need to involve the parents to do the follow ups of their children seemed feasible. The teacher need to only register the child into the program and the rest will be the responsibility of the parents.
6. There is no feature for user authentication in the application apart from the Unique ID of the child.

Thus based on the observations from the trainings conducted the following recommendations were made which are to be incorporated into the requirements gathered. The recommendations are:-

Recommendations:

- Should involve class teachers and not only NSS coordinators for reporting because the cases to be handled is likely to be too much for only 1-2 persons and the follow up process will be too cumbersome since there is only one or two NSS members in each school.
- The application should be able to run on smart phones.
- Option for the application in Hindi should be made available.
- User Authentication- there should be user authentication feature in the application for data privacy and security.
- Involvement of parents from stage one leaving only the registration responsibility to the teachers.
- Use of prerecorded voice instead of sms to the parents (in case the parents are illiterate) for the follow up reminders.

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CASE STUDY
ASSESSMENT OF THE USER'S ATTITUDE THE USE OF MOBILE APPLICATION

ABSTRACT

Background: Mobile phone based reporting of suspected cases of rheumatic fever/rheumatic heart disease has the potential of improving control of rheumatic heart disease in children. This technology is promising as it is relatively inexpensive, can solve the problem of internet [1] availability and may offer the ability to conduct timely diagnosis of rheumatic heart disease. This study aims to evaluate the attitude of the teachers regarding the use of mobile phones for reporting the suspected cases of rheumatic fever and rheumatic heart disease. This study is undertaken with the assumption that all the users own a mobile phone and are aware of mhealth.

Objective: To assess the attitudes of school teachers toward the use of mobile application for surveillance of rheumatic fever/rheumatic heart disease.

Methodology: All participants were asked to answer an 6 items questionnaire to assess their attitudes toward the mobile based reporting.

Results:

A total of 50 teachers participated in the study (i.e., a response rate of 40%). 70% (i.e. 35 out of 50 teachers) reported a positive attitude toward the use of mobile phones for reporting of suspected cases of RF/RHD. While 27% (i.e. 14 teachers) held a neutral attitude and 2 % (i.e. 1 teacher) held a negative attitude for the same.

Introduction

Real Time Biosurveillance Program provides the ability to detect and monitor a wide variety of health events involving multiple kinds of diseases, including communicable and non communicable as well as reportable and non reportable ones [2]. Under the current system in India, patient health data are gathered from healthcare centers using standard paper templates and sent to the higher health authorities where the data is analyzed and results are disseminated. The entire process can take almost 30 days [3].

The present system has proven to be ineffective in identifying the cases at the appropriate time. RHD is a condition which not treated early can lead to cardiovascular problems in the adult population [4].

The HISP, India in collaboration with the SHFW department of H.P. and the Education Department of H.P. have jointly initiated a project named as RHD Surveillance program the pilot of which will be a 6 month duration starting from May to October 2013.

RHD surveillance program had three components, namely patient data collection, event detection and message dissemination.

This application developed by HISP, India can be accessed on any java-enabled mobile phone. The data entered by the school teachers immediately reaches a server where the data is saved and prompts and alerts are sent to the teacher based on the condition of the patient. The present study was designed with the objective of understanding the knowledge and perception of the school teachers regarding the contribution of mobile phone based data collection adopted in RHD surveillance project.

Methodology

Type of study:

Descriptive

Study Population -

School teachers belonging to the schools selected for the pilot project.

Study Unit-

Schools under Shimla district selected for the pilot project.

Sample Design- convenience sampling

Sample Size – 50

Tools and techniques:

Questionnaire

A closed questionnaire was developed and Participants were asked questions pertaining to their attitude towards the use of mobile based reporting for surveillance of RF/RHD. The questionnaire was divided in to three parts the first part consisted of questions on the usability of the mobile application. The second part consisted of two questions to assess their adaptability of the application. Subsequently in the third part participants assessed

on their intention to use the mobile application. These six questions were then summed up and analyze to assess their overall attitude towards the use of mobile based reporting for surveillance of RF/RHD on a scale ranging from 1 to 5(1 = strongly agree; 5 = strongly disagree).

RESULTS

Part 1- Usability

1. Timely and periodic medical treatment may help a child live a normal life in the future

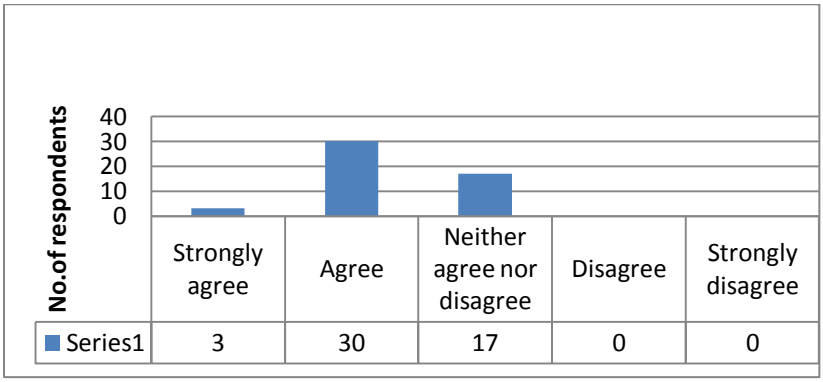

Fig.1

2. Mobile phone text messaging can be used to report any symptoms of a disease to a doctor /health facility.

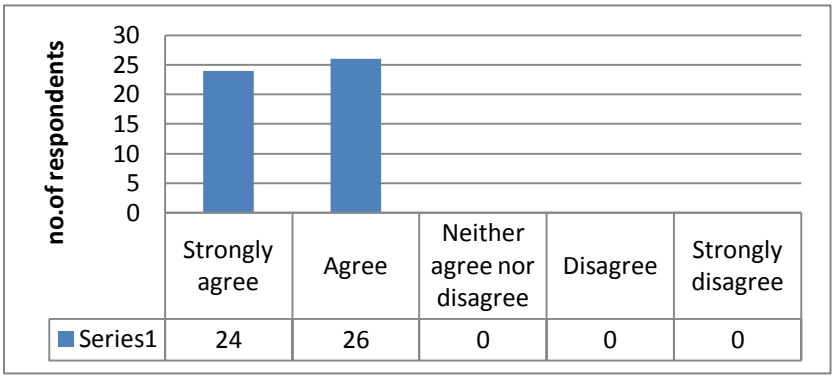

Fig.2

Part 2- Adaptability

1. Text messaging can be used as a Two-way communication between patients and a health facility

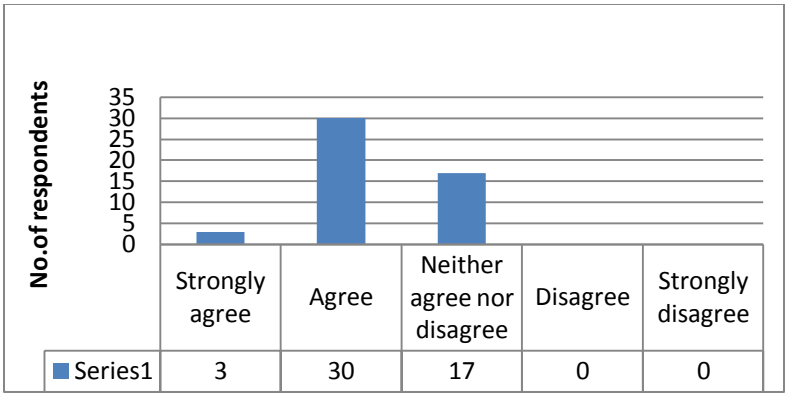

Fig.3

2. Mobile reporting will be more flexible method of reporting as it can be done anytime, anywhere

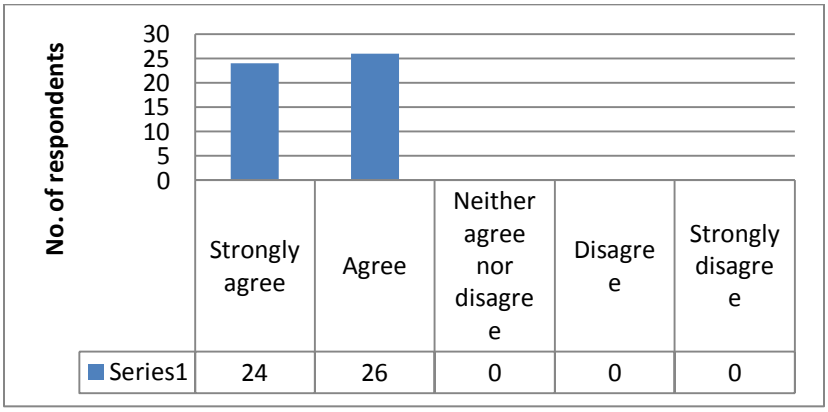

Fig.4

Part 3- Intention to use

1. It will be easy to use mobile application for tracking RF/RHD?

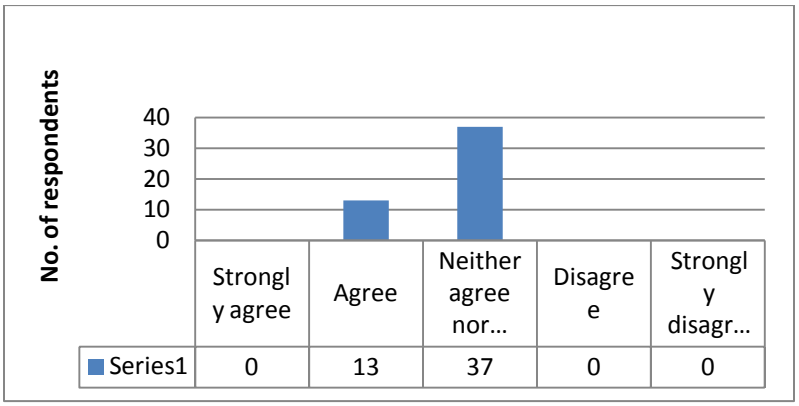

Fig.5

2. If you are provided the mobile application free of cost and instructed on its use you would use it as directed to improve the health status of your students

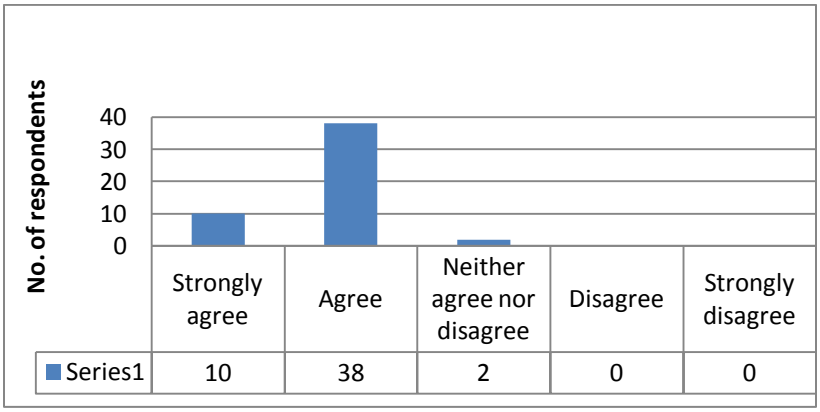

Fig.6

Overall result of the attitude towards the use of Mobile application for RF/RHD surveillance:

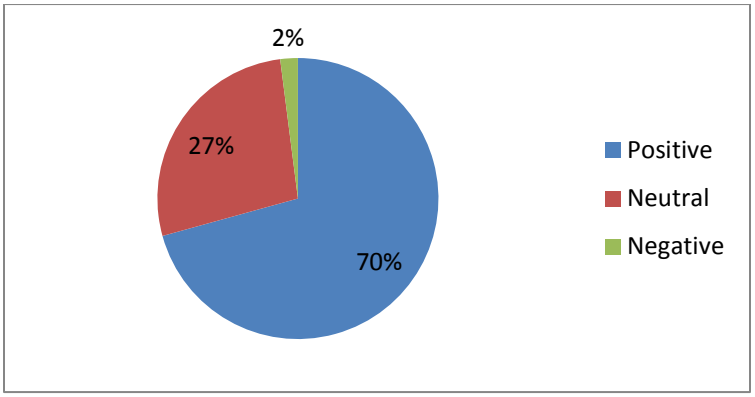

Fig.7

Discussion

This study was conducted in the two schools out of the five schools which were selected for the pilot project. Convenience sampling method was followed for the study. A total of 50 teacher participated in the study (i.e., a response rate of 40%). To assess the attitude of the teachers toward the use of the mobile application for reporting the suspected cases of RF/RHD a six item questionnaire was used where the respondents were asked to rate their agreement or disagreement on a four point likert scale. The questionnaire was divided into three parts. The first part consisted of two questions to assess the attitude towards the usability of mobile application. The second part consisted of two questions to assess the attitude towards adaptability of the mobile application. Lastly the third part also consisted of two questions to assess the respondents' intention to use the application. All these questions together were used to assess the overall attitude of the users toward the use of the mobile application for disease surveillance . All the respondents owned a mobile phone with the majority owning a simple mobile phone. The results show that 70% (i.e. 35 out of 50 teachers) reported a positive attitude toward the use of mobile phones for reporting of suspected cases of RF/RHD. While 27% (i.e. 14 teachers) held a neutral attitude and 2 % (i.e. 1 teacher) held a negative attitude for the same.

Limitations

Unfortunately only 40% of the school teachers under the pilot study participated in the study. The low response rate could be attributed to the study being conducted at the time new academic session. Teachers were busy with the admission process.

Conclusion

The study findings show the motivation level of the teachers is noted to be high with the teachers appearing to be ready for and accepting the mobile application to be used for RF/RHD surveillance in their schools. Thus involvement of school teachers in this desired solution for RHD surveillance can be considered in other schools as well.

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Appendix 1: ***Training evaluation form:***

Criteria	Strongly agree	Agree	Disagree	Strongly Disagree	Don't know
Training was effective					
Instructor was prepared					
Length of training was sufficient					
Content was well organized					
Questions was encouraged					
Instructions were clear and understandable					
Training met my expectations					
Materials provided were helpful					

Appendix 2: ***Questionnaire for mobile based reporting of RF/RHD surveillance***

1. Timely and periodic medical treatment may help a child live a normal life in the future

   a. Strongly agree
   d. Agree
   c. Disagree
   d. Strongly disagree

2. Mobile phone text messaging can be used to report any symptoms of a disease to a doctor/health facility.

   a. Strongly agree
   d. Agree
   c. Disagree
   d. Strongly disagree

3. Text messaging can be used as a Two-way communication between patients and a health facility.

   a. Strongly agree
   d. Agree
   c. Disagree
   d. Strongly disagree

4. Mobile reporting will be more flexible method of reporting as it can be done anytime, anywhere

   a. Strongly agree
   d. Agree
   c. Disagree
   d. Strongly disagree

5. It will be easy to use mobile application for tracking RF/RHD?

   a. Strongly agree
   d. Agree
   c. Disagree
   d. Strongly disagree

6. If you are provided the mobile application free of cost and instructed on its use you would use it as directed to improve the health status of your student.

   a. Strongly agree
   d. Agree
   c. Disagree
   d. Strongly disagree