

Study on Developing an m-Health Solution as an
Alternate Recording and Reporting System for Auxiliary
Nurse Midwives in Udaipur District of Rajasthan

By

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TO WHOMSOEVER MAY CONCERN

This is to certify that **Doma Sherpa** student of MBA Hospital and Health Management from The IIHMR University, Jaipur has undergone dissertation training at **Khushi Baby Inc, Udaipur** from February 8th 2016 to May 8th 2016.

She successfully completed her dissertation under my guidance on a study titled *"A study on developing an m-health solution as an alternate recording and reporting system for auxiliary nurse midwives in Udaipur, district of Rajasthan"*

The Candidate has successfully carried out the study designated to her during dissertation training and her approach to the study has been sincere, scientific and analytical. This training is in fulfillment of the course requirements.

I wish her all success in all future endeavors.



Dr. Ashok Kaushik
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Internship certificate

The certificate is proudly awarded to

Ms. Doma Sherpa

In recognition of having successfully completed her dissertation with Khushi Baby Inc.

On a study titled

*“A study on developing a mhealth solution as an alternate recording and reporting system for
Auxiliary nurse midwives in Udaipur district of Rajasthan.”*

8th Feb 2016-8th May 2016

At

Khushi Baby Inc., Udaipur

Doma Sherpa completed her work with Khushi Baby, as per the guidelines of her dissertation. She contributed valuable input and insight into an improved mobile application platform that can reduce redundancies while meeting reporting standards. She also lead field tests of prototypes of the application, and liased with a team of mentors from Frog in Milan. Doma was recognized for pitching the Khushi Baby solution, as the winner of the Innovations category at the Udaipur Tech4Raj competition. For her exceptional work, Khushi Baby gives Doma its strongest recommendation for her future endeavors, and would like to nominate her for receiving due honors or distinction from IIHMR Jaipur.



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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "*A study on developing an m-Health solution as an alternative recording and reporting system for auxiliary nurse midwives in Udaipur district of Rajasthan*" and submitted by **Miss. Doma Sherpa**, Enrollment No. **IIHMR-U/MBA-HM/2014-2016/19-1548** under the supervision of **Prof. Nutan P. Jain** for award of Postgraduate Diploma in Hospital and Health of the University carried out during the period from **2014 to 2016** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



Signature

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Thank you to all!

Best,
Doma Sherpa

Abstract

Background: Auxiliary Nurse Midwives are the most peripheral point of contact to the deliver healthcare in India. They provide the majority of rural primary maternal and child healthcare services. Each ANMs visits four to five different villages every month to conduct maternal and child nutrition (MCHN) day where she provides basic preventive and curative services and also maintains separate register for data entry for every villages, fill different formats of monthly reports and do various other documentation work. Keeping in view the use of technological advancement by many development partners, it is important to look for alternate solutions to overcome the challenges and its feasibility of use. Pilot studies suggest that Mobile health technologies have made significant contribution in reducing the burden of recording and reporting for frontline health workers. However, very few mobile health applications have explored the space of user centric approach where the feasibility of the mobile prototype needs to be tested and co-created by the user.

Objectives: The study included the following objectives: (1) to study the process of MCHN Day. (2) To understand key stakeholders involved in conducting MCHN day. (3) To study the challenges faced by ANMs in conducting MCHN day, especially maintaining records and preparing report. (4) To find out feasibility of an alternative m-health solution that is already being worked out for MCH in parts of Rajasthan.

Methods: The study was conducted in three blocks (Badgaon, Girwa, Rishabhdev) of Udaipur district of Rajasthan. A total of thirty ANMs (13 from Badgaon, 15 from Girwa and 2 from Rishabhdev) were interviewed using a semi structured questionnaire. A total of seven Maternal and child nutrition day of Badgaon block were observed to study the workflow and process. Besides primary data collection, a review was done for the variables in the ANMs registers and Khushi Baby (ongoing m-health project in the district) mobile based information system. Based on the current variables used by ANMs a mobile app was created to test the usability in general.

Results: Seven key stakeholders namely AVD, ANMs, ASHA, AWW, LHV, Block manager and beneficiaries were identified to be directly involved during the MCHN Days. Five key challenge areas were identified (i) Patient identification and registration, (ii) at immunization site, (iii) resource mobilization. (iv) Communication (v) Training and education. Due list was found to be the major source of information for patient identification. Ninety percent of the total thirty ANMs interviewed said that they do multiple entries using the RCH register. Fifty two percent of them said that the data documentation time over exceeds the time taken to deliver services to the patient. Although Seventy five percent of the ANM ranked the LHV first to receive immediate feedback for decision making but the frequency of meeting was found to be only 2 times a month. To overcome these challenges an alternate solution i.e. an m-health app prototype was built and tested among 10 users for feasibility. The application variables for antenatal care and child care were reduced from 117 to 88. The overall time taken to successfully complete different steps in the prototype was greater for the >35 age group ANMs. The overall experience of the application was satisfactory.

Conclusion: The alternate solution will help in minimizing double data entry and time taken per child/ANC will subsequently decrease. The findings may further be researched to know the intricate details of the workflow of the ANMs and the challenges that they face in conducting MCHN days to consider it for scaling up.

Keywords: Auxiliary nurse midwives, mobile health application, MCHN Day, Khushi Baby, swasthya sandesh seva.

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INTRODUCTION

Executive Summary

Immunization is one of the most cost effective interventions of public health providing protection directly and indirectly against VPD's. Although it has been a major contributor for the decline of under-5 mortality rate from 233 to 48 in last five decades in India¹, there are still 5 lacs children who die because of VPD's in India only out of the 15 Lacs worldwide. Children in India currently are provided vaccination to fight against seven such vaccine preventable diseases namely, Tuberculosis, Hepatitis, diphtheria, pertusis, tetanus, Polio, Haemophilus influenza. The government provides these vaccines free of cost at their health care centres, Every child has the right to be fully vaccinated i.e up till measles dose that is given at 9 months of age. However the importance to measure the timely immunizations is often omitted from the immunization reporting systems. First, vaccinations are to be given as early as possible to save lives. Second, timely vaccination ensures higher levels of herd immunity by reducing the pool of susceptible individuals, thereby protecting infants that are too young to be vaccinated from deadly vaccine-preventable diseases.² One cannot think of reducing child mortality without giving regard to maternal health. A healthy mother gives birth to a healthy child is now a proven fact. The International Conference on Population and Development in 1994 had recommended reduction in maternal mortality by at least 50 percent of the 1990 levels by the year 2000 and further one half by the year 2015. Antenatal care provides an opportunity for a variety of preventive interventions during pregnancy, including tetanus toxoid injections, folic acid supplements, high risk detections through routine haemoglobin, urine and sugar tests and educating women about nutrition, safe delivery, and postpartum allows women who face a high-risk pregnancy to be identified and monitored during pregnancy to ensure a safe delivery. The care received by her during her reproductive span specifically during her pregnancy stage is crucial for her health and her newborn's health. The focus of the govt. to a more holistic program, the RMNCH+A that follows life cycle approach and shows how each phase of the life cycle is interdependent on each other.

The eradication of polio from India was a combined effect of both the medicine and administrative efforts.

The documentation of information of ANC and Immunization records takes place at various levels i.e. first it is maintained by ANM in the sub center level, by data operators at the primary health centre and community health centre level and then by District consultant/coordinator at district level. The entire process takes up to a month to be converted into a report at the district level for any managerial decisions. The fact that the same information goes through different channels makes it more vulnerable to discrepancies and the lag time between data entry in the field and report generation at the district level may lead to inefficiency of the program. Therefore a need for a centralized system that allows the data of each patient to be accessed in the shortest time and in a standard format is realized.

A multitude of mHealth solutions have emerged over the years in many developing countries. The costs of mobile handsets and usage are declining as demand for mobile services increases and mobile networks are being rapidly expanded. Recent evidence from randomized scientific trials and studies has demonstrated that the capabilities of mobile phone technology, particularly SMS messaging, can positively impact treatment outcomes (Actevis consulting group 2013).

According to the Global Observatory for eHealth, WHO some of the healthcare challenges related to information system include:

- Lack of timely and actionable disease surveillance,
- Poor drug inventory and supply chain management,
- Slow rates of information flow and reporting delays.

CHAPTER 2

Review of Literature

2.1 Efforts to reduce child and maternal mortality in India

To ensure the MDG 4, the routine immunization plays a very important role to bring down the IMR and U-5MR. Govt. of India's started the Universal Immunization programme (UIP) since 1985 for children between the age group 0-12 months to protect them against six preventable diseases: tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, and measles. The goal of UIP was to ensure 100% coverage of all eligible children. A nationwide survey covering all States and Union Territories of India by UNICEF that was conducted during November 2009 to January 2010 suggested that the national FIC against the six vaccines among 12-23 month old children was only 61 percent. India national estimates found DTP3 coverage, which is the widely accepted RI global indicator, was still unachieved with 83 percent, against a global target of 90 percent by 2015³. The increase in full immunization coverage has only increased by 1 percent from 2009-2013 that urged JP Nadda, union minister of health to take this on a mission mode and he on 24th December 2014 announced the launch of Mission Indradhanush in order to cover all children vaccine preventable disease through immunization by 2020. Delivery care is a crucial aspect of maternal care. Most non-abortion maternal deaths occur around the time of labor and delivery or within a few days after birth (Fauveau et al. 1988). Access to obstetric services from qualified professionals is therefore essential to preventing maternal deaths. Educated mothers are more likely to recognize a problem, seek medical care, and report a problem. Infant and child mortality rates are also greatly reduced if mothers received antenatal and delivery care from trained health professionals (IIPS 1995). In India for example, infant mortality rates range from 97 per 1,000 for births with neither antenatal nor delivery care, to 64 per 1,000 for births with either type of care, and 44 per 1,000 for births with both antenatal nor delivery care. This pattern is constant for all the states under study. The findings are similar for institutional deliveries. Data from the NFHS show that infant mortality in India is 31 percent higher for births delivered at home than for births delivered in a public health facility and twice as high as for births delivered in a private facility. Promoting antenatal care and institutional deliveries have been a major Survey data on Maternal Mortality Ratio (MMR) is available from the Report of Registrar

General of India - Sample Registration System (RGI-SRS). The latest available data on MMR is for the period 2011-13 which is 167 per 100,000 live births. Average decline in MMR between 2007-09 and 2011-13 has been 11.3 points per year, i.e. 5.8% compound rate of annual decline. Assuming that the annual compound rate of decline observed during 2007-09 and 2011-13 continues, India's MMR is likely to reduce from 167 during 2011-13 to 140 in 2015 against the target of 100 per 100,000 live births by 2017. The government definitely needs to gear up in order to reach the competitive target. Maternal health comprise of services like essential obstetric care, quality antenatal care, Post natal care, skill birth attendants, provision of emergency and referral services. SRS data shows that that so far only three states—Kerala with an MMR of 66 per 100,000 live births, Tamil Nadu with an MMR of 90 and Maharashtra with an MMR of 87—have been able to achieve the millennium development goal. Andhra Pradesh is close to achieving the target with an MMR of 110. Going by the trend, most other states will not be able to achieve the target. India, as whole, is also lagging behind.⁴ Rajasthan state has ranks as one of the poor performing indicators on child and maternal health.

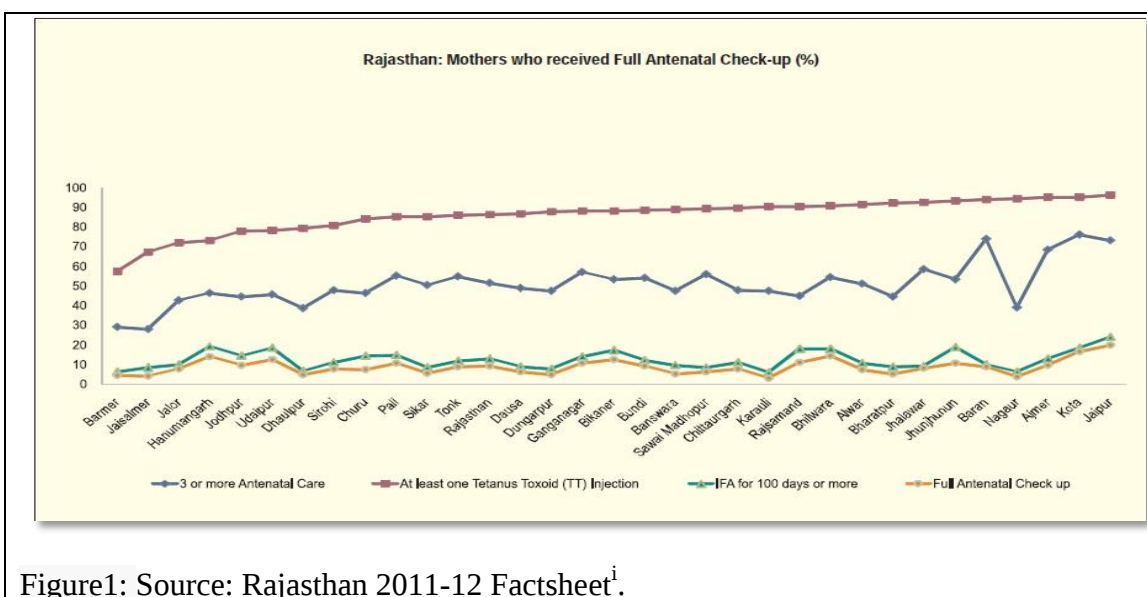


Figure1: Source: Rajasthan 2011-12 Factsheetⁱ.

ⁱAHS-RajasthanFactsheet_2011-12(Pg.102):

http://www.censusindia.gov.in/vital_statistics/AHSBulletins/AHS_Factsheets_2011_12/Rajasthan_Factsheet_2011-12.pdf

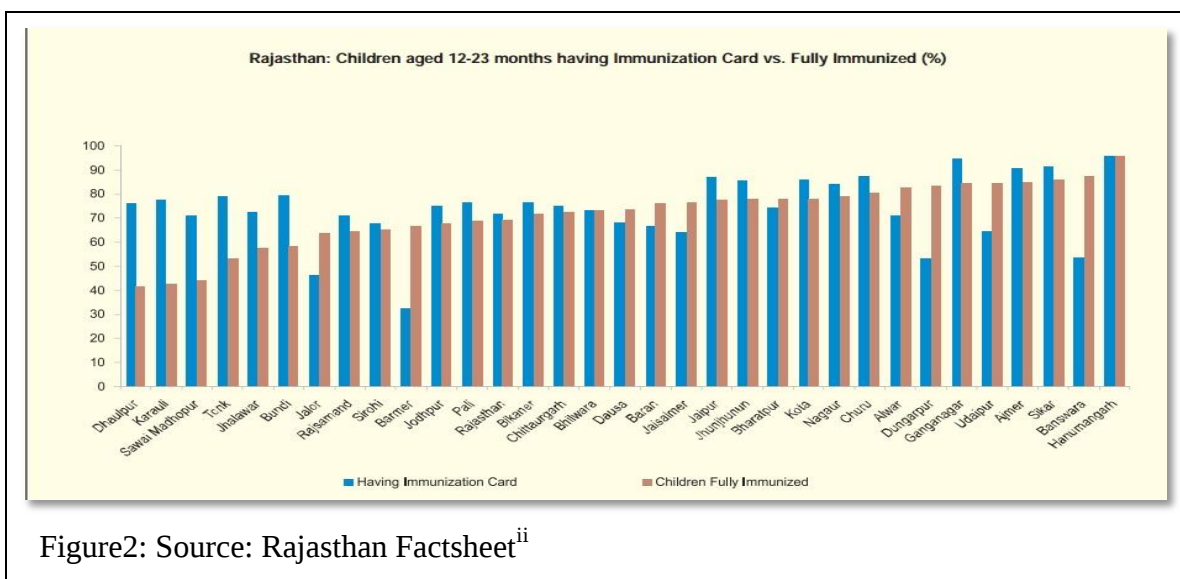


Figure2: Source: Rajasthan Factsheetⁱⁱ

Most maternal and child deaths in developing countries are preventable through adequate nutrition, proper health care, the presence of a skilled birth attendant during delivery and emergency obstetric care. To provide healthcare to the rural areas have always been a challenge. The dearth of doctors to deliver last mile care has existed for long. Community health workers are therefore the most peripheral point of contact who delivery some most essential services.

Advanced wireless technologies offer a revolutionary opportunity to strengthen the capacity of frontline health workers, expand coverage and improve the quality and timeliness of delivery of critical maternal and child health interventions such as antenatal services, birth preparedness planning, prevention of mother-to-child transmission of HIV, essential newborn care, immunization and community case management of childhood diseases.

2.2 Reasons for poor health performance

Supply side

- Budget as a constraint:

An unfortunate fact however, is that India spends very little on routine immunization. Only 2.1 percent of the national government's health budget is allocated to routine immunization a small amount given the country's large population and number of births. The additional cost

ⁱⁱ AHS-RajasthanFactsheet_2011-12(Pg.105):

http://www.censusindia.gov.in/vital_statistics/AHSBulletins/AHS_Factsheets_2011_12/Rajasthan_Factsheet_2011-12.pdf

per capita each year to reach 90 percent of Indian children with the six basic vaccines already included in the national immunization program diphtheria, tetanus, pertussis, tuberculosis, polio, and measles would be less than three rupees, or eight cents, in the poorest states and even less in the other states.⁵ Or equivalently, the vaccine cost per fully immunized child would be roughly eighty cents.

- Huge population to immunize:

The reason to understand why India has not been able to achieve set targets is complex where the huge population with relatively high growth rate is a barrier in itself. Approximately 27 million children are born in India each year being the largest birth cohort in the world but less than 44 percent receive a full schedule of vaccinations. In contrast, in Bangladesh, on the northeast border of India, 82 percent of children are fully immunized by age two. In adjacent Nepal, 80 percent of children are fully immunized by age one.⁶

- Lack of skilled human resources

Shortage of trained personnel to manage the program at both the national and state levels; WHO report on progress of human resources estimates that based on population need there is a shortage of 7.2 million healthcare workers and this is expected to rise to 12.9 million globally by 2035.⁷ In India the doctor and patient ratio is very low specially the rural areas where approximately 70 percent of India's 1.2 billion populations live. There were 1,52,326 rural SC's, 25,020 PHC's and 5363 CHC's in March 2014, compared with 1,45,272 SC's 22,370 PHC's and 4,045 CHC's.⁸ India has one government doctor for every 11,528 people and one nurse for every 483 people. This shortage of health providers in comparison to the health force is also unequally distributed where more than half of the global population live in rural areas are served with <38 percent of total nursing force and <25 percent of total desired physician⁹. The transfer of roles and tasks from a higher cadre to a lower cadre also known as task shifting has resulted in FHW's such as CHWs, auxiliaries and midwives being responsible for the provision of crucial health services like ante natal care, skilled birth attendance, breastfeeding practices, immunizations, malnutrition and communicable diseases such as tuberculosis, HIV/AIDs etc. especially in areas where the burden of the diseases is maximum the FHWs are the first point of contact to deliver such essential care. Studies have suggested that there are many challenges faced by these FHWs at the field level in deploying these activities; some of them include inappropriate means to collect data, poor patient

management due to lack of proper training, lack of communication and coordination between stakeholders. The FHW's spend substantial amount of time in recording data on the field, making monthly reports which later are manually entered by into database.

Demand Side

We cannot forget that one of the main challenges also lies on the demand side, the degree to which individuals do their part to be vaccinated. Poor literacy rates, which are consistently correlated with the likelihood that individuals will not complete vaccination schedules, pose a major barrier to expanding vaccination rates in rural areas.⁵ Better communication about the benefits of vaccines and the potential but typically harmless side effects, such as sore arms and low-grade fevers, could greatly boost confidence in vaccines and the immunization program.

- *Perceived Barriers*

The perceived barriers in availing healthcare facilities among women in rural areas are also one of the major challenges. The health belief model explains the various stages of obstacles that come in between availing health care services. The perceived susceptibility, severity and benefit action of the disease must outweigh the barrier to the action. Eg. The perceived risk of suffering from vaccine preventable diseases and the benefit of availing timely vaccination shots should outweigh the barriers like transportation, time constraints, and availability of health care staff and services.

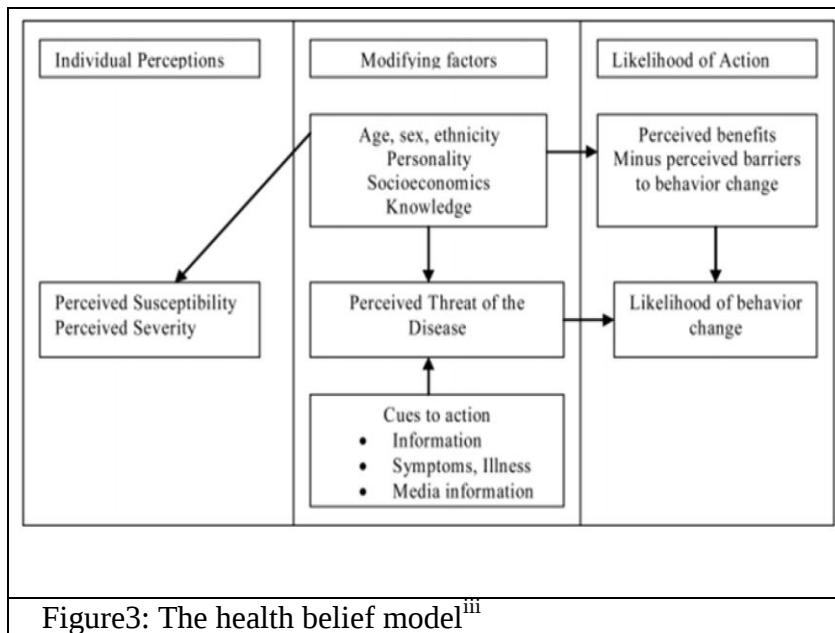


Figure3: The health belief modelⁱⁱⁱ

ⁱⁱⁱ The HBM was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services

2.3 The need for Innovations

In rural settings within developing countries, records are mostly maintained on paper. Very often there are multiple points of entry of the same data transferred into numerous paper forms, before it gets transcribed and aggregated on a centralized computer system at an urban location. This process of copying and compiling data on paper is both error-prone and time consuming, with long delays between initial data entry and data aggregation and digitization. High error rates in data are particularly problematic in the domain of healthcare where an errant entry may prevent lifesaving treatments from reaching patients. Furthermore, because of delays in aggregation, it may take weeks or months before decision makers view the data, resulting in corresponding delays in remedial actions such as providing emergency medical care.

Current solutions such as hard copies of records are easily lost, and there is no centralized location to retrieve this information. Moreover, in rural India, there is little incentive to get children immunized when it is at the price of losing valuable hours in the workday during which parents could otherwise be earning money for the family. These reasons compounded together ultimately mean that there are large hurdles to overcome in order to achieve effective and systematic immunization, and by extension, overall health in society.

A recent report suggests that by the end of 2014 there will be more mobile phone subscriptions than people in the world.¹⁰ Currently, total cellular connections are estimated at 7 billion and are expected to grow to approximately 8.7 billion by the end of 2018.¹¹ Mobile phone penetration rates stand at 96 percent globally (128 percent in developed countries and 89 percent in developing countries). India is an important part of this market, with one of the largest telecommunications networks in the world as of March 2010. In terms of subscribers, India had 807 million active mobile users as of August 2014.¹² The global mobile health market, including devices, software and services, is projected to grow eightfold, from \$5.1 billion in 2013 to \$41.8 billion in 2023.¹³ An evaluation showed that by using existing mobile networks and low-cost feature phones, the system improved the ability of health workers to deliver services and improve health outcomes. More women had skilled assistance with their delivery, more women delivered in health centers, and more women received antenatal care.

The system improved CHW capacity to respond in a timely manner and shows that in a context where internet coverage is low, mobile phones can be an effective way to improve health system performance. The internet and associated technologies have the potential to expand health services in developing countries, increase health system efficiency, and lead to better patient outcomes. E-health encompasses the full range of uses of information and communication technologies (ICTs)—from traditional administrative reporting systems to broader Health Management Information Systems (HMIS) to telemedicine, electronic medical records, clinical decision support, and patient portals—and a full range of technologies, including internet and mobile applications¹⁴

However, the success of the technology itself depends on a lot of factors. One of the most important is the role of the implementing institutions. Effective adoption of technology in organizations requires significant investments in skills and changes in working arrangements, and politicians and policy makers need to have the incentives to make these investments. Adopting new technologies also requires learning new skills and changing processes, which can add to the workload, at least initially. An unclear career rewards in patronage-based civil service systems, particularly given the difficulties in measuring the productivity of government agencies. Ministries and departments compete against one another for scarce budgetary resources, leading to a silo mentality and resistance to horizontal collaboration. Most important, the automation of business processes and improved monitoring reduce bureaucratic discretion and opportunities for petty corruption in patronage-based systems. The main explanation for the varying impact of digital technologies lies in the mismatch or gap between rapidly changing technology and slowly changing political and administrative institutions. Political institutions can be distinguished by whether they are clientelist or pro-poor, and bureaucracies can be classified by whether they are patronage-based or performance-oriented¹⁵

Curative and preventive health care are private and public goods, respectively, and so differ in the citizens' incentive to monitor, although vaccinating children is a preventive measure that parents are likely to have an incentive to monitor. But the highly discretionary nature of clinical services and the difficulties in measuring the outcomes of treatment render curative

health care more difficult to improve through the application of technology than preventive health campaigns that follow more relatively standardized procedures (such as control of communicable diseases). On the other hand developing countries have the fastest mobile growing rate and the Indian smartphone industry market growing with almost a third of all Indian mobile users expected to own a smartphone by 2017. The global smartphone penetration forecast shows that almost 50 percent of mobile users worldwide are projected to own a smart device by 2017. According to Forbes 2016 India has already crossed 1 billion mobile subscribers.

2.4 Pregnancy, child tracking and health services management system (PCTS)

It is an online web based application launched on 15 Sept. 2009. Its new version as per Government of India guidelines has been made functional since 1st July 2010. The objective of PCTS is case specific monitoring of every pregnant woman and her child to reduce maternal and infant mortality. The software helps in maintaining an online directory of health institutions, automatic data consolidation, and online trend analysis.

The Service Delivery Register (SDR) is filled by ANM. She uses this data to fill facility based forms 6, 7, 8 at SC PHC, CHC/DH level. They are uploaded in PCTS by the Information Assistant or Data Entry Operators. The line listing (area wise reporting for catchment population for ANC, delivery and immunization) continues for the entire month which constitutes the line listing of the figures mentioned in Form 6. The Form 6, 7, 8 are then checked at the block level by the Block Data Entry Operator, both manually and using Assan software to correct the discrepancies in the data. The discrepancies are made to be corrected at the respective facility. At the block level Form 9A is generated automatically. Similarly at the district level Form 9 is generated automatically which includes the information from all the blocks. Also, through Assan software the information is uploaded in Health Management Information System (HMIS) which is checked by the District Nodal Officer.

CHAPTER 3

METHODOLOGY

3.1 Background and Rationale

Khushi Baby is a novel mhealth solution that provides a mobile health application coupled with a wearble pendant. Khushi Baby completed the first round of randomized control trial in 96 immunization camps conducted by a local NGO Seva Mandir. The 96 camps covered 100 villages of five blocks of Udaipur: Badgaon, Girwa, Jhadol, Kherwara and Kotra. The trial was to test impact of khushi baby intervention on vaccination adherence rate, vaccine awareness, social acceptance and timeliness. A cluster randomization design was chosen for the study to avoid cross contamination. The 96 camps were randomized into three arms Control: NFC Sticker arm, Experiment 1: pendant arm and Experiment2: pendant + voice arm. The findings from the study suggest that the acceptability of the pendant was high and only two percent of the enrolled and lost or forgot the pendant while coming to the camp. The timeliness to adhere to the standard WHO recommended guidelines to complete immunization was higher in pendant camps as compared to pendant plus voice calls and control arms, however no significant difference was found on the adherence rate between pendant, pendant plus voice calls and sticker.

The next pilot will include 318 villages of Udaipur. The study will include the government immunization camps which has an entirely different protocol of data recording and reporting. The immediate step that need to be explored are challenges faced by the mobile app user i.e the Auxiliary nurse midwives and develop a mobile health solution that can reduce the burden of the ANMs.

3.2. Research questions

- What is the current process of MCHN day/ VHND?
- Who are the key stakeholders involved and what are their roles, responsibilities?
- What are the challenges faced by the auxiliary nurse midwives in conducting MCHN day?
- What are the views of the auxiliary nurse midwives on Khushi baby's mobile health prototype?

Aim

The study aims at facilitating ANMs by simplifying the MIS using m-health solutions.

The objectives

1. To study the process of MCHN Day
2. To understand key stakeholders involved in conducting MCHN day.
3. To study the challenges faced by ANMs in conducting MCHN day, especially maintaining records and preparing report.
4. To find out feasibility of an alternative m-health solution that is already being worked out for MCH in parts of Rajasthan.

3.3. Procedure

Study Type

This study is an exploratory study to test out the feasibility of alternative m health solution against the currently used recording and reporting MCHN day. In order to gather preliminary information that would help to define problems faced in conducting MCHN day camp from the perspective of the user i.e. the auxiliary nurse midwives (ANM) and to design and test a prototype of a mobile health application as an alternate solution that accounts for user preferences to overcome those challenges, exploration is required.

Study Area: The study was conducted in Udaipur district of Rajasthan, three blocks namely Badgaon, Girwa and Rishabhdev were covered during the study. The district was selected as the Khushi Baby's m-health project on child immunization is ongoing.

A total of seven MCHN days were observed in Badgaon block during March – April 2016. During the two months duration 8 such MCHN day's could be visited but one of the Thursday (the day when MCHN days are conducted) was holiday and the session was shifted to some other day.

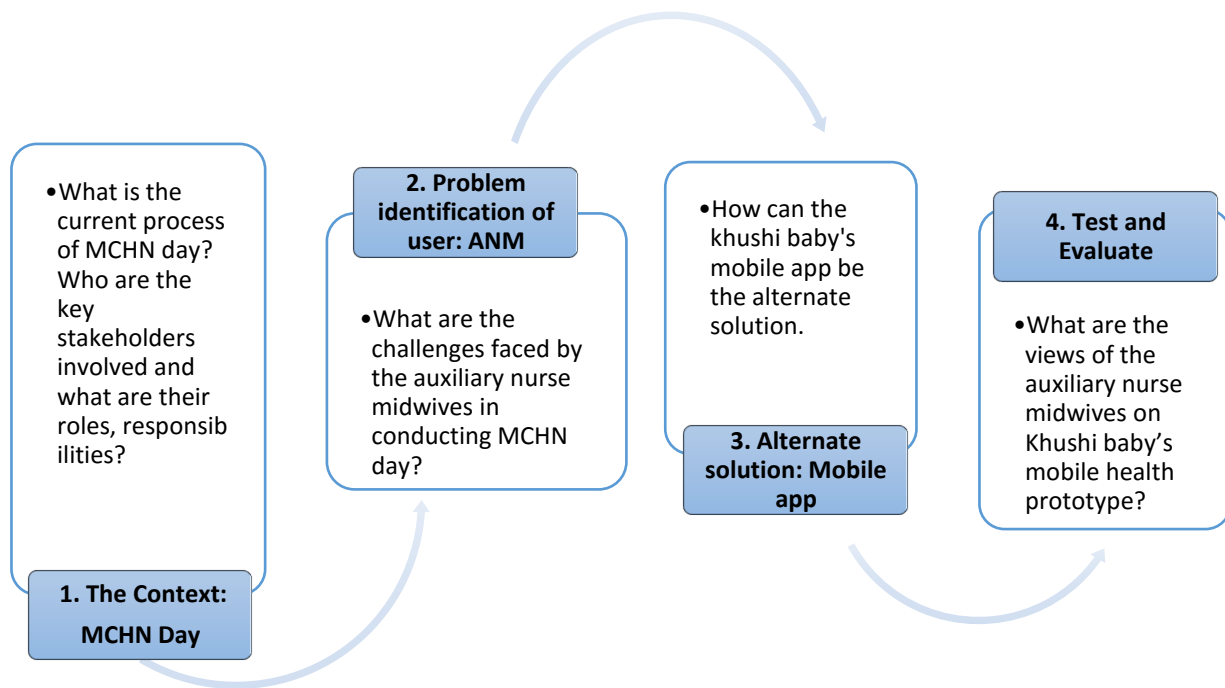
3.3. Data Collection

A total of 30 ANMs were interviewed. 13 of which were from badgaon block, 15 from Girwa and 2 were from CHC Rishabhdev.

Table 1: A snapshot is presented on the key stakeholders, their role in MCHN day, method of data collection and the tool.

Participant (n)	Purpose	Methods of data collection	Data collection Tool
ANM (30)	To identify the challenges faced by ANMs in recording and reporting data of mother and children during MCHN day. To conduct usability test of a low fidelity mobile app prototype and get their feedback.	In depth Interview	Semi-structured interview schedule Checklist of mobile application steps
At the Block level:			
Block Manager (1)	To know the data needs for analysis.	In depth Interview	In-depth interview guide/ checklist
LHV (1)	To understand the role in responsibility for MCHN day.	In depth Interview	In-depth interview guide/ checklist
Data operator (1)	To understand the role in responsibility for MCHN day.	In depth Interview	In-depth interview guide/ checklist

Figure 4: A representation of the steps followed to conduct the study:



3.4. Procedure:

For Objective No. 1-3

1. Web based search for relevant literature and documents was conducted
2. Permission was taken from the District program manager to visit the MCHN day session sites.
3. Badgaon block office was visited and in depth interview with the block manager, data operator and LHV was taken to understand their specific roles and responsibilities.
4. The list of MCHN day session sites was taken from the block manager.
5. Verbal consent was taken from all the participants before conducting any interview
6. A semi structured questionnaire was prepared to identify the challenges faced by the ANMs during MCHN day camps.
7. 7 MCHN Day sites and 6 Sub centres of badgaon block were visited.
8. 3 ANMs from CHC Rishabhdev were interviewed.
9. 12 ANMs from monthly meeting that was held in Kurabad CHC of Girwa block were interviewed.

10. The RCH register which the ANM uses for recording mother and child information was downloaded online and the variables were identified.

11. All data collected through the questionnaire, notes was analyzed.

For Objective No. 4:

12. Mobile application screens were prepared in MS PowerPoint with the collected information

13. Print out of the screens was taken to make a paper prototype of the mobile application.

14. The prototype of the app was tested with 10 users.

15. The users were divided into two age groups i.e. 25-35 yrs and >35 yrs.

16. The user's ability to understand the mobile app was tested using a checklist. The checklist had listed different steps of the mobile application.

17. Feedback from the users was noted.

18. Study shared with stakeholders

CHAPTER 4

4.1. Results

The findings are divided into four major steps. Starting from understanding the context of the MCHN day, identifying the key players, their roles and responsibilities. The next was to identify the problems/challenges faced by the ANMs during MCHN Day; this step was further divided into 5 problem areas of the ANMs. A paper prototype of the alternate solution is the next finding and the last finding is of the user testing feedbacks.

1. The context: MCHN Day

Maternal child health nutrition day is a government of India initiative and is the most significant platform for providing essential care to maternal and child health care. Providing the first point of contact for primary health care community and it works as a common platform for convergence amongst service providers of health, ICDS and community. There is expected to be one MCHN day every month in a village of 1000 population. One Sub centre may have 4-5 such villages therefore every Thursday's of the week is allotted as MCHN day for a particular village. The engagement and mobilization of the community is taken care by the ASHA worker of every village. One day prior to the session, social mobilizer should be requested to conduct house-to-house canvassing and community line-listing to identify all eligible children and pregnant women. The MCHN day is conducted mostly in aanganwadi centres that is managed by an aanganwadi worker or in schools. If a village does not have an AWC or school some other site is identified to conduct the MCHN day. Cold chain handler at the PHC will be vaccine- carrier as per the requirements specified in the PHC plan, and label each vaccine- carrier. ANMs provide the antenatal care, child immunization services, and family planning counseling services to the people. All the details of the people is recorded in a Reproductive child health register (RCH) which is a huge register that has 3 sections each for eligible couple, Pregnant woman and child care. One RCH is exclusive for one village and is meant to be used for a period of 2 years.

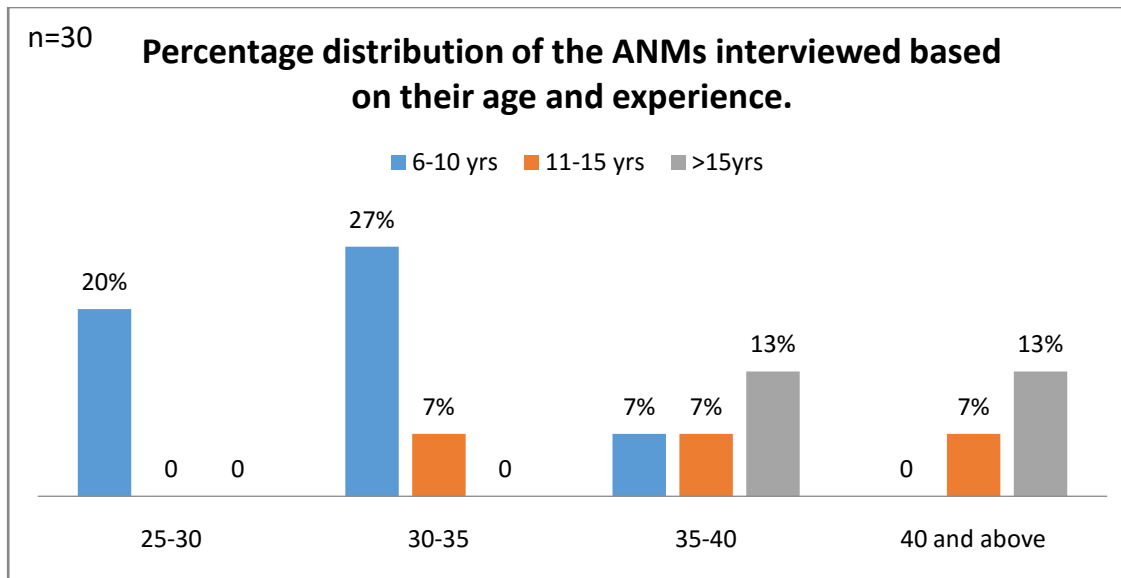
Table 2: Identification of the key players involved their roles and responsibilities and Gaps identified

Key players	Roles, responsibility and gaps
Aanganwadi Karyakarta and Aanganwadi	First one arrives to open the AWC and set up the camp. Mobilizes the community. Provides nutritious food packets (Poshak) to the beneficiaries. Keeps account of the packets provided. Takes

Sahyogini	signature/Thumbprint on the register where she maintains her accounts. Gaps: Some AWWs are not from the village and do not engage much with the community. Sometimes they do not maintain proper accounts of the food packets which may lead to stock outs.
ASHA Worker	Mobilizes the community people of her coverage area. Reminds the PW and mothers due to visit that day. Counsels on family planning, maternal health and breastfeeding habits. Identify and refer high risk patients to hospital or MTC. Gaps: ASHA has to travel long distances on foot to mobilize the people. Sometimes she may be new to the village and would not be aware of her coverage area. Forgets to remind mothers to bring the Mamta cards. Cultural barrier can also be faced by ASHAs of lower caste which may lead to incomplete survey. Does not remind about the next due date.
Alternate vaccine delivery	Delivers and collects vaccination box before and after the session. Gaps: Sometimes may be late to reach the vaccination site, which may lead to long waiting time of the patient.
Auxiliary nurse Midwife	Provides health services: Ensure the vaccines and medicines are available. Provides Antenatal care and child immunization care at MCHN Day. Keeps account of the services given. Maintains records and submits monthly, quarterly, annual reports throughout the year. Counsels on family planning, maternal health and breastfeeding habits. Identify and refer high risk patients. Gaps: Not always reaches on time leads to increased patient waiting time. Recording data takes more time than delivering the services. It increases more when the patient forgets to bring their mamta cards. Does not know how steps to identify a high risk patient and therefore cannot refer at the right time. ANM leaves early and asks ASHA to prepare the due list. Does not remind about the next due date.
Beneficiary	Receives health services and food packets. Gaps: Has to wait long hours.
Village health society/Committee	One representative from the village visits the campsite every month and ensures availability of clean drinking water, sanitation. Gaps: The representative is not regular in coming to the camp. The communication between the anms, ASHA, AWW and the representative is very weak.
Supervisor LHV/MO	Visit the session with a checklist to monitor the proceedings of the MCHN Day. Gaps: Monitoring does not take place regularly.

2. Problem identification of the user: ANM

The ANMs were asked about the process of MCHN day and what challenges they face in conducting it. Table shows the respondents age and years of experience.

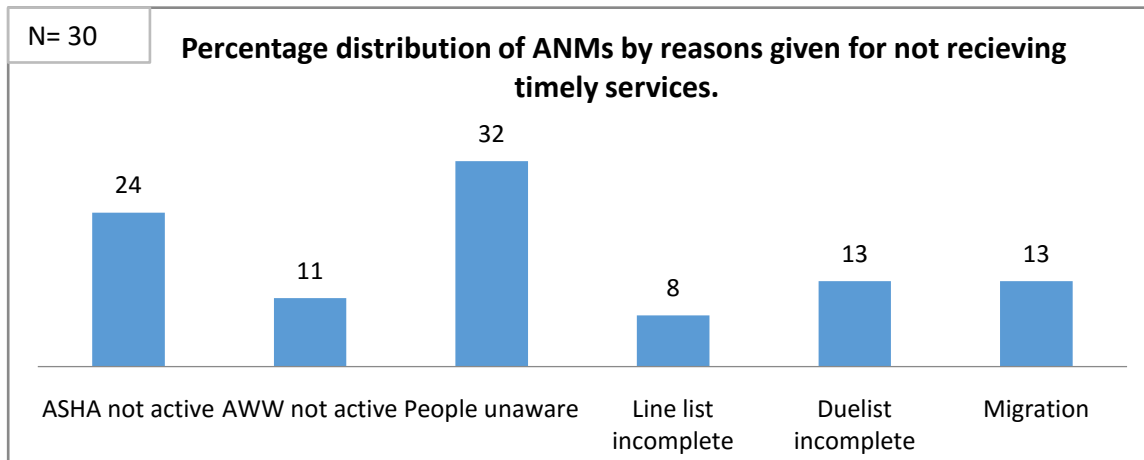


The respondent is the ANMs whose problem we are trying to identify. Based on the field visits, responses and data collected the overall problem identification was organized into 5 key areas.

i). Identification and registration of eligible beneficiaries

It is expected that in a population of 1000, in one year there are expected to be 100 eligible couple, 40 pregnant women and 30 children who will come to the MCHN day site however the numbers patient's that receive timely vaccination is always less than the expected. It was found that ANMs contribution to identify patient is the least and she is entirely dependent only on the work done by ASHA's and Aaganwadi workers to bring mothers and children to the camp.

When asked for possible reasons as to why the beneficiaries do not receive timely services their responses were:



Lack of awareness among people regarding the importance of immunization was also one big reason to high dropout. It was observed that even during the MCHN day the mothers were not reminded about the next visit. During interaction with the beneficiaries and the other key stakeholders it was found that it is largely the unawareness among the people about the services provided on the day, the timing and place where is it held that leads to low attendance and drop outs. ASHA worker and AWW do fully cover the coverage areas and do not provide proper education and counseling to the community.

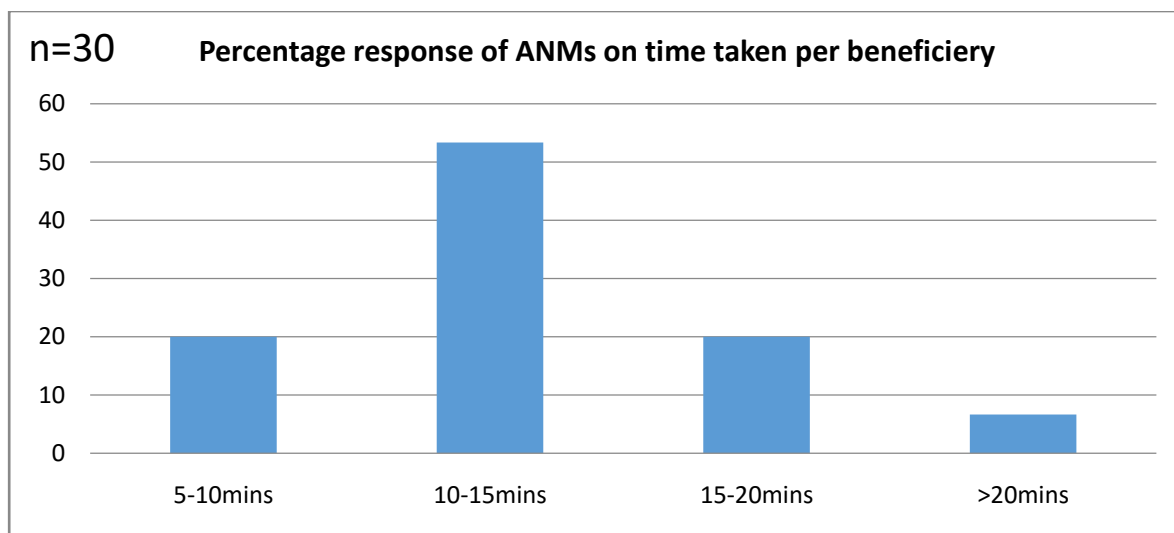
When asked for the reasons for delay in reporting information the ANMs said that they complete the records on time but complained that even though they provide regular information and reports the data does not get uploaded in the PCTS and there are days when the PCTS ID for the mother does not get generated on time.

On the visit to a block office it was found that the data operator was not present for past few months and that the data was entered by ANMs at the block office or at home using their laptops. The particular window period i.e from 5th to 10th of every month to enter data in the system leads to last moment entry of huge amounts of data that affects the quality of the data entered. Other reasons included that PHC level did not have a data operator and most of the system were in non functional condition.

ii). At Immunization session site

The ANM goes to pick up her equipments, registers from the respective facility prior to coming to her immunization site. She reaches the camp at 10am on every Thursdays and before she arrives the vaccination box is delivered at the site by the AVD incharge. Most of the times the required equipments like Hub cutter, BP instrument, Hb meter are kept at the aaganwadi centres where the camp is held, only in villages that do not have the capacity for proper storage will have the ANM to carry all the equipments from the facility (PHC/CHC/SC). One of the pain points for the ANMs was to carry the heavy register and equipments to remote villages. The registers are huge and heavy to carry and when they have two camps the same day they have to carry two different registers that doubles their load.

During the session pregnant women and mothers with their children arrive at the camp. The first time visitors are registered and their personal details, bank account, aadhaar details are taken or are rewritten from the line list of eligible couple details. Many times mothers would forget to bring the mamta card or would lose it. In such situation the ANMs find a bit difficulty in searching their names and match the vaccine due with the card. Fifty two percent of the ANMs interviewed said that the average time taken to deliver service to each patient is around 10-15 mins and out of which they said that it hardly takes less than 5mins to deliver the service and more than half of the time is taken to enter records if different places. This consumes a lot of her time. Approximately ninety three percent of them felt that they find themselves doing multiple entry of the same patient at different columns in SEC-II of the RCH register.



Also, while attending ANMs monthly meeting at CHC Kurabad of Girwa block it was seen that many ANMs do not provide complete services that is supposed to be given at the MCHN Day like the abdomen and fundal examination, urine test, Hb test etc. It was found that it was due to lack of proper training, guidance and lack of equipments like bed, Hb meter etc at the site.

A due list is made after every MCHN day that pre determines the number of mother or child due for the next service and vaccines that will be required. A copy of the due list is also given to the ASHA to remind the mothers to come for the next visit. Out of the 30 ANMs interviewed almost all of them felt that the due list is important for them to plan for the session. However, it was found that some ANMs leave early and leave the responsibility on ASHAs to prepare the due list.

iii). Resource Mobilization

The vaccines are packed by the LHV's from the PHC/CHC and carried to the field by AVD in-charge. The demand list is based on the due list provided by the ANM.

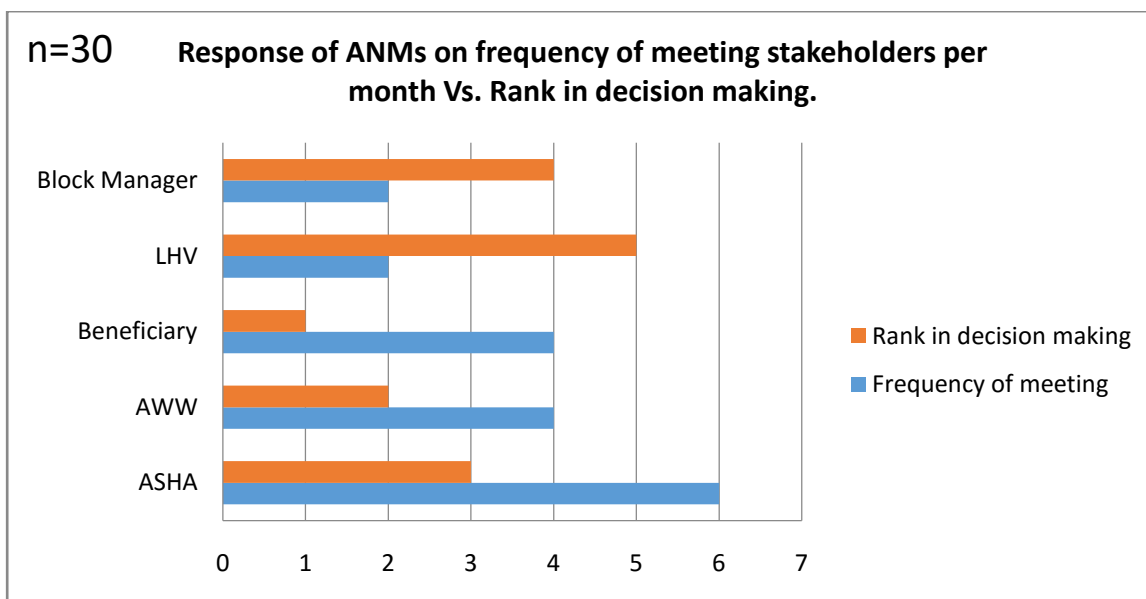
A tracking bag is distributed at every sub centre level where copy of the mamta card can be kept in this bag according to the due date of the vaccines. It was found that out of the 30 ANMs 4 of them did not have tracking bag at the facility or said that it was in a bad shape. Almost two third of the respondent said that they do not find the tracking bag very useful

because they already have the due lists and other records that help them identify the patient due for the next service.

The Rajasthan govt. launched a scheme of swathya seva sandesh which are SMS health alerts sent to Health workers and beneficiaries. The health workers receive the delivery and immunization schedule every month while the beneficiaries are sent reminder messages via SMS. 18 out of the 30 respondent said that they receive regular sms from the government while 10 out of the 18 said that the list did not always match the due list that they made.

iv). Communication

We already know the key stakeholders involved in conducting the MCHN Day and their roles and responsibilities (). It is important also to know the frequency of interaction among them to and whom does the ANM look up for decision making. It was found that the frequency of meeting ASHA is the maximum while ANM does not consider them the highest rank for decision making. While on the other hand the frequency of meeting LHV is the least while she considers her to be the most superior for decision making. The influential role of the LHV, block manager over the ANM for decision and support is greater than the ones she meets more frequently i.e the AWW, ASHA.



v). Training and Education

Training and educating the ANMs play an important role to make sure that they perform the vitals effectively. The entire respondent interviewed said that training helps them understand a lot of things but however some of them complained that the training provided is not sufficient and they tend to forget many things. They do not like the way the training is conducted. For e.g. one of the respondent said that the training provided is just one-two day and then they expect from us to do it independently from there onwards. They do not know whom to approach when they cannot understand things since the higher officials are not available most of the time. It was seen that some of the important services like fundal abdomen checkup, identification of high risk pregnant and children were not done since most of the ANMs could not identify them or do not know the immediate steps. Some of them also said that as soon as one training is over and they start implementing it, training comes in between for some other program.

Findings from the Block level

The purpose of meeting the block manager was to identify the data needs at the block level. The block manager provided different formats of the reports that are needed from the MCHN Day and RCH register. He mentioned that monthly reports are submitted by the ANMs in the block office and the data is entered in the portal. The data operator was a newly recruited at the block and did not have any prior experience of data entry related to RCH register. It was found that the position had been vacant for past few months and the data had been entered by the ANMs who are computer literate. The block manager also helped to identify the problems faced using other mobile apps like the E-jan swasthya app which was given to all the 34 sub centre ANMs of badgaon block but however was rolled back in the month of April. The reasons for rolling back of the app were that there was a missing link between the eligible couple and Antenatal checkups. There was no proper training given to the ANMs to use the app.

3. Alternate solution: Mobile application

Based on the findings from the in-depth interviews the problems encountered by the ANM, the data needs of the block manager an attempt was made to make a prototype of the mobile application that can be an alternate solution to record the data during MCHN day for pregnant mothers and children. The detailed variables incorporated in the application are presented in the annexure. However a brief comparison of the features between the status quo and Khushi Baby system is mentioned in Table 3. (The app has incorporated only Section II and Section III of the RCH register).

Table 3: A comparison of status quo Vs. mobile app prototype feature tested and problem addressed.			
Steps	Status quo	Khushi Baby Mobile App	Problem Addressed
Pregnant woman registration	Repeatedly filled at 5 different places.	One time input	Avoiding multiple entries.
ANC details	42 variables	30 variables	Automated delivery date calculated.
Delivery Outcome	14 Variables	12 Variables	Avoiding multiple entries.
Post natal care	28 Variables	25 Variables	Avoiding multiple entries.
Child Registration	12 Variables	3 Variables	Auto generated from mothers record.
Child Immunization	21 Variables	18 Variables	Avoiding multiple entries.

4. Test and Evaluation

The feasibility study of testing the mobile health application was done using a paper prototype. The screenshots of the mobile app prepared using the Microsoft power point was printed in the size of the user interface i.e. the google nexus tablet screen.

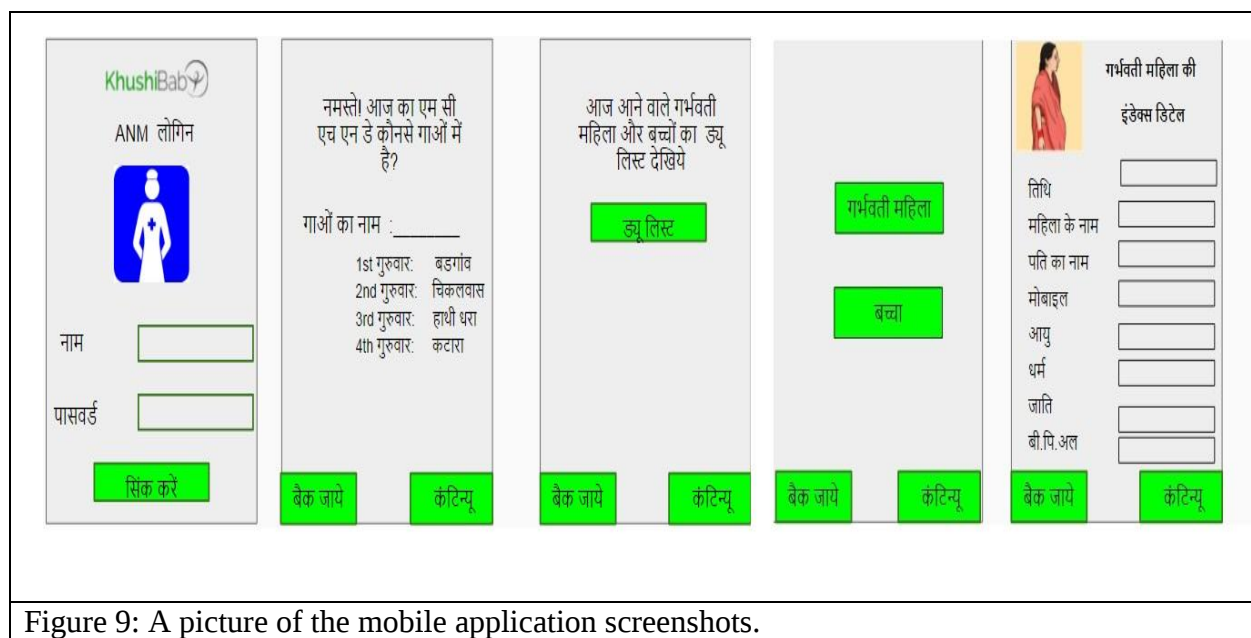


Figure 9: A picture of the mobile application screenshots.

This prototype was arranged in the order that was identified from the in depth study and tested among 10 ANMs who were present at the monthly meeting of Girwa block.. The ANMs were divided into two age groups:

Table 4: Distribution of the ANM age groups who were user tested.		
	Age	Remarks
Group 1	25-35yrs	3 out of 5 have used android phones in the past.
Group 2	>35 yrs	2 out of 5 had used android phones in the past.



Figure 10: Picture showing the user trying to use the mobile prototype.

Initial information about the context of the mobile application was given to all the ANMs. Then the prototype was placed in front of them and asked to read and understand the screens. The ability to understand and go to the next step by clicking on the appropriate button was observed. A checklist that was prepared enlisting all the steps was used. The steps where they got stuck, took more time and could not derive any meaning were noted. Feedback on over all experience was taken.

All the users were able to complete the process of login, checklist, due list, new registration of pregnant woman and child. However the user of group 1 was able to understand the prototype faster and completed each step in lesser time as compared to users of group 2. Individual user feedbacks were taken and overall satisfaction level of the user was very good.

Discussions

The purpose of the study was to understand the workflow of the ANMs in conducting MCHN day and identify the challenges faced in recording and reporting the data collected by them and learn how an alternate solution can be generated. ANMs are overburdened with multiple responsibilities and administrative data. Many tools recorded by them have duplicate data entries; further the data is manually entered in the portal by a data operator making the procedure a long and cumbersome process. The process of the MCHN day was observed and the key stakeholders were identified. The roles and responsibilities were studied and finally workflow map was drawn. The flow helped in understanding the gaps in the process. It was found that there is increase in beneficiaries waiting time when mothers forget to bring their mamta cards. ASHA workers along with the AWW mobilize the community but still not all the eligible beneficiaries turn up to take the services. ANMs think that the reason to this unawareness among the community people and lack of motivation from ASHA to mobilize them. An in depth interview with the ANMs helped to identify the 5 key problem areas that they face when they conduct MCHN day. A due list is the key source of information to identify beneficiaries. ANMs enter the details of the beneficiaries multiple times and spend more than half of the time in data documentation. Non availability of equipments at the facility due to poor resource management lead to incomplete services at the site one major pain point of the ANMs were that they were not able to provide some of the services due to insufficient training. A mobile app was developed keeping in mind to reduce data duplication and avoiding multiple entries while recording and reporting. A prototype was then tested among 10 users of two age groups. Users with prior experience of android phones were able to complete the steps more easily than the user with no such experience. During usability testing the users were very happy and were willing to adapt to such a system. They could easily understand the functions and could relate to the current method of record keeping. . The entire process of creating a user friendly mobile application is a combined effort of field researchers and tech support. Field researches provide the insights from the field and such qualitative research helps in understanding the user better

CHAPTER 5

Supplementary

ANNEXURE I

A table showing the mobile app feature with corresponding data elements and data type.

Feature/Step	Data element/Variables	Data Type
ANM Login	ANM name	Textual input
	Password	Numerical Input
Camp selection	Select camp location	Multiple choice
Due list	Check Due list	
Check list	Check list	
ANM Check-in	Check- In picture	Image Time
Registration date	Date of Registration for Mother or Date of Birth for Child	Date
Personal Details	Name	
	Caste	MC - 4 options
	Husband Name	Textual input
	AADHAR Number	Numerical Input
	MCTS ID Number Mother	Numerical Input
	MCTS ID Number Child	Numerical Input
	Village	Multiple Choice
	Mobile Number	Numerical Input
	JSY Beneficiary	Multiple Choice
Past History	LMP	Date input
	Number of Children	Numerical Input
	Diabetes	
	Hypertension	Multiple Choice
	Heart Disesae	Multiple Choice
	Epileptic (Convulsions)	Multiple Choice
	STI / RTI	Multiple Choice
	HIV+	Multiple Choice
	HepB	Multiple Choice
	Asthma	Multiple Choice

	APH	Multiple Choice
	Pregnancy Induced Hypertension (PIH)	Multiple Choice
	Repeated Abortion	Multiple Choice
	Stillbirth	Multiple Choice
	Congenital Anomaly	Multiple Choice
	C-Section	Multiple Choice
	Blood Transfusion	Multiple Choice
	Twins	Multiple Choice
	Obstructed Labour	Multiple Choice
	PPH	Multiple Choice
	Hemophilia	Multiple Choice
ANC Test	First ANC Date	Date input
	Days from ANC 1 to 2	Numerical Input
	Days from ANC 2 to 3	Numerical Input
	Days from ANC 3 to 4	Numerical Input
	WT 1	Numerical Input
	WT 2	Numerical Input
	WT 3	Numerical Input
	WT 4	Numerical Input
	BP 1S	Numerical Input
	BP 1D	Numerical Input
	BP 2S	Numerical Input
	BP 2D	Numerical Input
	BP 3S	Numerical Input
	BP 3D	Numerical Input
	BP 4S	Numerical Input
	BP 4D	Numerical Input
	Position 1	Binary Input
	Position 2	Binary Input
	Position 3	Binary Input
	Position 4	Binary Input
	Movement 1	Multiple Choice
	Movement 2	Multiple Choice
	Movement 3	Multiple Choice
	Movement 4	Multiple Choice
	Fetal Heart Rate 1	Numerical Input

	Fetal Heart Rate 2	Numerical Input
	Fetal Heart Rate 3	Numerical Input
	Fetal Heart Rate 4	Numerical Input
	UT 1A	Multiple Choice
	UT 1S	Multiple Choice
	UT 2A	Multiple Choice
	UT 2S	Multiple Choice
	UT 3A	Multiple Choice
	UT 3S	Multiple Choice
	UT 4A	Multiple Choice
	UT 4S	Multiple Choice
	HB 1	Numerical Input
	HB 1	Numerical Input
	HB 3	Numerical Input
	HB 4	Numerical Input
	TT1 Date	Vaccine – Date
	Given/Denial Reason Code	Vaccine - Given/Denial
	TT2 Date	Vaccine – Date
	Given/Denial Reason Code	Vaccine - Given/Denial
	IFA Date	Medication – Date
	Given Dose / Denial Code	Medication - Given/Denial
	IFA Date	Medication – Date
	Given Dose / Denial Code	Medication - Given/Denial
PNC	PNC 1 Date	Date input
	Days to PNC 2	Numerical input
	Days to PNC 3	Numerical input
Complications		
	PPH	Yes (with Date)/No
	Fever	Yes (with Date)/No
	Sepsis	Yes (with Date)/No
	Severe Ab Pain	Yes (with Date)/No
	Severe Headache	Yes (with Date)/No
	Difficulty Breathing	Yes (with Date)/No
	Chills	Yes (with Date)/No
	Eclampsia	Yes (with Date)/No

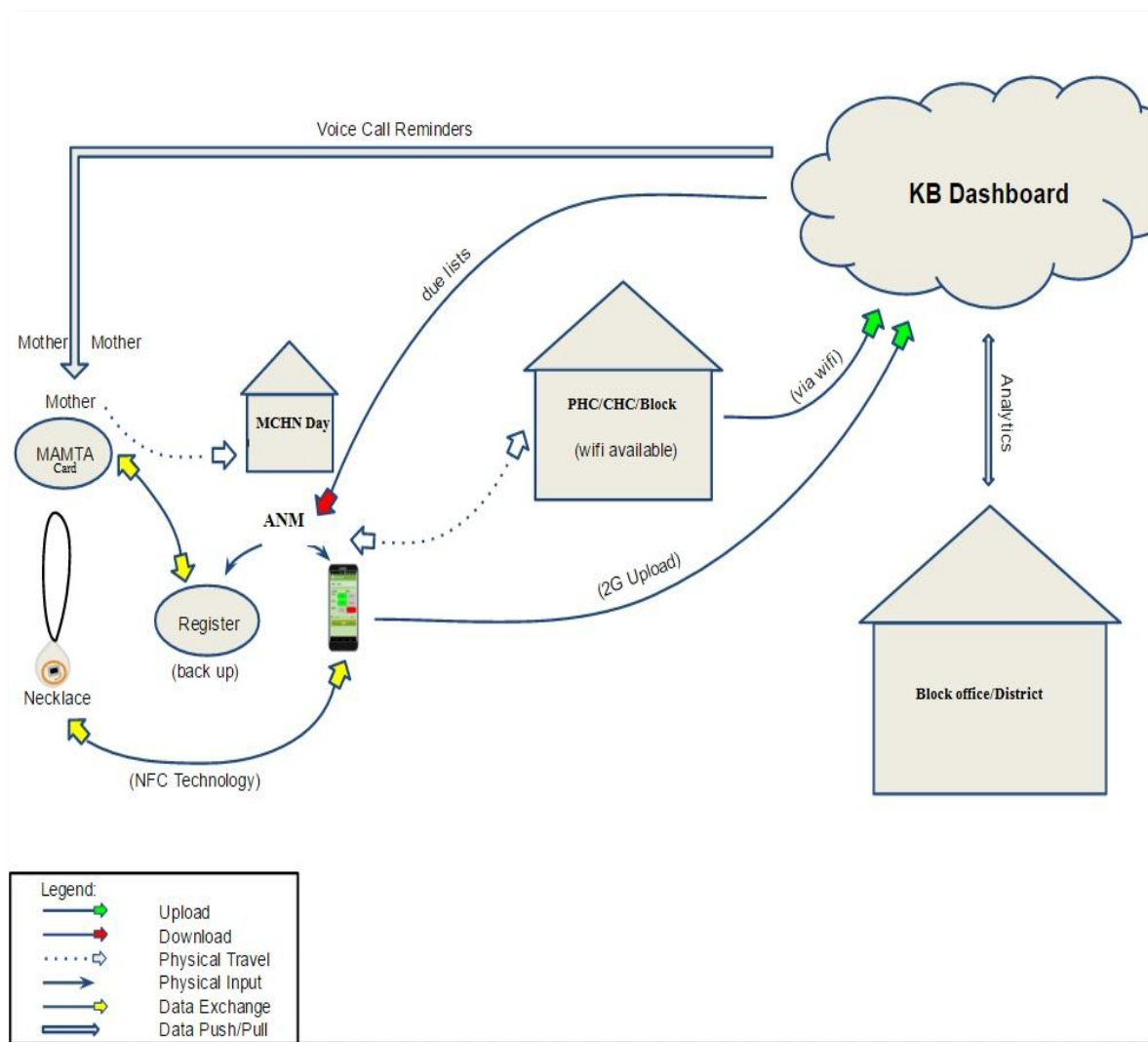
	Fever/Chills	Yes (with Date)/No
	Convulsions	Yes (with Date)/No
	Obs Labour	Yes (with Date)/No
	Prolonged Labour	Yes (with Date)/No
	Abortion	Yes (with Date)/No
	Twins	Yes (with Date)/No
High Risk	High BP (Sys >140 and/or Dias >90)	Yes (with Date)/No
	Convulsions	Yes (with Date)/No
	Vaginal Bleeding	Yes (with Date)/No
	Foul Smelling Discharge	Yes (with Date)/No
	Severe Anemia (Hb Level < 7 GMS%)	Yes (with Date)/No
	Diabetes	Yes (with Date)/No
New Child registration		
	Child Birth Order	
	MCTS ID of Child	Auto-generated
	Date of Registration	Date type
	Name of Child	Textual input
	Sex of Child	Multiple Choice
	Mother	Textual input
	Father	Textual input
	Mobile Number	Numerical input
	MCTS ID of Mother	Auto-completed on scan
	Address	Textual input
	Weight at birth (kg)	Numerical input
	Place of Birth	Multiple Choice
	Religion	Multiple Choice
	Caste	Auto-complete from Mother
	Exclusive breastfeeding given up to 6 months (Yes/No)	Yes/No/Dont_Know
	Complementary Feeding initiated after 6 months (Yes/No)	Yes/No/Dont_Know
	If answer to 109A is no, which month complementary feeding was initiated?	Numerical Input
	Date of visit	Date
	Weight of the Child (Kg)	Numerical Input

	Diarrhea in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, ORS given (Yes/No)	Yes/No/Dont_Know
	Pneumonia (fever and fast breathing/chest-in drawing) in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, Antibiotics Given (Yes/No/Dont_Know)	Yes/No/Dont_Know
	Date of visit	Date
	Weight of the Child (Kg)	Numerical Input
	Diarrhea in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, ORS given (Yes/No)	Yes/No/Dont_Know
	Pneumonia (fever and fast breathing/chest-in drawing) in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, Antibiotics Given (Yes/No/Dont_Know)	Yes/No/Dont_Know
	OPV Birth	Vaccine - Date - Given/Denied
	Denail Reason	
	HepB Birth	Vaccine - Date - Given/Denied
	BCG	Vaccine - Date - Given/Denied
	OPV 1	Vaccine - Date - Given/Denied
	Penta 1	Vaccine - Date - Given/Denied
	OPV 2	Vaccine - Date - Given/Denied
	Penta 2	Vaccine - Date - Given/Denied
	OPV 3	Vaccine - Date - Given/Denied
	Penta 3	Vaccine - Date - Given/Denied
	Measles	Vaccine - Date - Given/Denied
	DTP Booster	Vaccine - Date - Given/Denied

	JE 1	Vaccine - Date - Given/Denied
	JE 2	Vaccine - Date - Given/Denied
	VitA 1	Vaccine - Date - Given/Denied
	VitA 2	Vaccine - Date - Given/Denied

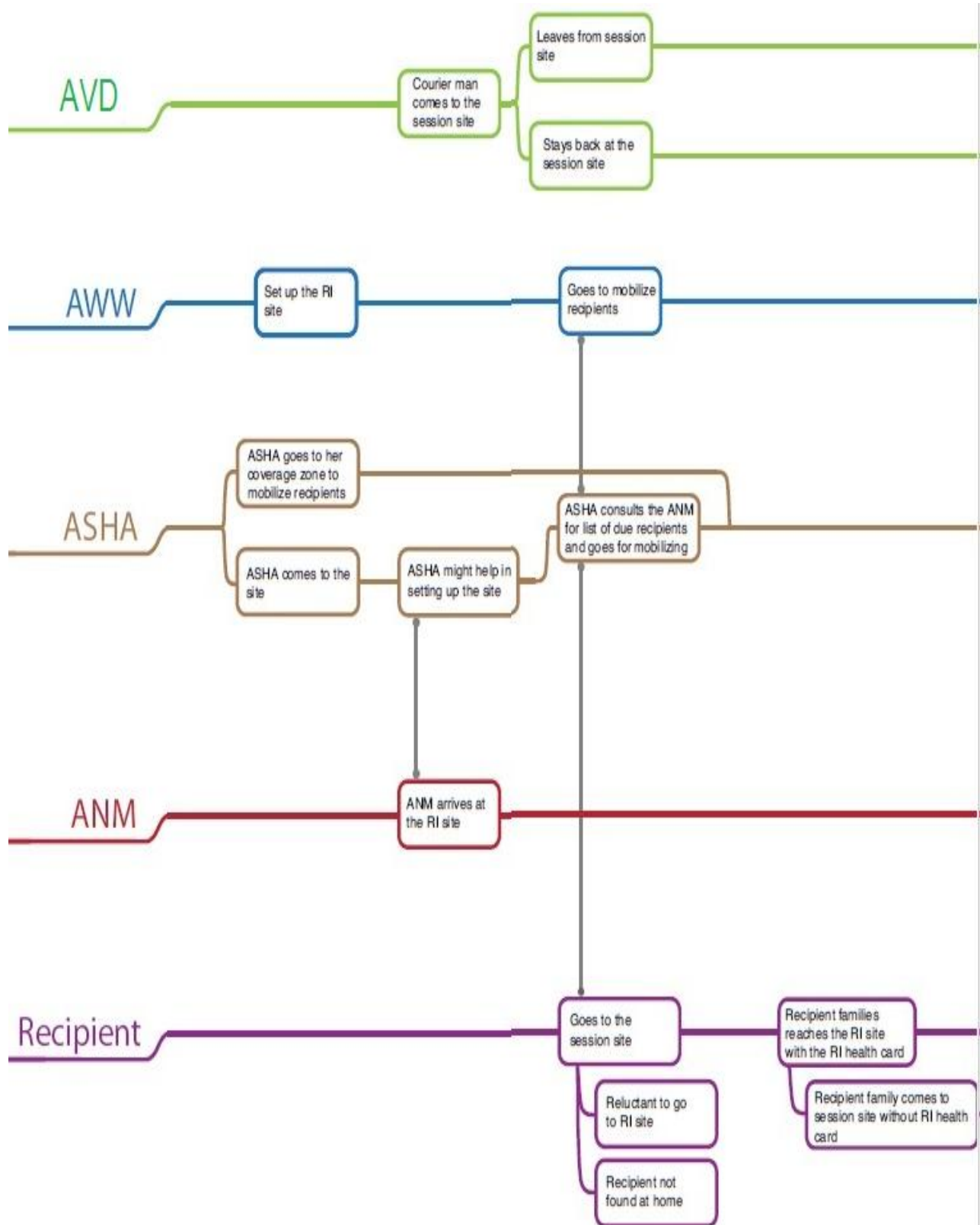
ANNEXURE II

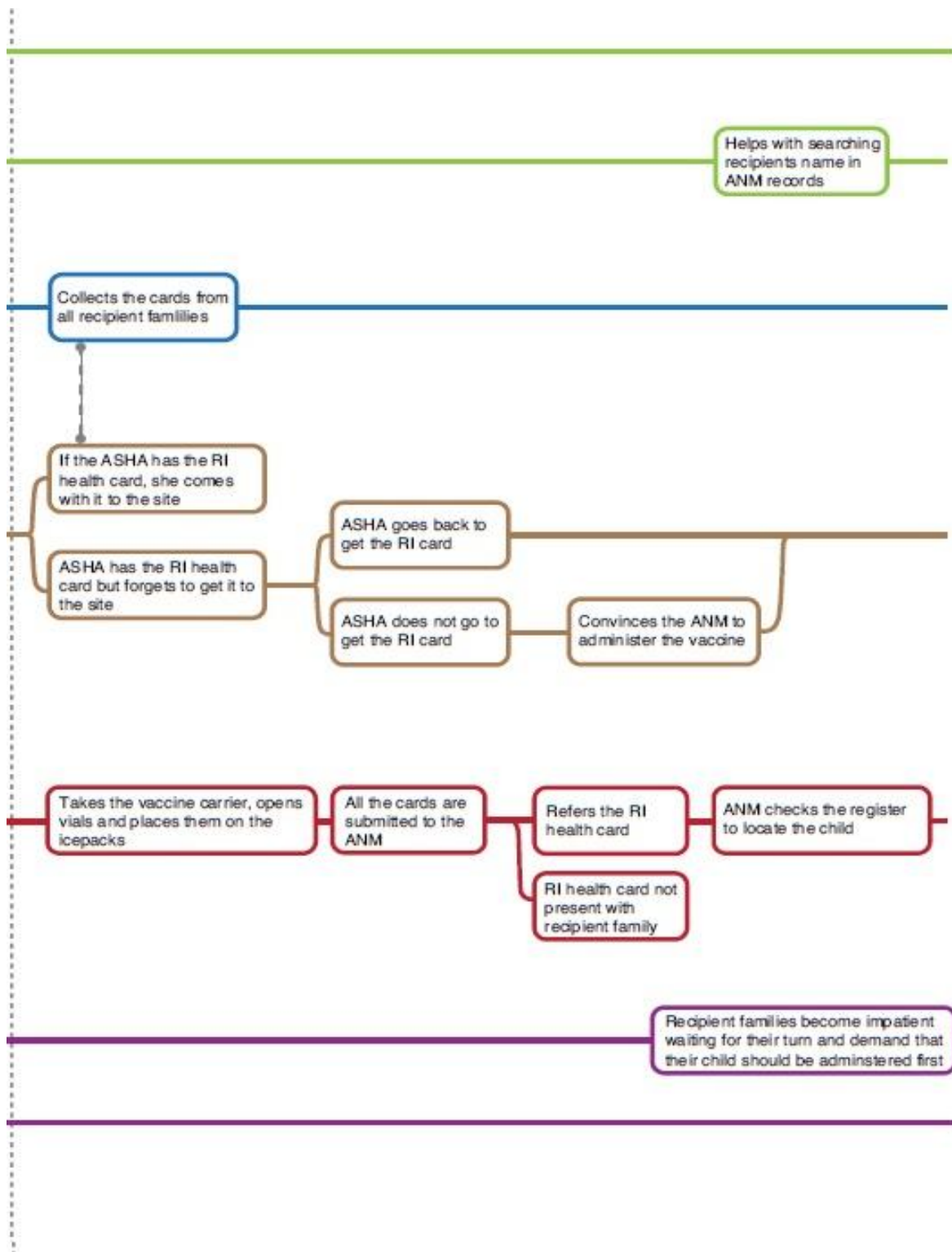
A picture showing the process map of Khushi Baby's intervention.

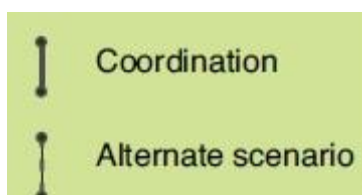
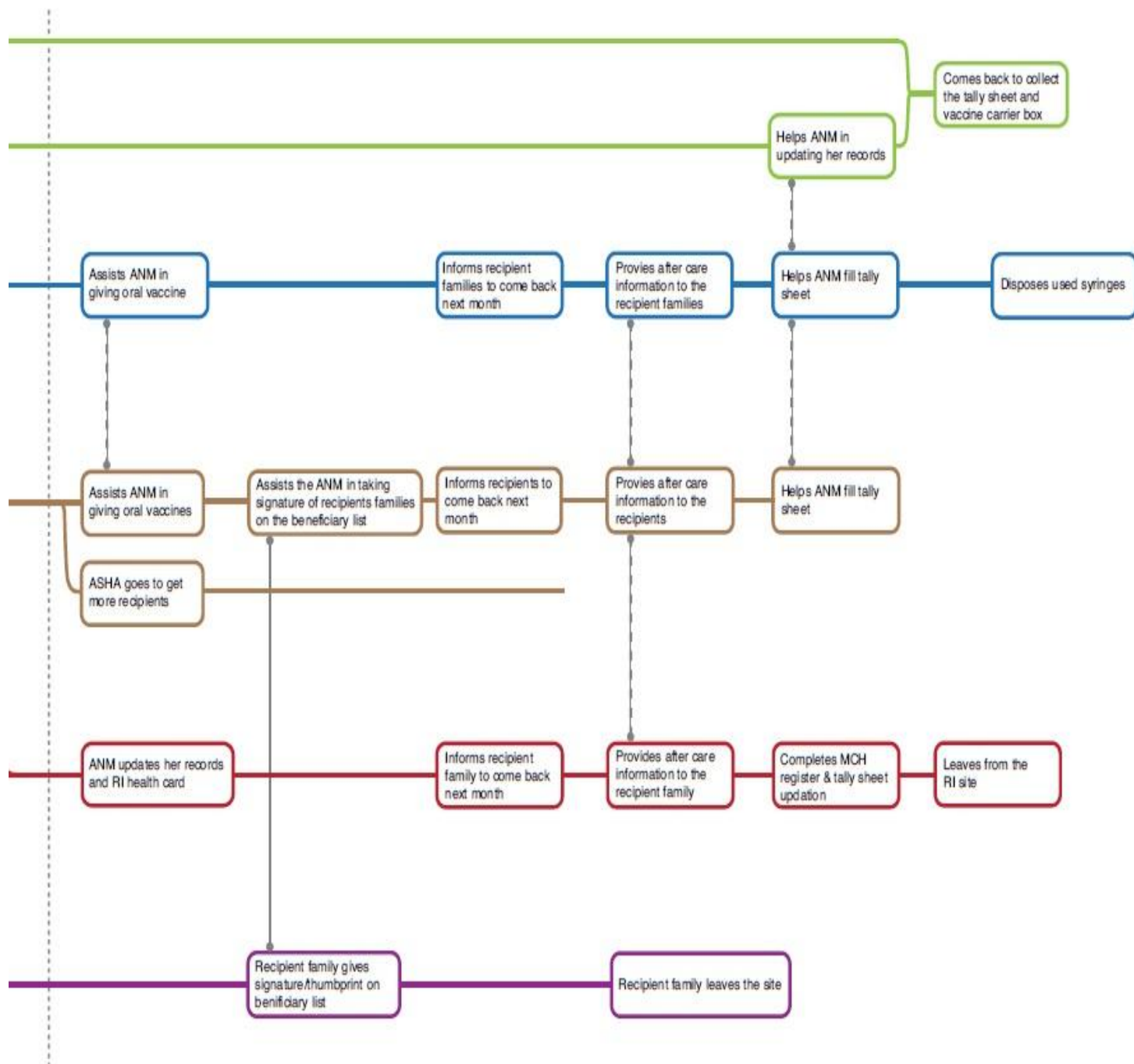


ANNEXURE III

The map shows the different proceedings of the MCHN day by various key stakeholders.







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