Chapter 35:
Role of ICT in Health Promotion in Community Mobilization: A Case Study from Rural India

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Take-home messages:

- Ground-up ICT solutions, when appropriately designed to cater to unmet clinical needs of the local health care system, can have a positive impact in the health care practice in terms of better provisions and standards for care.
- By engaging local health care providers—such as community health workers and primary care doctors—as well as community participants, the ICT solution can be integrated into their daily routines and affects the dynamics of the community in terms of awareness, behavior change, and capacity enhancement.
- Further large-scale evaluation through clinical trials will measure clinical impact and scalability.

Overview

Building an effective telemedicine system within the contextual fabric of a resource-poor setting is challenging. This chapter situates the local community as the focal point as it describes a real-life implementation of a clinical decision support system (CDS) for cardiovascular disease (CVD) risk assessment and management across villages in southern India (the *SMARThealth-India study*).

The chapter is divided as follows: Part 1 describes the problem of CVD; part 2 outlines the existing health care framework in rural areas; part 3 details an ICT solution for CVD risk management; part 4 outlines tangible health aspects in terms of the community's control and understanding over their health as a result of introducing the CDS system in a pilot study; part 5 describes the challenges, opportunities, and barriers in fusing technology and human endeavor while mobilizing the community to facilitate continuous health improvement in the process.

The Problem of CVD

The burden of cardiovascular disease (CVD) in the developing world has soared, as exemplified by increasing global CVD mortality [1] and the rise of non-communicable diseases (NCD) as an emerging epidemic [2]. Low- and middle-income countries (LMIC)

account for over 80% of CVD related deaths [1]. In countries like India, the epidemiological and demographic transitions add to the enormous burden on the country's healthcare system. Existing measures for CVD prevention are inadequate [3]. The promise of mobile health, if crafted successfully, offers an unprecedented opportunity to fill the implementation gap for early identification and management of CVD risk.

The Existing Health Care Framework, the Need for CDS, and Building Workforce for CVD Care

To provide equitable healthcare access, the Indian government set up the National Rural Health Mission (NRHM) in 2005 with the aim of providing efficient primary healthcare infrastructure that can benefit the vast majority of the population in rural areas [4]. One of the key features in this framework was the creation of Accredited Social Healthcare Activists (ASHAs),female health-care workers designed to serve as an interface between the people in rural areas and their health center. The position of ASHAs in the communities make them suitable candidates for capacity building in providing NCD and CVD management at the primary care level.

Over 70% of Indian physicians practice in the urban areas and by contrast, 70% of the total population lives in rural areas [5]. Opportunities for continuous medical education are also sparse for rural physicians who practice via India's Public Health Centres (PHC) [6]. Thus, the shortage of physicians, a deficiency in the oversight of care delivery, and inadequacy of the basic infrastructure in PHCs contribute to challenges in assessing and managing the burden of CVD. The current model, which employs a physician-centric, western-style care in resource-poor settings, poses difficulties for scalability and sustainability.

Role of ASHAs

In Hindi, one of India's official languages, the word *asha* translates to hope. Some key facts about ASHAs are listed below.

- They are chosen by the village panchayat (a team of usually five respected village elders serving as a ruling authority) and preference is given to married, divorced, or widowed women aged between 25 and 45 years. This is partly because in Indian tradition, it is common for women to move to their spouse's home after marriage. A majority of the ASHAs are semi-literate (educated up to the 10^{th} grade).
- ASHAs get performance-based remuneration such as Rs.200 (£2) for every woman they bring to the PHC to get their child vaccinated or receive advice on family planning. Their salaries are quite low (over Rs.1500 or £15 every month) but their status revered.
- ASHAs serve a major role in antenatal care and are also equipped with a drug kit for treating common ailments. Their familiarity with their village makes them an important ambassador of the NRHM's mission.

mHealth System for CVD Care in Rural India

The SMARThealth-India study (Systematic Medical Assessment, Referral, and Treatment) is aimed to evaluate the clinical effectiveness of a mobile-based CDS system for hypertension and CVD risk management in rural India. The CDS system was comprised of a client-side mobile application and server-side medical records. The client application enabled ASHAs to perform door-to-door screening for CVD risk. This was achieved through collection of data on a participant's medical history, family history, demographic, and CVD risk factors such as smoking status, blood pressure, and blood glucose. The application then estimates the participant's ten-year risk of developing fatal or non-fatal CVD events using the WHO/ISH color-coded charts. Point-of-care (POC) recommendations on lifestyle (on physical activity, smoking cessation, diet/nutrition

including salt intake and alcohol consumption), treatment in terms of medication, targets for BP, and follow-up schedules were also offered by the CDS. For instance, ASHAs found participants at high risk of CVD and referred them to the local PHC. The client-side application was linked to a server-side electronic medical record (EMR) system, which ran algorithms to prioritize patients for follow-up and facilitate interaction with local PHC physicians. When patients who were referred visited the PHC, the physician used the CDS to review the patient's risk score and, with the help of POC recommendations, perform further testing and/or provide treatment.

The creation of the CDS system followed a modified user-centered development approach, which balanced user requirements with system requirements. The design process involved ASHAs, physicians, and members from the local community. An observer team comprised of clinicians, an engineer, and a sociologist elicited requirements and feedback from the users and other stakeholders. An agile development approach was used to refine the design of the CDS tool and contextualize it to the dynamics of a resource-poor environ.

The CDS system was pilot tested for a month by three PHC physicians and 11 ASHAs who screened 292 participants in rural Andhra Pradesh, India for CVD risk. Subsequently, the system was tested in a cluster randomized controlled trial across 54 villages and 70,000 participants. This chapter shall only discuss outcomes from the pilot evaluation.

Impact of the SMARThealth in health promotion

1) Connected health framework

The direct interface between different health care providers is an important by-product of the mHealth infrastructure set up for the study. A rather strict hierarchy in the PHC was observable in rural India, where the physician was at the top followed by other health care providers and ASHAs at the bottom. This generates considerable challenges in interaction among the providers in extending care to every village. The introduction of the CDS tool enabled continuous digital interaction between the ASHAs and physicians for all high-risk participants in the respective villages that fall under the jurisdiction of the PHC.

2) Access to standardized care and digital health records

The ubiquity of mobile phones has enabled the delivery of complex algorithms (such as assessing ten-year risk of CVD) and creation of EMRs, thereby bridging gaps in the delivery of health expertise. This is important for longitudinal data collection to not only identify high-risk participants, but also to build a platform to make inferences on other factors, such as quality of life or location-based mapping of risk.

3) Scaling existing health care workforce

Semi-trained, semi-literate ASHAs were able to perform door-to-door assessment and advice on lifestyle changes including diet, exercise/physical activity, and alcohol consumption. Key observations from in-depth qualitative interviews included:

(a) ASHAs are now taken much more seriously in the community because of the tablet CDS tool:

"…this ASHA is doing tests, she has all the equipment and that there is no need to go to Bhimavaram (the adjacent big town). If we take tests here it is enough.... I have also told these things to two or three other people."

"She (ASHA) told this to everyone, and advised us to avoid beedi, cigarettes and any other smoking habits as well as to eat more leafy vegetables with less salt and to reduce meat, ghee etc.,"

(b) However, there was an instance of a role conflict between an ASHA and an Auxiliary Nurse Midwife (ANM), with the latter unhappy because of a perceived improvement in social status the CDS tool rendered the former.

(c) ASHAs voiced the new opportunities the CDS gave them—monetary gains, skill enhancement, access to information and building knowledge, and finally improved perception in the community.

"*Once I got examined by a nurse at Bhimavaram (and) she did an excellent job. And here (in this village) she (ASHA) will examine even better than that nurse. Not for the name sake. She is doing an excellent job."*

Due to the extensive design considerations in the creation of the CDS application, physicians found it easily integrated with their workflow. For example, we made provisions for intermediate health care providers such as nurses and pharmacists to use the CDS application. This provided more opportunities for CVD risk screening in the physician's clinic. An instance of this was found in one participating physician, who customized the tool to further suit his workflow. The physician leveraged the CDS efficiently as he instructed his nurse to perform data collection through the CDS application and therefore only had to review the patient's condition.

4) Health promotion through facilitating an absolute risk approach

The CDS tool was a POC device to encourage the use of an absolute risk approach for CVD risk management. An absolute risk approach can be more effective and efficient compared to treating individual risk factors [7].

5) Employing visualization techniques for CVD risk suited to rural setting

To visualize a ten-year risk of developing CVD and effectively communicate this to rural populace, the application used a visual risk projection meter in the form of a modified speedometer. To illustrate, consider the case of a 33-year old with diabetes who is a current smoker. The person's blood pressure is 160/89 mmHg, his total cholesterol is 176 mg/dL, and his risk of developing CVD over a ten-year period is high. If the person reduces his blood pressure alone by approximately 10 mmHg, we can demonstrate through the CVD risk meter that his ten-year risk of developing CVD reduces significantly from above 40% to between 20% and 30%. Therefore, the cause and effect of each risk factor to a particular patient's risk can be easily explained. This is intended to help the patients visualize the effect of controlling risk factors and was designed to encourage adherence to medication and a change in risky behavior like smoking.

6) Creating a framework for quality improvement

Using in-depth analytics that recorded every interaction the ASHA had with the tablet CDS system, we derived what we designated as performance metrics. These metrics provided two key insights—first, they identified ASHAs who were not performing as well as they used to (so as to give them training), and secondly, they identified features seldom used in the application or improvements to usability.

Impact of SMARThealth in community mobilization

In-depth focus group discussions (FGDs) were conducted with local community participants at the end of the month-long pilot study. We derived five themes based on the interviews that can further mobilize the community to participate in their care.

We believe the technology-boosted program altered the perception of villagers towards:

(a) Awareness of CVD risk factors like BP

"We did not know anything earlier, (but) by this process, we know what is BP and others (associated risk factors) and became more health conscious. Now we know that heart disease occur(s) when you smoke bidi, cigarette… consume alcoholic drinks…"

(b) Advocating healthy lifestyle

"I thought that I am alright. I did not know about BP till she (ASHA) mentioned (it). She said that I am having a bit high BP. It should be 120 but it is 160 and I have to take less salt in my food…"

"If we take care of our food habits, then there will not be any problem for another ten years…"

(c) Awareness and behavior change towards monitoring

"If she (ASHA) come(s) on the way where our house is, she will come to us but most of the times we used to go to her and get examined…..he (another villager) told me that there tests were being done and asked me to go to her (ASHA's) house in the evening…"

(d) Regaining trust in public health systems

Most community participants interviewed through FGDs expressed limited trust of their public health system.

"Normally we do not go to the government doctor. Instead, we visit a private hospital. In government hospitals, we wait and wait and are vexed with this waiting…"

"If we go to the government hospital, they don't care for us. If, say, 100 rupees is paid in the private (hospitals), they will treat our disease well. We have to spend money."

(e) Challenging non-standard practices, e.g. the role of Rural Medical Practitioners (RMP)

"Participant: I had high BP but it is cured.

Interviewer: Where do you go to check your BP?

Participant: We go to her (ASHA) and then go to doctor….

Interviewer: Who is the doctor?

Participant: A RMP (Rural Medical Practitioner) doctor, and he will examine well."

Rural medical practitioners, as the name suggests, are doctors in villages without any formal qualification and are usually unregistered and/or unrecognized officially. They treat common ailments normally and their familiarity in the rural setting is unique and key to their role in the village [8]. However, patients may receive non-evidenced-based care from RMPs that stems from a lack of documentation, and thus, oversight.

(f) Health care for the community from the community
(g)

The project empowers people from the community to take accountability of their own health for sustainability.

"Interviewer: Are there other organizations or foundations that provided care?

Respondent: No sir, there are no other organization…it has closed… (a big NGO run by a businessman was recently closed down)

Interviewer: What was the organization (the NGO) doing?

Respondent: (Checking for) BP, sugar…and in the beginning it was good…after closing that foundation, nobody is checking the BP… until ASHAs (came along). "

However, it is not uncommon to have no physician in the PHC, posing a considerable challenge to the effective implementation of SMART.

"The ASHA told me to see a doctor but there was no doctor when I visited the clinic. The nurse gave us tablets but doctor was not there."

Conclusion

ICT plays a pivotal role in creating new opportunities for community health care workers and the local community to take better control of their health. It has also positively influenced the dynamics of the communities. The SMARThealth-India project bestowed a means to measure care delivery and opportunities to improve the way local health care is provided

Questions for Discussion

Can you think of effective ways in which data collected from the community can be fed back to create positive behavior change?

References

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