

South Africa's Mobiles Deliver Healthcare Services

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Abstract

South Africa has harnessed mobile phones to deliver healthcare services (mHealth). The bold initiative is significant in that healthcare had, heretofore, been a privilege mostly for whites under the racial apartheid government. With the election of Nelson Mandela as president in 1994, the new non-racial government liberalized telecommunications policies which empowered the black majority who make up 79 percent of the population. Thus, the young multiethnic nation enjoys a multimedia environment where free SMS (short message service) text messages are transmitted to patients (users), including establishing two-way forums to facilitate nurses' training; field visitation by healthcare providers to rural areas, and grassroots for nurses; and delivering healthcare services to those who need it the most. Text and e.Mobile visual messages expedite transmission of patients' data to healthcare providers; facilitate training of healthcare workers; permit communication between healthcare provider and patients; assist patients with medication intake; and render a variety of women's healthcare services; and promote healthy living through treatment and testing of acquired immune deficiency syndrome (AIDS) and human immunodeficiency virus (HIV). Evaluation has shown improvement in healthcare delivery. Challenges include high levels of illiteracy among the population and issues pertaining to software ownership

Keywords: mobile, phone, healthcare, patient, application, evaluation, technology

INTRODUCTION

Blacks in South Africa have endured lack of adequate access to healthcare services. The status quo took a turn in 1994 for good when Nelson Mandela (fondly referred to Madiba) became president. Under the white-only racial apartheid government, blacks (79 percent of the population) were confined to regularly monitored lands where they worked in mines and on farms owned by whites. Their needs for healthcare services were summarily dismissed as they were denied access to white-only healthcare services.

The purpose of the paper is review the progress of healthcare services in South Africa since that country became democratic in 1994. In view of the proliferation of mobile phones and ease of access of information using the Internet, the paper was interested in the role of government to provide blacks the capacity to become involved in using mobile technology to conceptualize and disseminate healthcare messages. In particular, the paper sought to highlight telecommunications operations in South Africa and to delineate to extent to which these channels have contributed to health living, especially in rural areas which is home 80 percent of the population.

To this end, the present paper traces the milestones that Mobile Health for Community Based Services (MHealth4CBS) has followed in using mobile phone technology to provide healthcare for 50 million South

Africans. The paper set out to show the place of South Africa within the continent of Africa in relation to its telecommunications infrastructure, which places the country in the vanguard in using mobile phones for healthcare delivery.

In view of the country's tortuous path to modernity and development, it is a worthy contribution to chronicle South Africa's initiatives in engaging mobile technology in healthcare. This explains why Samsung Mobile Innovation Laboratory (SMILE) is being established to provide healthcare services to the country and beyond.

Professor Jean-Paul van Belle, head of information systems at Cape Town University and project brainchild, says, "This initiative will bring together academicians, practitioners, and researchers to pursue innovative and meaningful research and to develop leading-edge products and applications that will be relevant to Africans . . . considering its unprecedented growth of mobile phone users." Brett Loubser, Samsung South Africa representative, likens SMILE to "a visionary pillar of developing technology that is built in Africa, for Africa, and by Africa."

Rationale for mHealth Study in South Africa

A 2012 study by the United Nations Children's Fund (UNICEF) states that, South Africa experiences inequality in healthcare funding. 60 percent of

available funds are consumed by 18 percent of the population who have medical insurance and access to the private medical sector. As for the rest of the population, there are 77 doctors per 100,000 people, 24.4 doctors per 100,000 people, and 9.9 specialists per 100,000 people in the provinces. Besides, 34.4 of the medical positions in the public sector are unfilled.

South Africa has more HIV positive people than any other nation. In 2000, HIV/AIDS accounted for 30 percent of deaths in the country; cardiovascular disease accounted for 17 percent; malignant neoplasms accounted for 7.5; and non-HIV related infections accounted for 10 percent. The incidence of tuberculosis is one percent, and rising.

Fortunately for South Africa, AIDS was considered a health priority when Nelson Mandela became president. Boseley (2013) writes about the 2000 international AIDS conference in Durban (South Africa). In the article, "How Nelson Mandela changed the AIDS agenda in South Africa," and published in *The Guardian*, Boseley describes the president's total commitment to fight AIDS. Mandela continued the fight for AIDS long after leaving office. In 2002, he paid a visit to the AIDS activist, Zachie Achmat, who had refused to take antiretroviral drugs until the government made them generally available in South Africa.

A more formidable challenge was the position of Mandela's successor, Thabo Mbeki. Boseley (2008) regrets that Mbeki's policies on AIDS were directly responsible for the deaths of 300,000 people in the country. South Africa at the time had one of the most severe HIV/AIDS epidemics in the world, where about 5.5 million (18 percent of adult population) were infected with HIV.

South Africa, like many African countries, still lags behind the rest of the world. According to Nicholson (2011), the main impediments remain cumbersome regulations and inadequate transport. The author suggests that mobile technologies have to successfully tread these milestones in order to become fully operational in delivery of healthcare services.

Criticism in Using Mobile Phones for mHealth

There is a rapid increase in mobile phone affordability in South Africa thanks to prepaid contracts and deregulation of the telecommunications industry. Mobile phones do not just benefit the poor; they provide profit for the telecommunications companies. However, some criticism can be levied against South Africa's mobile phone industry.

Han (2012) regrets that little attention is given to negative aspects of mHealth. While the author recognizes that mobile phones are ubiquitous, many

interviewees have raised questions about how affordability is assessed. Han asked interviewees, "What is your opinion about the cost of mobile phones in South Africa?" Over three quarters of the interviewees said mobile phones were expensive, more so because they had to keep enough airtime on their mobile phones.

Culture is another obstacle to health. Kalichman and Simbayl (2004) are professors at the University of Connecticut (United States). The professors write in the article, "Traditional beliefs about causes of AIDS and AIDS-related stigmas in South Africa," that AIDS-related stigmas are pervasive in some segments of South African society. They add that stigmas can impede efforts to access mHealth messages, thereby preventing promotion of counseling and testing of HIV/AIDS and prevention. Kalichman and Simbayl indicate that, people from certain regions in South Africa believe AIDS is caused by spirits and supernatural forces. The belief, the professors insist, is an obstacle to communicating and utilizing AIDS-related knowledge and information.

Improving Use of Mobile Phones in mHealth

Obstacles, though, must be addressed if mHealth is to improve the quality of healthcare in South Africa. West (2010) notes there are a number of remote monitors for healthcare that enable patients to do test taking out of the doctor's office. For example, there are pulse-taking and blood pressure devices that measure vital signs. American, Telephone, & Telegraph's uses a "device certification lab" to track health on high-speed broadband networks.

Darrell Well (2010) is director of the Center for Technology Innovation at Brookings Institution (US). Well recognizes that smart phones do not just keep getting smarter; they go faster. These devices, stresses the author, have introduced a variety of new mechanical applications that help doctors and patients stay in touch and monitor health needs. The applications make doctors more efficient as they do not have to be in the physical presence of the patient to judge the condition of the latter. In effect, digital technology allows people to overcome the limitations of geography in healthcare services by accessing information from a distance.

LITERATURE REVIEW

Han (2012) states South Africa, with its high mobile phone penetration rate and persistent social inequalities, is the target of many "mobiles for development" (M4D) initiatives. The author notes that in the 1990s, the Internet was touted as a tool for information and communication technologies for development (ICT4D), but soon fizzled. There was a disparity in the amount of information between those who had access to the Internet and those who did not. Other factors were quality of connection and related

services. To propel mobile technology to champion South Africa's fight against crippling HIV/AIDS and TB epidemics, Ekine (2009) advocates the use of the mobile phone as an instrument for development, particularly for disadvantaged populations. Ekine affirms that, "The ubiquitous mobile phone in the hands of millions of Africans working as the primary tool for communication is fast becoming the core technology for social change and the empowerment of citizens."

Chad Hyett (2010), in "Mobile health in developing counties," remarks that mobile phone adoption is not just a phenomenon in the developed world. It is, rather, a sensation that has penetrated Africa at a startling rate. "Many predict that by 2014, 95 percent of the entire world will have mobile phones," writes Hyett. Jim Black and associates at the University of Melbourne (Australia) have utilized Microsoft technology in developing smartphone-based applications for healthcare workers. The software can analyze varying oximeter wavelength readings from inexpensive LED finger sensor. An oximeter is a device that clips onto the finger and reads a patient's heart rate and percentage of oxygen in the blood. A nurse is able to quickly communicate readings to the attending doctor by use of mobile phone SMS, thus saving lives.

Africa's first mobile health conference, held in Cape Town (South Africa) in June 2011, found that populations were using mobile phones for emergency calls, text messaging (with reminders), health information, and transmission of test results. Smith (2011) welcomes comments by Global Observatory for e-Health representative, Misha Kay. The latter affirms that, "The momentum is huge. What is happening [in Africa] is important. Millions of people in Africa still do not have access to any healthcare. With mobile technology they can at least have some."

BBC (2010) reports on South Africa's Afridoctor mobile, a smartphone application designed and launched in South Africa. It is popularly known as "pocket doctor." Afridoctor lets patients use its "SnapDiagnosis" system to submit photos of their ailments. In return, they receive advice from a panel of medical professionals. Patients can also use a mapping feature that is designed to enable doctors to find clinics and nearby industry and health-related services on <http://twitter.com/afridoctor>.

METHODOLOGY

This paper used secondary sources, including books, articles, magazines, websites, and online sources on the subject under investigation. Interviews were conducted with media and health practitioners. The paper employed uses and gratifications and two-step flow of information as theoretical framework.

The paper addressed four areas: a literature review of mobile phones, to identify specific mobile phone programs that have been used, to investigate the types of evaluative measures that have been carried out to determine the operability of the mobile phone programs, and to look at the benefits of mobile phone technology to healthcare delivery services in South Africa.

FINDINGS

Rationale for mHealth in South Africa

Participants at the Mobile World Congress in Barcelona (February 25-28, 2012) concluded that mobile phones could save as many as one million lives in Sub-Saharan Africa over the next five years. Patricia Mechael is executive director of mHealth Alliance that supports mobile technology in health delivery services. Mechael believes mobile phones stand to save over one million newborns a year. Speaking at the conference, Victor Higgs (2012), managing director of Applied Nanodetectors, said, "The direct benefit of this is reduced visits to healthcare practitioners, reduced costs and fewer expensive drugs." Additionally, UGlucuDock, an iPhone application since March 2012, allows diabetics to check their blood sugar levels.

In the words of Aaron Motsoaledi (2012), South Africa's minister of health, "Effective monitoring of healthcare service delivery and overall performance of the healthcare requires functional health information systems capable of producing real time information for decision making." The strategy defines eHealth as a broad domain, which includes mHealth and mobile technologies.

To this end, South Africa's mHealth strategy covers the following: electronic health records; routine health management information (web-based surveillance systems); vital registration (use of computerized systems for registration of births or deaths); consumer health informatics (access to information by health providers or patients); health knowledge management; use of mobile devices for healthcare.

South Africa enjoys an unequaled mobile technology market in Africa. It totaled an estimated \$25 billion in 2006. Despite the fact that broadband penetration is expensive, mobile phones have given direct access to healthcare providers to those who previously lacked access. To assure efficacy and professional standards, the South African Health Informatics Association and the South African Telemedicine Association provide needed direction.

On May 10, 2013, *The Rundown* published, "In South Africa, Using Mobile Technology to Improve Maternal Health Access." Attributing the source to the United Nations (UN), Imani Cheers argues that,

4,300 mothers die in South Africa every year due to pregnancy and childbirth complications. Cheers adds that 20,000 babies are stillborn, while another 23,000 die during the first one month. Regrettably, a total of 75,000 children do not even make it to their fifth birthday. South Africa has, therefore, initiated a number of mHealth projects to combat disease.

Project Masiluleke

Project Masiluleke is a thriving mobile health project that has taken advantage of mobile phone technology to provide healthcare in a different way and with a special touch. It derives its name from a Zulu word, meaning, “lend a helping [hand].” Project M is an HIV/AIDS support and awareness network driven by mobile phone text messages. It operates in partnership with Frog Design, Aricent Group, PoTech, Praekelt, and Nokia Siemens. Project M targets residents of Kwazulu Natal, an area with the most number of HIV-infected South Africans. The project provides services in three distinct ways: to encourage use of low-cost diagnostic test kits; to walk patients through the at-home testing process; and to nudge people toward healthcare systems and to encourage healthy preventive behavior (particularly HIV infection and prevention).

MAMA

The MAMA Program is aimed at mothers. The program is timely in that (according to 2012 estimates) for every 100,000 live births in South Africa, 685 of them die. MAMA’s impetus is to create the Mobile Alliance for Maternal Health. Pregnant women, and mothers of young children, can sign up for free SMS messages and receive information and support related to pregnancy and baby care. There are MAMA links to other healthcare services and related information. Funded by Johnson & Johnson Corporation, USAID, and mHealth Alliance, MAMA transmits healthcare services in concert with the Preakelt Foundation, Cell-Life, and Witts Reproductive Health & HIV Institute. MAMA features five services: MAMA MOBI for mothers; MAMA SMS service to mothers; MAMA USSD to enable users to recharge airtime; MAMA MXIT for access to mobile social networks; and MAMA VOICE to deliver pre-recorded healthcare messages to women.

e.Mobile TV

The program was launched in November 2010, in conjunction with eNews Channel and Channel O. It is designed to offer “free-to-air” mobile phone healthcare services and information. According to Bronwyn Keene-Young, e.tv group chief operating officer, “The launch of e.Mobile TV in South Africa makes [television] channels accessible to viewers at times when they normally would not be able to watch TV.” e.Mobile TV services can be accessed on a broadcast-enabled mobile phone, such as Nokia 5330,

Nokia N96, and ZTE F900. Services are available in Johannesburg, Pretoria, Soweto, Cape Town, Port Elizabeth, Polokwane, Mbombela, Rustenburg, Bloemfontein, and Durban.

MPAPI

In the MPAPI program, the first group consisted of 16 South African interviewers trained to conduct mobile phone-assisted interviews (MPAPI) as part of a clinic-based trial. Interviews were conducted from October 2010 to March 2011. The second was a focus group of 12 pregnant women with HIV. The third group consisted of three pregnant women living with HIV. Nicknamed “Project Masihambisane,” the study conducted a total of 708 interviews with 520 participants. Greg Slabodkin (2013) says results confirm that mobile phones are crucial in creating awareness about HIV infection. Slabodkin goes on to say, “The results obtained in the study suggest that it is feasible and acceptable to use Prevention of Maternal-to-Child Transmission (PMTCT) within South Africa.”

SMSpill

Developed by David Green (South African), SMSpill is a prescription bottle with an embedded mobile phone chip that uses mobile phone technology to remind patients to take their pills on time. SMSpill performs another key function. It alerts patients if they are about to take too much medication, thereby preventing overdose occurrences. First, the patient’s pill-taking schedule is programmed into the pill bottle, which communicates with the patient’s mobile phone. The SIM server is programmed in accordance with the patient’s medication schedule, which then communicates with the patient’s SIMpill dispenser. The server monitors the patient’s medication schedule against the times when the patient opens the dispenser.

Text to Change

As reported by Natalie Leon and Helen Schneider (2012), Text to Change is made possible by a Dutch NGO that runs a series of four-week education programs on SMS healthcare messaging. Each program starts with an SMS text announcement to a target group of mobile users in a given region. (Users who participate in the questionnaire receive free airtime as incentive.) Next, participants receive multiple-choice SMS questions. The program is credited with increasing patients’ knowledge of HIV/AIDS and in stimulating patients to seek counseling or go for HIV testing.

text4baby

Launched in 2010 under the sponsorship of Johnson & Johnson Corporation, South Africa participates in a program that provides free service to mothers. “text4baby” is a mobile health education service that uses direct texting to deliver healthcare messages to

mothers. Johnson & Johnson's goal is to use mobile phone technology to deliver healthcare information to deal with health challenges facing expectant mothers. Mothers receive SMS text messages regarding safe birth programs; new medications; information on prenatal health; clinic appointment reminders; and calls from health support groups.

Mobile Health and Computer Clinic

The Charlize Theron Africa Outreach Project (CTAOP) is committed to reducing the prevalence of HIV/AIDS and sexual violence among African youth by supporting mHealth initiatives that provide preventive education. CTAOP a partnership with Academy Award-winning actress and native South African, Charlize Theron, and Entertainment Industry Foundation (EIF).

In collaboration Oprah's Angel Network, CTAOP's first project provided seed funding to create a mobile health and computer clinic designed for improving the health and social development of Umkhanyakude youth district in the KwaZulu-Natal province. So far, the clinic has served over 8,000 community members and 10,000 students from 12 high schools. Each clinic renders services to schools one week a month, plus access to a nurse and social worker or psychologist.

Annually, every student receives:

- One-hour sessions with an HIV counselor where the students are evaluated for health and social problems, offered HIV testing, and receive guidance for a healthier life,
- Four 90-minute computer-training sessions with a focus on preventing HIV, and
- Four workshops on health education.

In an article published by TheSouthernAfrica.com on July 2013, president Jacob Zuma was adamant about the government's support of mHealth. South-Africa-born Charlize Theron interviewed the president. Theron is recognized for her work on social issues, most notably providing healthcare through mobile phone technology, interviewed the president. The president commended said, "We believe the successes we make in South Africa will have a big impact on the continent."

In summer of 2010, CTAOP partnered with ONEXONE foundation to provide clean water in soccer fields. In return, the fields are designed to create ideal gathering spaces for communities to permit rural mobile health units to serve more individuals.

Research Data on South Africa's mHealth

An important component of mHealth in South Africa is evaluation. Woods et al. (2012) argue that the use of mobile phone text messaging improves healthcare. The authors conducted a study that showed three

significant findings. First, text messages were well received by midwives. Second, the information was widely shared with colleagues and believed to be improving patient care. Third, the lack of access to the Internet, or failure to use mobile phones, limited the use of Internet-based healthcare. The authors concluded that use of text messaging provided cost-effective learning opportunities and improved a wide range of healthcare services.

The national Health Systems Research Unit (HSRU) of the Medical Research Council (MRC) and the School of Public Health at the University of the Western Cape conducted an evaluation of mHealth services in South Africa. It was titled, "MHealth4CBS in South Africa: A review of the role of mobile phone technology for monitoring and evaluation of community-based health services."

The review found that, despite promising reports and growing global promotion of information and communication technologies (ICTs), there is insufficient evidence of their ability to improve the performance of health systems, particularly on a large scale. Notwithstanding, the review underscored the need to assess the effectiveness of mHealth strategies. Recommendations included strategic leadership, aligning mobile technology with health care services/providers, security, and prioritizing technological acquisition. The authors concluded that, mHealth was viable for the people of South Africa and re-affirmed the role of mobile technologies in mHealth. Furthermore, the authors recognized the need for on-going partnerships between healthcare providers and the telecommunications industry. The authors concluded that evaluation must be a part of every mobile health communication initiative.

Verclas (2009) admits that although many South Africans cannot afford dinner, they can afford mobile phones. The researcher discusses responses from interviewees regarding MXit, a popular youth mobile phone service. One respondent said, "It's too dangerous because you know we MXit with people and sometimes those people, they convince us that they are young and they call us to certain places. Sometimes we go there and then you don't come back. Like a friend of mine who never came back."

In the article, "Human factors affecting the quality of routinely collected data in South Africa," Nicol et al. (2013) observe that, evaluations looking at the people aspect of the health information system in South Africa have focused more on the availability of human resources, and less on the competence or other behavioral factors. The researchers used the Performance Information System Management (PRSM) tool.

Data was collected from 161 health information personnel in 58 health facilities and two districts. A self-administered questionnaire was used to assess confidence and competence levels of routine health information system (RHIS) tasks, problem solving, data reading skills, and motivation. The findings showed that 64 percent of the respondents had poor numerical skills and limited statistical and poor data reading skills. Only 22 percent of respondents displayed competence above 50 percent.

Benefits/Challenges of Mobile Technology in mHealth

Data shows that mobile technology improves health care for citizens of South Africa. These include convenience and efficiency in data collection, storage, and transfer; rapid access/sharing of data; effectiveness of weekly supervision and ability to generate up-to-date schedules for Community Health Workers (HWs); plus data management. There are challenges, too. These are lack of technical know-how on the part of mobile technology users; high levels of illiteracy; high startup costs; and software ownership.

CONCLUSION

The importance that South Africa has placed on mHealth is paramount. In view of the country's tortuous path to modernity and development, South Africa has engaged mobile technology in healthcare. Thus, the country has partnered with the telecommunications industry in tackling challenges that require mobile phone applications.

Successes include harnessing information technology to maintain electronic health records, making available routine health management information, and access to health research. Appropriate government agencies, such as the Health Informatics Association, and the South African Telemedicine Association, evaluate the effectiveness of mobile healthcare services.

The ubiquity of mobile phones in South African has formed a three-way union that includes the government, healthcare providers, and the mobile telecommunications industry. The union is committed to addressing healthcare services and to inform and educate citizens about HIV/AIDS. In fact, African nations may learn from South Africa's initiatives in engaging mobile technology in healthcare.

Today's South Africa is a multi-ethnic country where citizens have access to healthcare that is facilitated by mobile phone technology. The use of mobile phone text messaging improves healthcare. Studies show that text messages are well received by midwives and that information is widely shared and believed to improve healthcare. However, continued training for

healthcare providers and mobile technology users is recommended in view of high levels of illiteracy.

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