Development of Code of Ethics for a Social Entrepreneurial Telemedicine Venture in Kenya
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Abstract
Students at the Pennsylvania State University are working on a social entrepreneurial venture in Kenya called Mashavu: Networked Health Solutions for the Developing World. Mashavu is a teledmedicine system that enables medical professionals to connect with patients in rural communities. The Mashavu kiosk operators, medical practitioners, website administrators, and other individuals connected to the Mashavu network are expected to adhere to the highest principles of ethical conduct. We had developed Code of Ethics for Mashavu based on universal health policies and guidelines. Our observations and lessons learned while conducting field research in Kenya have forced us to rethink our approach to developing and ensuring compliance with our Code of Ethics. This study explores the realities of privacy, liability, trust, hygiene, quality, business practices, and social customs in developing communities and discusses the systems thinking methodology we are employing to develop the ethical, policy, and compliance framework to roll out the Mashavu venture.

Introduction
Clinicians, scientists, engineers, and businesspeople around the world are investigating the use of advanced telecommunications and computer technologies to improve health care. One form of these efforts is telemedicine: the use of electronic information and communications technologies to provide and support health care when distance separates the participants (Institute of Medicine 1996). Students and faculty from various colleges at the Pennsylvania State University are working on a project called Mashavu: Networked Health Solutions for the Developing World. This initiative is led by the Humanitarian Engineering and Social Entrepreneurship program in the College of Engineering and is focused on the East African countries of Kenya and Tanzania. About 100 students and six faculty members from numerous different colleges participated in this venture in the Spring 2009 semester. Mashavu is a telemedicine system that enables medical professionals around the world to connect with patients in the developing world using modern technology and communications infrastructure.

Our team developed the Code of Ethics (CoE) for Mashavu during the Spring 2009 semester and conducted on-the-ground research in Kenya to assess its feasibility and validity and then refine it based on lessons
learned. We discovered a number of complexities that make certain tenets of our CoE impractical. However, the most important realization was the impossibility of ensuring compliance with our original CoE. This made us rethink the conceptual and practical framework for the CoE and compliance mechanisms. We are now attempting to develop the framework for a systems approach to the development of practical CoE and compliance mechanisms for Mashavu users, operators, and medical practitioners.

The first section of this paper discusses the health care crisis in sub-Saharan Africa and the Mashavu telemedicine solution. The next section discusses the CoE developed by our team and gives relevant insights into the Mashavu stakeholders. The final discussion focuses on observations from fieldwork in Kenya and our systems approach to the development of a practical and realizable policy framework to ensure the venture’s sustenance and success. The observations and lessons discussed in this paper are not based on scientific research. They are based solely on the authors’ (and team’s) experiences and bear the burden of their biases, prejudices, and ideologies. The purpose of sharing these observations is to provide insight into the ethical and practical intricacies of developing and commercializing telemedicine solutions in East Africa, and also in developing communities in general.

Health Care Crisis in East Africa
Sub-Saharan Africa (SSA) is facing continuous health threats characterized by a pandemic of infectious diseases such as HIV/AIDS, malaria, high levels of infant-maternal mortality, low life expectancy, and deteriorating health care facilities. With 24% of the global burden of disease, SSA has only 3% of the world’s health workers and spends under 1% of the world health expenditure (World Health Organization 2006c). Table 1 shows the number of doctors per 100,000 people in SSA compared with Australia, the US, and Italy. Access to care is further limited when large distances must be traveled for basic medical care, and often the decision to seek professional help is made too late. About 70% of the SSA population lives in rural areas with communities having poor or no access to health facilities, resulting in over 65% of SSA countries lacking essential care services (Kifle and Mbarika 2007).

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<thead>
<tr>
<th>Countries</th>
<th>Number of Doctors per 100,000 People</th>
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<tr>
<td>Australia</td>
<td>249</td>
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<tr>
<td>US</td>
<td>509</td>
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<tr>
<td>Italy</td>
<td>606</td>
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<td>SSA Countries</td>
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(Source: World Health Organization 2006c)

Table 1. Density of Doctors in Various Countries

Communication technologies and telemedicine have the potential to help overcome some of the health care challenges in remote regions. Cell phones are rapidly transforming the African continent, and computers are slowly making their way into rural Africa. Computers and cell phones can connect patients in developing communities with doctors around the world. Many health-care practitioners are interested in performing outreach in developing communities, but cannot make commitments to long-term international assignments. They are, however, willing to contribute their time and expertise from the comfort of their desks.
Mashavu: Networked Health Solutions for the Developing World

Mashavu (Swahili for chubby-cheeked) is a networked system that enables medical professionals from around the world to connect with patients in the developing world using modern technology and communication infrastructure (Fleishman et al. n.d.). Trained operators at Mashavu stations collect essential medical information including weight, body temperature, lung capacity, blood pressure, photographs, stethoscope rhythms, and basic hygiene and nutrition information for each patient. Web servers aggregate this information from the Mashavu station over a cell-phone GPRS link and provide it on a web-based portal. Figure 1 shows the three-way Mashavu network, which connects the Mashavu kiosks with medical professionals in the local area as well as professionals around the world. They can view the patient’s information and respond to the patient and the nearest doctor(s) with their recommendations. Our validation efforts have indicated a significant need for linking local doctors to remote rural communities. Public health officials can review community health statistics in order to evaluate any general health trends or possible epidemics in the area. The anonymous health information can then be shared with local community leaders so that health priorities are addressed effectively.

![Figure 1. The Mashavu network connects Mashavu kiosks in remote communities with doctors anywhere in the world.](image)

The over-arching objectives of Mashavu are:

1) Improving access to pre-primary health care.
2) Active community health education.
3) Socio-economic development through micro-enterprise.
4) Transforming students (in US and East Africa) into entrepreneurial global citizens.

Our team of students, faculty mentors, and industry experts is developing virtual instrumentation-based biomedical devices, including a blood pressure device, spirometer, stethoscope, weighing scale(s), thermometer, camera, etc. with an emphasis on modular, rugged, and affordable design. The approximate cost of each Mashavu system will be $200, excluding an appropriate cell phone and computer. The system will work with any computer that has a USB port and operates Windows XP. The market penetration strategy is to target large NGOs and governmental/UN agencies. We are also developing strategic symbiotic partnerships with the United Nations Industrial Development Office (UNIDO) and the
African Medical Research Foundation (AMREF). The end-users for Mashavu will be clinics, orphanages, community centers, churches and Faith Based Organizations (FBOs), and micro-entrepreneurs. They can purchase the system with help from microfinance organizations and may charge community members a small fee to use the service. We have conducted extensive surveys in Kenya and Tanzania to determine the feasibility of this business model. The people overwhelmingly supported the venture, with most willing to pay about 1 USD per consultation which would imply a Return On Investment (ROI) of between six months to one year after implementation. Detailed information on the Mashavu value proposition, technology innovation, business model, and validation received on all aspects is provided in a separate publication (Fleishman et al. n.d.).

**Ethical Issues with Telemedicine**

While telemedicine systems such as Mashavu provide an attractive solution to the shortage of health care practitioners, the rules of engagement and ethical conduct for international or local telemedicine have not been resolved. The World Health Organization (WHO) resolution of 2005 alludes to ethical matters by acknowledging the need to respect the principle of equality and differences in culture, education, language, physical and mental ability, and geographic location (WHO Committee A 2005). It does not, however, address specific ethical questions related to telemedicine, such as informed consent, confidentiality, safety, and data security. With regards to Information and Communication Technology (ICT) policy, the Kenyan government created the Kenyan Communications Act in 1998 to cover areas of privacy and data protection.

This Act has been found insufficient to protect privacy and data, and therefore as of 2008, there have been recommendations by the Kenyan ICT Federation to follow the UN’s Guidelines for the regulation of computerized personal data files. No specific policy guidelines focusing on international telemedicine initiatives have been crafted by Kenya or other SSA countries. The Mashavu team strongly believes that all Mashavu stakeholders should exhibit the highest standards of honesty and integrity. Each player in the Mashavu network has a direct and vital impact on the quality of life for all stakeholders. Accordingly, the services require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Even a single instance of ethical misconduct can have a significant negative impact on the acceptance and sustainability of the Mashavu system.

**The Mashavu Code of Ethics**

Guidelines regarding professional conduct of Mashavu users require a commitment to behave ethically and to encourage and support the ethical behavior of others. Although a health care professional’s first mandate is to “do no harm,” the use of technology brings many complicating issues into play. The Mashavu ethical guidelines provide a common set of values designed to direct Mashavu medical practitioners and operators in resolving the ethical dilemmas experienced in professional life.

The Mashavu CoE has been developed using western norms and guidelines for primary health care. In general, the guidelines are derived from the CoE from the National Society of Professional Engineers (2007) and the Association for the Advancement of Health Education (Coalition of National Health Education Organizations 1999). The Mashavu privacy-guiding principles are based on the Health Insurance Portability and Accountability Act (HIPAA) privacy rules of the Department of Health and Human Services. The enforcement of these HIPAA principles ensures patient confidentiality and affords additional privacy by eliminating individually identifiable health information. There are two fundamental tenets of the CoE: responsibility to the profession and public, and responsibility in kiosk and website management.

**Responsibility to the Profession and Public**

Mashavu operators and medical professionals are responsible for the reputation of their profession and hence their behavior should be consistent with the CoE. They are expected to maintain their professional...
competence through continued education and training of the Mashavu system. It is their ultimate responsibility to educate people about health in order to promote wellness and an improved quality of life. As “health educators,” Mashavu operators, doctors, and nurses recognize that decisions about health are made at individual, family, community, society, and global levels. When there is a conflict of interest among patients, clinics, or hospitals, Mashavu workers consider all issues and give priority to the principles of responsibility and freedom of choice.

In order to be responsible to the public, health care providers must enforce informed consent, privacy, confidentiality, and equality. Informed consent pertains to the patient’s right to make informed decisions regarding their own health. Confidentiality is the right of an individual to not have personally identifiable medical or other information disclosed to others without that individual’s specific informed consent. Mashavu operators employ privacy and equality and treat individuals with dignity and respect.

Responsibility in Website & Kiosk Management
Electronic health information complicates the issue of privacy because this information can be used for purposes other than those for which it was originally collected. Computerized records allow health care information to be assessed, copied, and transferred to unauthorized parties. Patients who use the Mashavu system have the right to expect that the personal data they provide will be kept confidential. Personal health data in particular may be very sensitive, and the consequences of inappropriate disclosure can be grave. Mashavu operators and website developers have the responsibility to ensure the value and integrity of the website and kiosk station by exercising judgment in using the site and service, and by providing meaningful feedback about online health information and services.

Regulatory & Ethical Framework
We developed the appropriate regulatory and ethical framework procedures during the Spring 2009 semester. The tenets of the Mashavu CoE are summarized below:

Article I: Responsibility of Health Practitioners and Kiosk Operators to the Public
- Do no harm.
- Accurately communicate the potential benefits and consequences of services.
- Be truthful about your qualifications and limitations of your expertise and provide services consistent with these qualifications and limitations.
- Support the right of patients to make informed decisions regarding their own health.
- Protect the individual’s privacy and dignity.
- Commit to providing professional services that are equitable to all people.
- Respect the rights of others to hold diverse values, attitudes, and opinions.

Article II: Responsibility of Health Practitioners and Kiosk Operators to the Profession
- Use current professional standards and guidelines when accepting consultations and when making referrals.
- Maintain professional competence through continued education and training related to the use of the Mashavu system.
- Promote the right of patients to be actively involved in all aspects of the Mashavu pre-primary care process.
- Implement strategies and methods that enable patients to adopt healthy lifestyles through choice rather than by coercion.
• Conduct regular evaluations of system effectiveness.

**Article III: Responsibility of Health Practitioners and Kiosk Operators in the Delivery of Patient Health Information**

• Be sensitive to the variety of cultural and social norms.
• Make good faith efforts to understand the patient’s particular circumstance.
• Give clear instructions for follow-up care when appropriate or necessary.
• Clearly and accurately describe the constraints of Mashavu diagnosis and treatment recommendations.
• Obtain patient’s affirmative consent to collect, use, and share personal data in the ways described.

**Article IV: Responsibility in Website & Kiosk Operations**

• Website should clearly disclose collected patient data such as the patient’s name, contact information, and health data.
• Website should disclose which, if any, organizations or individuals the site shares data with and how it expects its affiliates to use that data. For example, by “encrypting” data, protecting files and passwords, or using appropriate security software for all transactions involving the patient’s personal medical or financial data.
• Take reasonable steps to prevent unauthorized access to or use of personal data through the use of, for example “audit trails” that show who viewed the data and when.
• Make it easy for operators to trace how personal data is used.
• Ensure that when personal data is “de-identified” (e.g., when the patient’s name, contact information, or any other data that might identify him or her has been removed from the file) it cannot be linked back to the patient.

On-the-ground assessment of the Mashavu CoE was carried out over a four-week period during Summer 2009. The objective was to assess the feasibility and practicality of the guidelines in the Kenyan context and get feedback from the various stakeholders. The next section discusses Mashavu users and their contextualization of our observations on practical issues related to the CoE.

**Mashavu Stakeholders**

Mashavu users include patients, health practitioners, kiosk operators, and website administrators.

*Patients*: In Kenya, the population living below the poverty line (% population living under $1/ day) in 2005 was 45.9% (Kenya National Bureau of Statistics 2005/06). People in rural areas do not generally frequent district clinics or hospitals, as they typically choose to spend their limited income on food and cell phones over health care. A majority of the patients live in rural areas with no routine access to health care, and hence the Mashavu experience may seem strange and unfamiliar to them. Mashavu patients will have varying education levels and understanding of basic health care needs; the vast majority of the users will have only primary or secondary school education. Patients can be characterized as perceptive and having a good understanding of what they want, but are not attuned to the idea of preventive health care. Mashavu users will have a wide variation in terms of age and physical ability, but will be mostly from the lower socio-economic strata. The patients will be appreciative and eager to learn more about their health. They will be curious and willing to ask more questions if a more communicative space is created.

In many areas of Kenya, the majority of households are headed by men, but cared for by women. There are a significant number of households which are headed by women because the men have deserted the family or passed away. Most mothers or caretakers will not go to the hospital themselves, but will escort
their children or an elderly person if necessary. Many caregivers are not directly related to the children or the elderly persons they are caring for. However, they continue to provide care because there is no other option. These caretakers also take on this responsibility because of their religious or spiritual beliefs and their collectivist values. We discovered that some caretakers considered this job to be a chore and devoted less time or resources to caring for sick individuals.

Health practitioners: Kenya and Tanzania suffer from a severe lack of health care professionals. There is one doctor for every 50,000 people in East Africa compared to one doctor for every 390 people in the United States (WHO 2008). Provider shortages are likely to persist, as many countries do not have the means to train adequate numbers of medical personnel. Kenyan doctors are accountable to the Kenyan Ministry of Health, along with the Kenyan Medical and Dentist Board of Practitioners. The doctor (either local or international) will (1) receive and review medical data, (2) provide feedback, and (3) provide medical advice (prescribe medication) and/or give further recommendations. Doctors and nurses in developing countries regularly face ethical dilemmas in everyday practice. These are caused by poor basic community services like sanitation, the provision of potable water, electricity, and transport (Jack and Mars 2008). In addition to the shortage of doctors, medical facilities in developing countries are often poorly resourced and doctors may be isolated and lack peer support, all of which affect patient management (Wootton 1999). The doctors using the system will be dispersed over the region and come from various tribes, with different language, culture, and staple diets. The doctors are paid very low salaries and despite the fact that many of them consider themselves privileged and want to give back to society, they need to have a definite incentive to participate in the system and give medical feedback.

There are two forms of health care in Kenya: first, the formal and officially sanctioned hospital/institution based health care according to western scientific medicine (Figure 2) and, second, the informal, community-oriented, traditionally supported indigenous system (Figure 3). Generally, ill people move between both the formal and informal sectors, sometimes using them both and sometimes adhering to only one, when the treatment in the other sector fails to relieve physical discomfort or emotional distress (Helman 1994). The formal health care system has a hierarchical structure with primary care provided by health centers, community clinics, and dispensaries, followed by community referral clinics, and district and teaching hospitals which serve the entire country. In small towns, it is easy to find private clinics with family practitioners as well as specialists. There are a number of private charitable clinics and hospitals in small towns, most of them with some religious affiliation. Many of them want to provide services or weekly outreach to dispersed, rural communities, but lack the resources to do so.

The potential use of telemedicine to address the disparity of health care delivery in developing countries
has been questioned (Finch et al. 2005; Bauer 2003). The specific issues pertain to whether telemedicine services project inequality in the provision of health care and if telemedicine will replace a face-to-face physical consultation. This is indeed a fairly complex question and is also highly contextual, as the dynamics vary significantly from community to community.

**Mashavu kiosk operator:** The Mashavu kiosk operator is responsible for kiosk maintenance, clinical testing, and health data entry. The operator (1) creates an account for a new Mashavu patient and conducts searches for accounts of existing Mashavu patients, (2) inputs/updates the patient’s medical history, (3) collects vital sign data from the patient, (4) sends the data through the Mashavu server, and (5) provides feedback to the patient. The operator should be a well respected member of the community who has earned trust and is able to responsibly operate and maintain the health system. It is important to have both male and female operators of various ages who understand the ethical guidelines of the system and comply with them. The operator also educates people about health in order to promote wellness and a better quality of life.

The skills of the kiosk operators may range from a very limited skill set to a broad one. The kiosk must cater to all user levels, including those who may have no experience working with a computer. The kiosk operator might be operating the kiosk as a small business and have appropriate small business management training. The kiosk operators may not have the knowledge, skills, and experience related to pre-primary care, in which case they will go through an appropriate formal training program.

**Website administrator:** The website administrator is responsible for managing the website and the networked system. He/she has access to the patients’ as well as the community’s medical records and is responsible for website security and server security, as well as de-identifying information to provide to public health officials.

**Compliance Issues**

Kenyan health providers are a heterogeneous group, ranging from qualified medical practitioners to untrained informal providers. Untrained informal providers, such as traditional healers and herbalists, have no regulations or restrictions. We have actually encountered veterinarians who are “treating” people in rural communities. Qualified medical practitioners have received training in institutional guidelines, and there are policies that are established for all health care facilities. Government institutions such as the Ministry of Health and the Nursing Council of Kenya make unannounced visits to both hospitals and clinics. Through these institutions, there is punishment for noncompliance by way of a fine and/or revoked license. However, many practitioners, as well as facilities, do not follow all the policy guidelines. The actual policies change according to the number of workers, intensity of workload, supply of materials and equipment, endemic location (such as high prevalence of malaria, HIV, etc), and the number of patients. The probability of the current legal and ethical guidelines being followed decreases significantly as you move away from large hospitals in urban areas to isolated clinics in rural areas.

**Observations From Fieldwork in Kenya**

A team of fifteen students and three faculty members working on the Mashavu project traveled to Nyeri, Kenya in Summer 2009. Our primary partner in Kenya was the Children and Youth Empowerment Center (CYEC), a public/private partnership that cares for former street-dwelling children. We were able to validate and learn about real on-the-ground health and ethical issues through conversations with a host of local individuals in various communities, and informal interviews with doctors and nurses at the district hospital and two nearby clinics. We also obtained extensive observational information from the Mashavu clinics that were set up in the area. From this we gained information pertaining to accountability, privacy, liability, and doctor-patient communication. In addition, we also discovered over-arching constraints and
issues related to government, culture, religion, community power dynamics, and the environment.

**Accountability/enforcement**

Good doctor-patient communication is required to achieve accountability and confidentiality, and to reduce liability. However, since Kenya is a multi-lingual, multi-tribal country consisting of 62 languages and more than 40 ethnic groups, doctor-patient communication presents some ethical challenges. According to a former Kenya Ministry of Health nurse, an example of this difficulty occurred during the 2007-2008 post-election conflict which resulted in riots along tribal lines and claimed about 1,000 lives. Many patients were fearful of getting care from doctors and nurses of a different tribe than theirs.

When practicing telemedicine directly with the patient, the doctor assumes responsibility for the case in question. This includes diagnosis, advice, treatment plans, and direct medical interventions. In order to determine how the public enforces doctor accountability in Kenya, we asked patients if they generally trusted their doctors and believed everything the doctor said. We found that most Kenyans do believe everything the doctor tells them and they feel that it is inappropriate or disrespectful to question any doctor. Therefore, patients rarely complain. The fact that Kenyan patients do not enforce accountability from their doctors is also due to the complexity of filing a complaint with health administrators. The institutions where one would file a complaint are usually too far away and require significant documentation and evidence. Complaints are rarely processed, and following up on the complaint is a further drain on the patient’s limited resources. Lack of education and/or illiteracy further aggravates accountability. Patients in this category may have implicit faith in whoever appears to be the doctor. We also learned that many patients would seek medical care from a traditional healer or herbalist if they do not like the information received from the medical practitioner.

Traditional medicine covers the common symptoms and disease syndromes typical of the socio-economic status of a developing country, such as diarrhea and dysentery. Unfortunately, traditional medicine is also associated with imprecise diagnosis, symptomatic therapy, the possibility of intoxication, and the practices of sorcery and quackery. The systems of traditional medicine are sometimes integrated with religion and traditions and beliefs about life, death, and disease. As we talked with several women in the community, we discovered that herbalists were the health care providers of choice for many of them because they were easily accessible, relatively inexpensive, and, most importantly, were part of their community and likely to provide their services on credit during tough financial times.

**Privacy/confidentiality**

When it comes to concerns of privacy and confidentiality in Kenya, logistics, time, and money are major constraints. Since the local hospitals have limited space, there is little or no privacy when a patient’s history is taken. Such lack of privacy may result in inaccurate responses from questions concerning the patient’s medical history. The Mashavu clinics were set up in very open settings with little space and no privacy (Figure 4). It was interesting to learn that no one had a problem with having their vital signs taken with numerous people surrounding them. Open clinics are common in many parts of Kenya because charitable organizations set them up on a bi-annual basis to reach out to people who otherwise have no health care.

Kenyans do not like to go to the hospital because there are too many patients and not enough clinicians, and many Kenyans must sacrifice at least a half day’s work to travel to the hospital and back. One poultry farmer we met spends an average of four hours at the hospital and pays 200 shillings to travel to the nearest hospital. At Nyeri Provincial Hospital, patients may remain in line through the night in order to be the first to be seen by a doctor the next day (Figure 5). Long hospital waits also affect accountability. After a patient has waited a long time in line, he or she does not want to ask their doctor more questions, especially with others still waiting in line.
There is no privacy when it comes to accessing medical records at small clinics such as the youth clinic that hosted us. At this particular clinic, we, as visitors, could walk into the clinic and freely view the children’s medical records at any time. The medical records (Figure 6) are held in notebooks and there is no back-up system for lost or stolen records. Adult patients at most Kenyan clinics and hospitals must give authorization for anyone else to see records, including their spouse. If a woman has HIV but the husband does not, the woman does not have to inform her husband of her condition. The health provider cannot inform the husband, but is only allowed to encourage the woman to inform her husband. It was also interesting to walk past the medical records office at Nyeri Provincial Hospital and see the records located in open view behind windows (Figure 7).

![Figure 4. Lack of Privacy at Mashavu Clinic](image1)

![Figure 5. Waiting Room at Nyeri Hospital](image2)

![Figure 6. Medical Records at the CYEC Youth Clinic](image3)

![Figure 7. Medical Records, Nyeri Provincial Hospital](image4)

**Liability**

Doctors and nurses must make judgment calls as to how much information should be given to a patient based on physical assessments. Even though nurses and doctors are accountable to governmental ethical guidelines, in reality, practitioners in small clinics do not seem to be concerned with issues of liability. On the other hand, doctors and nurses working at the Nyeri Provincial hospital seemed to be more concerned with liability, as some indicated that they were not comfortable with giving a diagnosis without seeing the patient in person. One doctor we spoke with believed that it would be difficult to assess skin conditions via an electronic image, especially for patients with dark skin. She, along with her colleagues, also insisted that due to language and social barriers, their patients might not give accurate information concerning their health. They explained how patients only describe the issue that is causing them pain and never give clear answers. For example, the doctor may ask, “How long have you had this problem?” and the patient will respond, “Oh, for a little while.” However, while these doctors were concerned about liability issues when giving a diagnosis over the internet, other doctors in the same hospital actually supported the idea.
wholeheartedly. It seemed to us that some of the best educated doctors at the large hospitals had a very negative view on the role of telemedicine from a liability standpoint.

**Overarching Constraints**

We spoke to various entities: doctors, nurses, health care workers, public servants, and, most importantly, patients about the practicalities of the system of operations and ethical code for the Mashavu system in Kenya. We discovered several factors that could possibly impede the implementation of Mashavu without enforceable ethical policies in place. These constraints include flawed government policies, societal norms, and religious beliefs.

**Flawed government policies**

An issue that could possible lead to liability issues for Mashavu is the lack of systematized nursing education in Kenya. A degreed nurse with four years of college education and one year of internship can prescribe medication. A diploma nurse, following three years of education, can begin work but is not allowed to prescribe medication. Paradoxically, a certificate nurse, after only six months to one year of training, mostly at questionable private “nursing colleges,” has almost the same privileges as a nurse with a diploma or degree and can prescribe medication.

Marginalization is another challenge. Very few citizens can afford health insurance, and those who do not must pay a fee for various services. Oftentimes the cost of reaching the clinic is higher than the clinic’s fees and even basic medicines are very expensive. Physically challenged people have an especially hard time reaching the clinic thanks to the cramped public transportation system. An incident from our business plan validation activities presents another compelling challenge: an elderly lady wanted to know her blood pressure but did not have the money to pay for it (Mehta et al. 2009). We learned that it was very typical for elderly people (especially women) to not have access to any funds. Nevertheless, they did participate in the local informal economy (e.g., looking after children in exchange for food). What kind of equity can these women (and others in a similar situation) contribute, and how can Mashavu address their needs?

**Society and religion**

In Kenyan society, many patients expect something in return when visiting local clinics. For example, we first thought that they required something tangible such as de-worming pills or vitamins, so we distributed de-worming pills at our first clinic. However, we quickly discovered that the process became extremely chaotic and unmanageable. We discontinued the distribution of de-worming pills at subsequent clinics and found that the patients were satisfied to just get their “numbers” to see if they are healthy (“normal”) or not. We also learned that there is no conscientious dissenter clause in Kenya. A conscientious dissenter refuses to inform a patient of all options available because of ethical, moral, or religious principles. Since there is no clause, a Kenyan doctor cannot withhold any information regarding treatment options. Nevertheless, many doctors and nurses withhold treatment options based on their religious or moral principles.

**Systems Approach to Rethinking Code of Ethics**

A key outcome of our team’s fieldwork in Kenya was the realization that there are no rules regarding telemedicine in Kenya, and the myriad laws and policies regarding health care are not enforceable. Expecting the Mashavu stakeholders to comply with the original CoE is not realistic due to common challenges like lack of resources, education, large distances, and different value systems and highly contextual issues that vary from community to community. We are currently engaged in rethinking the core concepts and compliance mechanisms from a systems perspective and redesigning the concept of operations as a system with checks and balances.
Besides the common systems concept of regulation (a closed-loop system with feedback to ensure that the system is actually working), we are trying to apply two key tenets of systems thinking to Mashavu: systems are defined by their interactions and not their parts, and systems exhibit multi-finality. We are designing a closed-loop system where all the stakeholders truly understand their role, have a direct incentive to participate in the process, and there are feedback mechanisms for accountability. The process and the user experience should be clear to the stakeholders and there should be specific checks and balances to ensure that the process is actually followed. Rewards for participation should be based on the quality of the transaction.

The concept of multi-finality refers to (designing) a system where the individual actors (inputs), the sub-systems, and their interactions all meet their own goals while the system as a whole also meets its goals. In our context, the challenge is to have a thorough understanding of the stakeholders and their constraints, the Mashavu sub-systems and the interactions between them, and the Mashavu system as a whole, and design the concept of operations so that it meets everyone’s goals.

For example, the Mashavu experience/clinical encounter is expected to last about twenty minutes. An hourglass will be used to time the encounter to ensure that the patient is actually getting the full time at the Mashavu kiosk and the kiosk operator is not shortchanging them. A binder with laminated sheets explaining every health indicator and the measurement process will guide the user through the various measurements. The proliferation of cellphones provides the opportunity to have the patient rate the Mashavu experience by sending a (free) text message to rate their encounter. The kiosk operator will receive incentives for good service and will be cut off from the network if they do not offer proper service. There are always specific issues and it is very difficult to create a system of operations that is fool-proof, idiot-proof, and context-proof. However, the idea is that after trial runs, we will have a good understanding of the ground realities and motivations of the various players and will then fine tune the system to maximize its probability of success and sustenance.

Educating all the stakeholders about the Mashavu user experience, processes, and expectations is critical and hence we are developing appropriate training modules. The kiosk operators will undergo thorough training in the use of the Mashavu system and their role in the process. We will adopt reasonable mechanisms to trace how personal data is used (e.g., by using “audit trails” that show who viewed the data and when). The Mashavu kiosk, website, and all the biomedical devices are user-friendly and easy to use. Since a large part of our customers are children, we are trying to integrate fun into the system. For example, the computer-based stethoscope plays a child’s heartbeat on the computer speaker and a friend inflates the blood pressure cuff for the child using a bicycle pump. Instant gratification is another important design criterion for Mashavu. We are trying to provide some sort of feedback during every aspect of the Mashavu user experience to keep the user engaged.

A major challenge has been the expectation from the users of a definite answer on whether they are healthy or not! The concept of preventive health care barely exists in SSA and even if it does, resources are not available to support preventive health care. Active community health education that ties in personal health indicators and educational materials on the relevance and importance of those indicators is an important goal of the Mashavu system. The basic idea is that “what you can quantify, you can improve.” Health cannot be bought; it needs to be developed from the ground up, and hence we are aiming to get Mashavu kiosks into the communities where the real Africa lives.
Road Ahead
The goal for the Mashavu project in Summer 2010 is to conduct full-functionality pilot testing with three kiosks in remote communities in Kenya. We will be collaborating with the Children and Youth Empowerment Center, United Nations Industrial Development Office (UNIDO), and African Medical Research Foundation (AMREF). We intend to redesign the Mashavu concept of operations and CoE with a systems thinking approach during the Fall 2009 and Spring 2010 semesters and test and validate it in Summer 2010.

We will conduct individual interviews as well as focus group meetings with the various Mashavu players: patients, kiosk operators, nurses, and doctors to determine the practicality and feasibility of the new CoE. Mashavu intends to hire its first employee in Kenya in Summer 2010 for a minimum period of six months. This person will be primarily responsible for monitoring and maintaining the three deployed Mashavu systems and will gather data about CoE compliance issues, challenges, and opportunities through observations and face-to-face interviews.

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