In low- and middle-income countries, where health systems are centralized (care provision is focused in urban areas) and fragmented (providers of health care largely work independently with weak quality assurance and improvement standards), much of the population lacks access to high quality, affordable health care. Development programs have tried to bridge the health gap, often with the use of technology, but have been criticized for their focus on short term vertical programs rather than longer term capacity building. In order to create sustainable change in developing countries, technology innovation by itself is not enough. The problem is not only one of a lack of technical solutions but also insufficient support for local leadership, and underdevelopment of networks and business model innovations necessary to propagate and sustain value creation.

Sana is a volunteer group of engineers, doctors, social entrepreneurs and public health experts focused on improving the quality of health care in developing countries through leveraging innovations in wireless technology. Its approach is interdisciplinary and collaborative: encouraging local leaders to develop solutions enabled by the Sana platform, an open source customizable medical records system for Android mobile phones. The goal of Sana is to strengthen health care systems by using innovation to maximize the effectiveness of existing resources and to foster sustainable change through a focus on capacity building and cooperation. The approach enables technical innovation (based on the open source Sana platform), business model innovation (based on models being developed and tested with our partner organizations) and the development of value creating networks (building coalitions of local and international academic and provider organizations to identify and share examples of best practice and pool resources).

The Sana open-source software platform enables smart phones or tablet devices running Google's Android operating system to be used to

- Input patient histories (based on best practice algorithms),
- Input multimedia information (including pictures and video),
- Integrate with Point of Care diagnostic devices (EKG, Ultrasound, electronic stethoscopes and clinical chemistry)
- Integrate this data to any electronic medical record database.

The Sana strategy is to form partnerships between provider organizations and academic centers (with computer science and public health capacity) in developing countries. It has been successful in developing such partnerships in the US, India, Great Britain, Mexico, the Philippines, Greece and Brazil. Furthermore with generous network coverage in even the poorest regions in the world, the falling price of cell phone handsets and the development of low cost tablet devices, Sana as a medical informatics solution is becoming ever more viable even in the poorest regions of the world. The platform is distributed for free via a BSD Open Source Software license. The team has developed an integrated package of hardware, software, training, maintenance, evaluation and quality improvement measures to support our partners in customizing the software to meet their needs.

Typically, the initial contract with a partner organization has included a bundle of services for adapting clinical forms to a local workflow, including designing the entire operating system (software, hardware, and human resources) if one does not currently exist. Sana also helps train clinicians and healthcare workers on proper use of the cell phone application. The team and implementing partners collaborate to raise grants to cover the costs of implementing a project. Partners, described below, are supported to develop sustainable business models to scale their programs.

Karnataka, India with Narayana Hrudayalaya hospital and the Rajiv Gandhi University of Health Sciences

The hospital was connected to rural health care providers in the state of Karnataka using a customized version of the Sana platform with locally designed procedures for oral cancer screening. Over 4000 patients were screened this past summer with about 300 high risk cases identified at rural clinics and referred to Narayana Hruduyalaya hospital for definitive diagnosis and treatment. Current initiatives plan to scale up to cover the entire state and develop further applications for cardiovascular disease screening and management. The intention is to launch a for-profit entity building a primary care network for the Narayana Hruduyalaya hospital enabled by the Sana platform.

Punjab, India with Health Point Service and the Public Health Foundation of India

Sana worked with Health Point Service to extend the reach of their six primary care centers in rural Punjab, North India. In this pilot, one community healthcare worker has been trained for each clinic and equipped with a customized protocol for assessing the risk of cardiovascular disease and referring high risk patients for treatment. Outcomes data from this three month pilot will be available in Jan 2011. The aim is to integrate the Sana enabled outreach activities into Health Point Service's for-profit model of low cost rural health care delivery.

Philippines with Negros Women for Tomorrow Foundation, the Center for Community Transformation, University of the Philippines, Ateneo de Manila University, and Asia Pacific College.

Sana is working with local partners to implement a screening program for hypertension, diabetes and chronic lung disease to the Rizal province, and Negros Occidental. The intention is to develop a suite of applications on the Sana platform to facilitate the expansion of existing social insurance offerings to include primary care.

Brazil with MIT Netra Lab, Instituto Nacional de Telecomunicações, and Universidade Federal de Sao Paulo

Sana has partnered with a Brazilian NGO, Anjos de Saude, formed by a group of currently Boston-based professionals - ophthalmologists, computer scientists and public health experts - to provide eye care to underserved populations in Brazil. A procedure has been developed that assesses the risk of eye disease based on questions, acuity testing on the phone (using Professor Ramesh Raskar's work at the MIT Media Lab) and fundoscopy (using a low cost integrated device developed by the Brazilian team). The plan is for pilot implementation in Jan 2011 in the slums of Sao Paolo with scale up over 12 months to cover contiguous underserved areas. The goal is to secure recurrent funding from the government of Brazil as a low cost high quality vehicle for their outreach activities.

The Sana mission is intentionally aligned to Millennium Development Goal 8: Develop a global partnership for development. Specifically the organization came into being to "make available the benefits of new technologies, especially information and communications" through partnership. Pilot projects have shown that the Sana approach works. The organization believes that current initiatives can be scaled to achieve its vision of strengthening health systems through a multidisciplinary collaborative use of wireless technology. As more people adopt and develop the open source Sana platform and share their experiences with each other, a virtuous cycle of collaboration and growth can be established that will positively impact health outcomes even within existing resource constraints.

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