

Grass Roots Distributed Healthcare

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Societal Grand Challenge Focus Area: Health

Abstract. A revolution in patient care is emerging, in which patients are using the power of technology, including social and ubiquitous computing, to help manage personal healthcare. The goal of this societal grand challenge is to leverage technology to provide healthcare services and information that is robust, accurate, affordable, and available to everyone.

Healthcare is a scarce resource throughout much of the world, one that is costly and difficult to obtain. The challenges here are daunting, and range from the emergency mobilization of resources in response to pandemics to the provision of basic preventative services in remote regions. Innovative, nonprofit, volunteer organizations, and government social services are able to address some issues, but they generally struggle to scale enough to address all of the issues. By leveraging the Web and mobile technologies, however, innovative researchers are beginning to define a new era in health care, one in which it is possible to find health information easily from grass roots sources rather than from direct conversations with doctors, to connect remote doctors with patients who otherwise could not reach them, and to help individuals with chronic conditions monitor and manage their own conditions over time. A revolution in patient care is beginning.

The challenge is to enable this revolution without sacrificing quality or accuracy, and to make it accessible to *everyone* who needs health care. Some of the issues that must be overcome to make this possible include the possibility of incorrect or misleading information, the difficulty of ensuring correct diagnoses, the negative impact that use of grass roots information can have on the doctor/patient relationship, the difficulty of transferring correct information to doctors no matter how remote, and inaccuracies in monitoring leading to mistakes in managing conditions over time.

As we move into the 21st century, it becomes increasingly important that we identify better solutions for worldwide healthcare. We believe that technical solutions to problems of access, accuracy, robustness, and affordability can be created that will help everyone to be much better served. Given the rapidly changing nature of technologies for connecting people and continual advances in medicine, such solutions will necessarily evolve over time. We can, however, identify some initial goals that can and should be addressed first. These include:

- Management of chronic illness: Increasingly many health conditions are becoming chronic rather than fatal. As they become more pervasive, we look to technology to provide answers as we change in the way we think about health management, the assignment of responsibility for this management, and the lessening of the economic impact of long-term care.
- Mobile telemedicine: Mobile solutions for connecting doctors and patients, regardless of location or computer connectivity are both possible and increasingly necessary. Such systems would need to deal with issues of literacy, language translation, the demands of transferring diagnostic imagery without degradation, affordability, and usability by those in need.
- Health information: Better tools are needed for searching, sorting, triangulating, evaluating, and otherwise exploring online health care information.

What is required to make progress on these goals? First, a multidisciplinary team is necessary to conduct the behavioral work that can help to identify and prioritize the true needs of both patients and health care providers. Second, better machine learning algorithms that can parse the vast corpus of online health care information and provide both useful indices and ratings of authority are needed. Third, powerful and flexible new mobile devices must have custom interfaces created for the capture and transmission of medical telemetry. All this work must, of course, be undertaken within the context of the medical profession, paying due heed to considerations of privacy and issues of policy.

This work will also require the cooperation of international researchers. Information, once solely possessed by a group of people, is now openly discussed and shared on worldwide forums. As a result, healthcare information created in one part of the world has the potential to immediately affect people everywhere.

We are seeing the beginnings of patients taking control of more aspects of their own healthcare. This grassroots effort is not one that will be stopped. The goal of this grand challenge is to provide the best tools to support this trend, providing robust, accurate, affordable, and accessible tools in the service of global health.