

# Requirements and Barriers to Pervasive Health Adoption

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**Abstract.** An increasingly significant characteristic that has emerged through the use of eHealth applications is the rise in consumer empowerment. The latest advances in sensor technology, sensors implementation, improved wireless telecommunications capabilities, open networks, continued increases in computing power, improved battery technology, and the emergence of flexible software architecture has led to an increased accessibility to healthcare providers, more efficient tasks and processes, and a higher overall quality of healthcare services. Intelligent infrastructures have provided the layers for contextual information gathering, knowledge processing as well as adaptation and optimization mechanisms. Pervasive health monitoring and care (PHMC) would shift the paradigm of healthcare from the traditional reactive, event-driven model, to one where subjects proactively manage their health in a patient centered healthcare system. The objective of this work was to identify requirements and barriers to adoption of pervasive sensing and computing in healthcare. To do so, the authors systematically reviewed published works on health information technology, eHealth, and pervasive health care, since 2005. We found technological, financial, psychological, logistic and liability issues related with requirements and barriers to PHMC adoption. We identified as potential requirements related with adoption of PHMC: optimization of hardware and software for remote, unobtrusive health monitoring; better evaluation of the implemented systems; better coordination of the involved stakeholders; respect and improvement of existing standards for eHealth or new standards realization; collaboration and team work of all stakeholders that may benefit from pervasive health implementation; training in using new technology; training for searching library and information sciences related with health technology and information communication technology; training in thoughtful analysis of added value associated with new health technology; promotion of healthier lifestyle using health information technology; analysis of social and organizational change process in order to design flexible, adaptive systems for health monitoring and care; adequate policy support for quality improvement of pervasive health systems; transparency with regard to the goal, business plan and process

implementation of pervasive healthcare; consideration of patients' perception as well as healthy individuals perception and patient-physician relationship as a core organizational operational system for PHMC; healthcare equity through improved data collection; education for technology literacy; and education for lifestyle management using new technologies. Barriers to implementation are associated with: financial constraints; privacy policy and related issues; poor transparency towards work plans and with regard to the implementation of health information technology; underestimation of complexity of the technological, clinical process and organizational problem; less or even lack of collaboration and team work of all stakeholders - patients, doctors, therapists, sociologists, engineers, computer technicians, etc.; fragmented or lack of responsibility in management of health information system implementation; low effective, persistent and consistent management of system implementation for more closely coordinated forms of health and social care provision; lack of quality audits of health information technology implementation in some healthcare systems; health professionals perception related mainly with less evidences on added value of some implemented eHealth approaches; aspect of culture associated with all stakeholders involved in health information communication technology. For the future it would be desirable to set up a comprehensive method that provides support in implementing PHMC taking into account quantitative measurements of variable identified in this work and potentially supplemented by others standardized surveys.

**Keywords:** pervasive health monitoring, pervasive healthcare, health information technology adoption.

## 1 A Short Story. Information Technology in Healthcare

*"I sighed as I flipped again through the paperwork sent with my first admission of the night. All I found was a partially legible discharge summary. The patient, a young man who was ventilator dependent and in a vegetative state since receiving a gunshot injury 6 months previously, had been transferred from a nursing home after a workup revealed a new deep venous thrombosis in his leg. From the limited notes provided by the nursing home, I ascertained that the gunshot had initially caused a subarachnoid hemorrhage. It was my job, as a night-float admitting resident, to determine whether it was safe to start anticoagulation for his thrombosis. I rummaged through his papers again. All I could find regarding his brain hemorrhage was the handwritten statement "Recent head CT stable." I was angry that physicians had sent this patient without adequate documentation. In the corporate world, a business transaction would not be finalized if crucial information were missing, but transfers like this are commonplace in medicine. I called the nursing home and reached a doctor who had never heard of my patient. He agreed to look up the record and call me back. A few minutes later, someone else from the nursing home paged me and said he couldn't find any mention of a previous head CT. I pressed him for more information. After a second perusal of the record, he discovered that a "brain" CT had been performed a few days earlier. My spirits rose as I waited for the report. "Oh," he said, "we don't have a report.*