

## **Conceptualizing the patient work system, Part A: macroergonomic models**

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### **1. Introduction**

In the human factors/ergonomics literature, it is widely recognized that the introduction of new interventions must be aligned with users' existing work systems, or context of use. Deeper understanding of users' work systems is particularly necessary in health care, where interventions such as health information technology are rapidly increasing. To date, macroergonomists' study of work and work systems in health care has almost exclusively focused on those employed by the health care system rather than those served by it. However, as the locus of health care shifts to home and community-based settings, technological interventions, including personal health records and mobile health (mHealth) applications, are also being designed and introduced for direct use by patients who must engage in management of their own health and health care.

In 2002, Hal Hendrick extended the concept of work within the macroergonomics literature to include nonpaid activity, for example, patients' self-care and self-management work. However, although the volume and complexity of patient work is increasing, the work system that shapes a patient's performance of health-related work remains poorly characterized. A patient work system (PWS) can be defined as the system within which patients are the central actors who perform health-related work. A deeper understanding of patient work systems can serve as a foundation for designing interventions to support patients in their health-related work responsibilities.

Consequently, the purpose of our work was to conceptualize and explicate the PWS with particular emphasis on its macroergonomic components. This paper synthesized PWS frameworks and findings from two independently conducted studies.

### **2. Methods**

In the first study, a model called SEIPS 2.0 (Holden et al., 2013) was used to understand elderly heart failure patients' work systems. The model's six interacting work system components were person(s), tasks, tools (or technologies), organization, internal environment, and external environment. Data were collected from 30 patients using interviews, surveys, and observations; family members and clinicians were also observed and interviewed.

In the second study, the Human Factors of Health Care in the Home work system model (National Research Council, 2011) was used as a basis for understanding the work systems

of patients using mHealth technology for asthma management. The model conceptualizes the work system as consisting of a triad of the person(s), tasks, and equipment/technology embedded in four environments: the physical, social, community, and health policy. Participants included four individuals (recruitment ongoing) who had engaged with the mHealth technology for two months. Through Skype based interviews, participants were asked how they perceived elements of their context of use to impact their positive and negative experiences with the technology.

Investigators of both studies conducted qualitative content analysis using NVivo 10 to characterize participants' work systems according to their respective models. Findings were integrated into a preliminary taxonomy of work system model subcomponents.

### 3. Results

Synthesis of the two models produced five key work system elements: person(s), tasks, tool/technologies, physical environment, and social-organizational environment. A combination of the study findings yielded a preliminary explication of lower order work system model components, a partial list of which is presented here:

- **Person(s):** data/computer literacy, aesthetic preference, availability, organizational style, stress, occupation, motivation, health, knowledge, attitude
- **Tasks:** complexity, routine, speed, priority, ambiguity, conflict, consequences
- **Tools:** interface, functionality, size, portability, integration, accuracy, transparency
- **Physical environment:** clothing, stimulation, weather/climate, size of community, technological infrastructure, transportation infrastructure, privacy, home layout
- **Social-organizational environment:** communication patterns, family beliefs and norms, cost of health care, access to health care, consistency of health care

### 4. Conclusion

Study findings provide a foundation for the continued assessment of the patient work system or PWS. Future studies should focus on characterizing PWS in the context of other health conditions and demographic settings and on prioritizing the need to create alignment between specific work system subcomponents and new technological interventions.

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