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Cascading Feedback: A Longitudinal Study of a Feedback Ecosystem for Telemonitoring Patients with Chronic Disease

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Abstract

While telemonitoring technology is widely used in treatment of patients with chronic diseases, our understanding of how it influences patient-related outcomes is limited. Drawing upon feedback intervention theory, the paper develops a model that examines how a telemonitoring feedback ecosystem (patient, telemonitoring technology, care provider) is related to patient behavioral outcomes. More precisely, we study the cascading effects of two types of technology feedback (medical and compliance alerts) on the provision of three types of feedback (outcome, corrective, and personal) given by care providers, and how the feedback in turn is related to patient adaptation and ultimately to calls to 911. Using generalized linear mixed modeling, we tested our hypotheses with longitudinal data from 212 patients with chronic obstructive pulmonary disease (COPD) and/or chronic heart failure (CHF) over 26 weeks. Our results show that medical alerts had a positive association with all three types of provider feedback. By contrast, compliance alerts had curvilinear relationships with corrective and personal feedback. Our results also show that outcome feedback and personal feedback were associated with increases in patient adaptations. Patient adaptation was negatively related to the odds of calling 911. Interestingly, we found a significant negative interaction between outcome and corrective feedback and patient adaptation. Finally, our results show that while the frequency of feedback decreased over the life of the program, the amount of adaptations increased over the same period, which suggests that patient self-management improved over time. By examining a telemonitoring-based ecosystem with two stages of feedback, our study contributes to the chronic disease management literature as well as to other contexts where monitoring technologies deliver feedback that is mediated by a third party. Theoretical and practical implications of our study are discussed.

Keywords: Telemonitoring, health information technology, patient adaptation, feedback intervention theory, feedback ecosystem, multilevel modeling, generalized linear mixed models