Faculty of
Education, Science, Technology and Mathematics

Development of a Smart e-Health Portal for Chronic Disease
(Diabetes) Management

Maryam Haddad

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Abstract

Diabetes mellitus (diabetes), an endocrine disorder, is in epidemic proportions globally, threatening the well being of people affected and challenging healthcare systems. This debilitating chronic condition warrants overall adjustments to lifestyle and therapeutic interventions to self-manage the condition and this can be achieved successfully by empowering the patient. Patient empowerment has emerged as a new paradigm recently, and can help improve medical outcomes while lowering costs of treatment. This paradigm can lead to better self-management, resulting in better clinical outcomes, particularly in managing chronic diseases, such as diabetes. This thesis investigates how information and communication technologies can play an important role in empowering the patients to self manage the disease, and attempts to make two important contributions. The first contribution, involves the development of a novel multimodal diabetes model. The proposed diabetes model can allow better self-management of the disease and lead to therapy success, as it takes into account multiple determinants, including the constructs of self-efficacy and locus of control drawn from socio-cognitive theory, and factors corresponding to personal attributes, demographics, disease traits, socio-environmental context (family and culture), and health context.

The second contribution involves the development of a smart Web 2.0 portal technology for implementing the proposed multimodal diabetes model. The implementation of the diabetes model with this portal technology allows an integrated holistic platform for self-managing the disease, with seamless integration, collaboration and communication features provided by the portal. These features provided by the portal, fully leverage the benefits of cutting edge information and communication technologies to the patients, the healthcare professionals, and the entire health systems, and allow:

• Integration: Integration of multiple determinants of diabetes within a single system, including factors such as self-efficacy and locus of control, and the factors corresponding to personal, demographic, disease trait, socio-environmental context, and health context.
• **Collaboration**: Enhanced partnership or collaboration between patients, doctors, the healthcare team, and the family and/or community so that the patient is equipped with proper knowledge and skills, and they are capable of participating in better decision-making, pro-active communication with health professionals, leading to better self-management of the disease.

• **Communication**: Rich communication between healthcare team, doctors and nurses, peers and community in general, facilitating better learning by observing others, with the environment, behavior and cognition, acting as the chief factors in influencing behavior change.

Innovative information and communication technologies can play an important role in healthcare, and can reduce overall burden of disease. However, the benefits of incorporating innovative technologies in healthcare can be realised only if theoretical and conceptual models of disease are designed properly first, and then a subsequent implementation of these models are done with appropriate technology platforms. Though there has been significant amount of work done on using innovative technologies in healthcare, their contribution to management of chronic diseases has been less than satisfactory, and so far remained somewhat elusive. This could be either due to availability of poor theoretical models, or due to uncoordinated efforts in terms of incorporating these models into technology implementations. This had led to undermining the potential of innovative information and communication technologies, for realising better healthcare outcomes, especially in management of chronic diseases. This thesis addresses these two shortcomings and proposes a novel multimodal diabetes model based on multiple factors, including the factors based on socio-cognitive theory, and the subsequent implementation of this model using a smart Web 2.0 portal platform.

Socio-cognitive theory and health environment context is applied today in many different areas, to predict behaviour in various health related situations such as weight loss, quitting smoking, and recovery from heart disease. Incorporating the aspects of socio-cognitive theory can result in better clinical outcomes, especially for chronic diseases, where disease needs to be self-managed by the patients for rest of their lives, and patients need to be empowered to do so. Including socio-cognitive attributes in the models can lead to better self-management of the disease, and in this
thesis, attributes such as self-efficacy and locus of control, drawn from socio-cognitive theory is included along with several other factors corresponding to personal, demographic, disease related, socio-environmental and health context factors. Further, this model was implemented with a novel technology platform, and consists of a smart Web 2.0 portal development. This implementation allows an integrated holistic approach with seamless integration, collaboration and communication features, allowing better self-management of the disease. The user evaluation of the proposed approach with a focus group of patients and doctors, showed that better patient empowerment to self-manage the disease can be achieved with proposed multimodal diabetes model and its subsequent implementation using a smart Web 2.0 portal platform.
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