Design, evaluation, optimization, and adaptation of a web application for type 1 diabetes self-management

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Abstract

Introduction: Self-guided web applications (apps) are one of the digital solutions with the lowest long-term development and maintenance costs that can be used in the field of self-management of chronic health conditions (e.g., type 1 diabetes [T1D]). However, a self-guided web app with evidence-based evaluation is lacking for T1D. This doctoral project aims to investigate the development of self-guided web apps, specifically in the context of T1D. **Methods:** A systematic review was performed to understand the development of self-guided web apps for the self-management of chronic health conditions. A self-guided web app for adult living with T1D was then developed with a multi-disciplinary team. A mixed-method registry-based proof-of-concept study was conducted for the web app evaluation. Self-reported questionnaires and semi-structured interviews were used. Data was collected at 6 months (user satisfaction, impact on hypoglycemia) with a follow-up at 12 months and analyzed using paired and independent t-tests and Person correlation tests. Interviews were conducted after 6 months of use (n=16), recorded, transcribed, and analyzed using inductive and deductive thematic approaches. The same web app was then used to explore the needs of youth for diabetes self-management (DSM) in the context of healthcare transition. **Results:** Results from the systematic review (n=20 publications) demonstrated: 1) an absence of behavior change theory-based self-guided web apps for PWT1D; 2) less than half of the publications (40%, n=8) discussed the acceptability of the features; and 3) inconsistency in the definition of web app adherence. The *Support* bilingual (English and French) self-guided web app for DSME/S was then developed based on the Behavior Change Wheel and Behaviour Change Techniques. The web app evaluation was conducted on 207 *Support* users (mean age 49.2 ± 13.7, 35% men, 96% White). *Support* received a median [quartile 1; quartile 3] satisfaction of 40 [35;45] (/49). There was a decrease in hypoglycemia frequency and fear at 6 and 12 months. Youth living with T1D expressed interest in reliable, practical, and novel educational content. They also emphasized the need to increase social support from such a web app. **Conclusions:** This project contributes to the field of digital health by demonstrating the development of evidence-based digital tools along with the fast pace of digital evolution and end-users needs. It also resulted in *Support*, a highly accepted self-management resource for PWT1D and provided evidence supporting its future implementation in routine diabetes care.

About the Candidate

LiFeng is a registered dietitian graduated from McGill University in 2015 and she pursued her Master studies in Biomedical Sciences at Université de Montréal. She is also the founder of NUTRIORIA Inc., a company providing an all-inclusive nutrition service for businesses worldwide. Her interest in digital health grew from her clinical experiences and working experience as a nutrition social media influencer. Her research interest focuses on the understanding of how digital tools can impact self-management of chronic conditions.