UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT AND EVALUATION OF THE EMPOWER-SUSTAIN e-HEALTH SELF-MANAGEMENT APPLICATIONS FOR INDIVIDUALS WITH METABOLIC SYNDROME IN PRIMARY CARE

MARYAM HANNAH DAUD

Thesis submitted in fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Medicine)

Faculty of Medicine

July 2022

ABSTRACT

Background: The prevalence of Metabolic Syndrome (MetS) and the associated cardiovascular (CV) risk factors in the Malaysian population has escalated over the past decades. This has resulted in the rising CV morbidity and mortality including in the younger age groups. Exponential use of mobile phones unlocks the potential to transform CV risk factors management in primary care using electronic health (e-health) technology. Therefore, the objectives of this study were to develop and evaluate the EMPOWER-SUSTAIN e-Health Self-Management Apps© for individuals with MetS in primary care. **Methods:** Content from the EMPOWER-SUSTAIN Global Cardiovascular Risks Self-Management Booklet© was evaluated for its suitability to be included in the prototype. Storyboard and wireframe were designed. Based on the wireframe, a mock prototype was designed to demonstrate the graphic representations of the content and function. Using the iterative model of the software development life cycle, a working prototype was developed based on the mock prototype. Utility and usability testing of the EMPOWER-SUSTAIN Mobile and Desktop Apps© were conducted. Topic guide for the semi-structured interviews was developed based on the 10 Nielsen's Heuristic Principles. Utility testing for the desktop and mobile apps were conducted among primary care physicians (PCP). They were requested to "think-aloud" while they performed tasks assessing the desktop and mobile apps. Usability testing for the mobile app was conducted among patients with MetS. They were given the mobile app to use for three weeks before the usability testing. They were requested to "think-aloud" while performing tasks assessing the mobile app. Interviews were audio and video recorded, and transcribed verbatim. Data was managed using Nvivo software (version 12) for thematic content analysis. **Results:** A total of seven PCP and nine patients were recruited. Six themes (efficiency of use, user control & freedom, appearance & aesthetic features, clinical content, error prevention, and help & documentation) emerged from the utility and usability testing. The PCP found the desktop app user-friendly. However, they had difficulty going to previous page, were unable to edit medication, found the interface immature and the colour too feminine. On the other hand, the PCP found the mobile app attractive and relevant sections were easy to find. However, they suggested bigger fonts for some parts and adding 'zoom' and 'swipe' functions. Patients found the mobile app user-friendly, with nice and simple interface, and straightforward language. It helped them understand their health better. However, they had difficulty understanding graphs due to absence of legends and could not edit or delete data in the 'My Self-Management' section. Based on this feedback, both apps were refined to improve their utility and usability. **Conclusion:** The EMPOWER-SUSTAIN e-Health Self-Management Apps© were designed, developed, evaluated and refined using a robust software development method. Based on the utility and usability findings, refinements of the EMPOWER-SUSTAIN Self-Management Mobile and Desktop Apps© were conducted to increase users' satisfaction and sustainability of use. The refined version of the apps is currently being utilised at the UiTM EMPOWER-SUSTAIN Clinic.

ACKNOWLEDGEMENT

My utmost gratitude is to Allah S.W.T for giving me life, health and making everything possible to complete this Doctor of Philosophy (PhD) thesis.

I also would like to express my sincere gratitude to my main supervisor, Professor Dr. Anis Safura Ramli, for her guidance and support throughout the course of my study. Without her encouragement, unfailing support and guidance, this thesis would not have come to fruition.

My gratitude also goes to Associate Professor Dr. Suraya Abdul Razak, my co-supervisor, for her thoughtful advice, interesting discussion on qualitative research methods and encouragement during this project. My sincere appreciation goes to Dr. Fakhrul Hazman Yusoff, my co-supervisor, for tirelessly guiding me and working with me to develop and refine the apps. I truly appreciate all the time and suggestions given for me to gain valuable knowledge and expertise to attain this Doctoral Degree.

Last but not least, without the support of my parents, Haji Daud Mohd Noor and Hajjah Ashkiah Abu Mansor, I will not be able to persevere through the most trying of moments. There is no word to express how grateful I am of their love and kindness that has guided me along this PhD study journey. I would also like to thank my family for their love and constant support throughout my journey.

This study was funded by the Ministry of Higher Education (MOHE) Malaysia: Prototype Research Grant Scheme (PRGS) no: PRGS/1/2018/SKK05/UiTM/01/2 or 600-IRMI/PRGS 5/3 (003/2019).

TABLE OF CONTENTS