



الجامعة
UNIVERSITI
TEKNOLOGI
MARA



PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIICaS 2024)



*“Flourish and Nurturing Sustainable
Innovation for a Prosperous Nation”*

Editorial Board

Editors

NUR INTAN SYAFINAZ AHAMD

DR. HAJAH NORBAITI TUKIMAN

DR. NUR IDAYU ALIMON

AHMAD KHUDZAIRI KHALID

DR. MOHAMAD FAIZAL AB JABAL

DR. WAN MUNIRAH WAN MOHAMAD

DR. NUR SYAMILAH ARIFFIN

AZYAN YUSRA KAPI@KAHBI

NURHAZIRAH MOHAMAD YUNOS

NORZARINA JOHARI

AISHAH MAHAT

AZRINA SUHAIMI

HARSHIDA HASMY

DR. NG SET FOONG

FOO FONG YENG

Copyright © 2024 Universiti Teknologi MARA Cawangan Johor, Kampus Pasir Gudang, Jalan Purnama, Bandar Seri Alam, 81750 Masai Johor.

All extended abstracts published in this e-book have not been subject to JIIICaS2024 peer review or check. The authors are responsible for the contents of their extended abstracts and warrant that their extended abstract is original, has not been previously published, and has not been simultaneously submitted elsewhere. The views expressed in the abstracts in this publication are those of the individual authors and are not necessarily shared by the editor.

All rights reserved. No part of this publication may be reproduced in any form or by electronic or mechanical means, including information storage and retrieval systems, or transmitted in any form or by any means, without the prior permission in writing from the Course Coordinator of College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Cawangan Johor, Kampus Pasir Gudang.

e ISBN: 978-967-0033-25-9



**Published in Malaysia by
Universiti Teknologi MARA Cawangan Johor
Kampus Pasir Gudang
81750 Masai**



Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.



Foreword Rector



Assalamualaikum warahmatullahi Wabarakatuh,
Salam Sejahtera, Salam Malaysia MADANI and
Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most
Merciful.

It is a great honor to welcome you to the Johor
International Innovation, Invention, Competition, and
Symposium 2024 (JIIICaS 2024). This event

connects various disciplines, focusing on education and engaging educators,
students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and
determination to turn those ideas into reality. The remarkable projects
showcased today highlight the dedication and spirit of all participants.
Initiatives like this not only explore new technologies but also cultivate skills
and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor
Branch, we are fully committed to fostering a dynamic culture of innovation,
promoting the commercialization of new products, and encouraging
meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all
sponsors, judges, the College of Computing, Informatics and Mathematics,
UiTM Pasir Gudang Campus as the event organizer, as well as to the
researchers and participants for their hard work in making this event a
success. Let us continue striving for innovation and excellence. May the
ideas presented today inspire us and lay the groundwork for future
achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
Johor Branch

**(A-ST044) THE EMPOWER-SUSTAIN MOBILE AND DESKTOP APPS®:
CARDIOVASCULAR e-HEALTH INTERVENTIONS FOR PATIENTS WITH
METABOLIC SYNDROME**

Divya Shalini Arumugam¹, Maneesha Parummal¹, Farah Hidayah Kamisan¹,
Maryam Hannah Daud¹,

¹ Faculty of Health Sciences, Asia Metropolitan University, Bandar Baru Seri Alam,
81750 Masai, Johor

Corresponding author: maryam@amu.edu.my (Dr. Maryam Hannah Daud)

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.

Problem Statement: Most of these apps were developed in the Western countries and high-income Asian countries such as Japan and South Korea which might not suit the needs of Malaysian local population. To our knowledge, there is no e-health self-management mobile or desktop app which has been developed to suit individuals with MetS in Malaysia.

Objectives: To develop and evaluate the EMPOWER-SUSTAIN e-Health Self-Management Apps® for individuals with MetS in primary care.

Description of Innovation Products: The EMPOWER-SUSTAIN Mobile App® empowers patients to take charge of their own health to prevent heart attack and stroke. Using this desktop app, the receptionist can register a patient and the nurse can enter check-up data which include anthropometric measurements and investigation results. Information entered into the EMPOWER-SUSTAIN Desktop App® will sync with the EMPOWER-SUSTAIN Mobile App®. During consultation, the doctor will use the desktop app to check the information entered by the receptionist and the nurse and use the mobile app to empower patients with knowledge and skills to self-manage their conditions at home.

Conclusion: The EMPOWER-SUSTAIN Mobile and Desktop Apps® are the first comprehensive tools developed in Malaysia, to be used by health care providers and patients to manage multiple cardiovascular risk factors such as hypertension, diabetes, hyperlipidemia, overweight, obesity and smoking.

Keywords: e-Health Apps, Metabolic Syndrome, Cardiovascular Risks, Healthcare Management

1.0 INTRODUCTION

Epidemiological research from throughout the world have clearly proven that Metabolic Syndrome (MetS) is becoming a global health problem, affecting not just the western cultures but also Asian populations (Saklayen, 2018). In Malaysia, the prevalence of MetS components such as obesity, dyslipidaemia, hypertension, and diabetes has reached epidemic proportions (National Health and Morbidity Survey, 2019). MetS

affects 25 – 44% of the adult population of Malaysia with the risk increasing with age (Lim & Cheah, 2016). Self-management programmes are recommended in international clinical guidelines for the management of MetS components, and they have been related to better health outcomes (Kennedy et al., 2007). In Malaysia, self-management tools for changing behaviour were based mainly on papers e.g. self-management booklet (Ramli et al., 2014). Exponential use of mobile phones in middle-income countries such as Malaysia unlocks the potential to transform paper-based self-management booklet into an app using electronic health (e-health) technology (Kvedar et al., 2016). However, most of these apps were developed in the Western countries and high-income Asian countries such as Japan and South Korea (Jamshidnezhad et al., 2019; Kim et al., 2021; Sequi-Dominguez et al., 2020) which might not suit the needs of Malaysian local population. To our knowledge to this date, there is no self-management desktop or mobile app which is available to cater the needs of the Malaysian population especially for individuals with MetS.

2.0 OBJECTIVE

To develop an e-health self-management intervention consisting of mobile and desktop apps for patients with MetS and primary care providers in the Malaysian primary care setting.

3.0 METHODOLOGY

Content from the EMPOWER-SUSTAIN Global Cardiovascular Risks Self-Management Booklet[®] was evaluated for its suitability to be included in the prototype. Storyboard (Chen et al., 2019) and wireframe (Erguera et al., 2019) 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 (Ali, 2017). Utility (Wright et al., 2017) and usability testing (Ruggiero et al., 2015) 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 (Gonzalez-Holland et al., 2017). Utility testing for the desktop and mobile apps were conducted among primary care physicians (PCP). They were requested to "think-aloud" (Eccles & Arsal, 2017) 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 (Thomas & Magilvy, 2011).

4.0 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. Based on this feedback, both apps were refined to improve their utility and usability. The mobile app contains 8 sections: My Profile, My Cardiovascular Risks, My Treatment Targets, My Check Up, My Weight Management, My Smoking Habit and

My Medication. The desktop app contains 7 sections which include: Home, About Us, Awards, Publications, Events, Contact Us and Management Section. The Management Section consists of 4 subsections: 1. Register New Patient 2. Reception 3. Check-Up Station 4. Consultation.

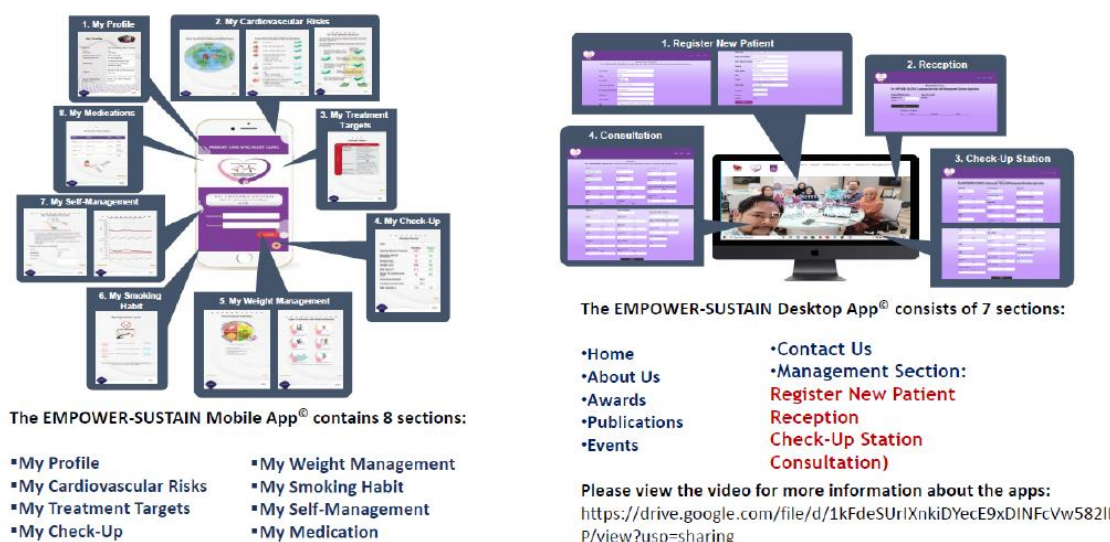


Figure 1: The EMPOWER-SUSTAIN Self-Management Mobile and Desktop Apps[®]

5.0 CONCLUSION

The EMPOWER-SUSTAIN Self-Management Mobile and Desktop Apps[®] are the most comprehensive and evidence-based apps available in Malaysia to empower patients and health care providers in managing multiple CV risk factors (hypertension, diabetes, hyperlipidaemia, overweight, obesity and smoking) to prevent heart attack and stroke. The apps are currently being used at a primary care specialist clinic. The EMPOWER-SUSTAIN Mobile and Desktop Apps[®] are ready for commercialization.

6.0 REFERENCES

- Saklayen, M. G. (2018). The global epidemic of the metabolic syndrome. *Current Hypertension Reports*, 20(2), 12.
- National Health and Morbidity Survey. (2019). National Health and Morbidity Survey 2019: Non-communicable diseases, healthcare demand, and health literacy. *National Health and Morbidity Survey (NHMS)*, Ministry of Health, Malaysia, 1-40.
- Lim, K. G., & Cheah, W. K. (2016). A review of metabolic syndrome research in Malaysia. *Medical Journal Malaysia*, 71, 20-28.
- Kennedy, A., Reeves, D., Bower, P., et al. (2007). The effectiveness and cost effectiveness of a national lay-led self-care support programme for patients with long-term conditions: a pragmatic randomised controlled trial. *Journal of Epidemiology & Community Health*, 61(3), 254-261.
- Ramli, A. S., Lakshmanan, S., Haniff, J., Selvarajah, S., Tong, S. F., Bujang, M. A., Abdul-Razak, S., Shafie, A. A., Lee, V. K., Abdul-Rahman, T. H. & Daud, M. H., (2014).

Study protocol of EMPOWER Participatory Action Research (EMPOWER-PAR): a pragmatic cluster randomised controlled trial of multifaceted chronic disease management strategies to improve diabetes and hypertension outcomes in primary care. *BMC Family Practice*, 15(151), 1-16.

Kvedar, J. C., Fogel, A. L., Elenko, E., & Zohar, D. (2016). Digital medicine's march on chronic disease. *Nature Biotechnology*, 34(3), 239-246.

Jamshidnezhad, A., Kabootarizadeh, L., & Hoseini, S. M. (2019). The effects of smartphone applications on patients' self-care with hypertension: a systematic review study. *Acta Informatica Medica*, 27(4), 263-267.

Kim, G., Lee, J. S., & Lee, S. K. (2021). A technology-mediated interventional approach to the prevention of metabolic syndrome: a systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 18(2).

Sequi-Dominguez, I., Alvarez-Bueno, C., Martinez-Vizcaino, V., Fernandez-Rodriguez, R., del Saz Lara, A., & Cavero-Redondo, I. (2020). Effectiveness of mobile health interventions promoting physical activity and lifestyle interventions to reduce cardiovascular risk among individuals with metabolic syndrome: systematic review and meta-Analysis. *Journal of Medical Internet Research*, 22(8), e17790.

Chen, S., Fan, L., Chen, C., Su, T., Li, W., Liu, Y., & Xu, L. (2019). Storydroid: automated generation of storyboard for android apps. In *IEEE/ACM 41st International Conference on Software Engineering (ICSE)* (pp. 596-607). IEEE.

Erguera, X. A., Johnson, M. O., Neilands, T. B., Ruel, T., Berrean, B., Thomas, S., & Saberi, P. (2019). WYZ: a pilot study protocol for designing and developing a mobile health application for engagement in HIV care and medication adherence in youth and young adults living with HIV. *BMJ Open*, 9(5), e030473.

Ali, K. (2017). A study of software development life cycle process models. *International Journal of Advanced Research in Computer Science*, 8(1), 15-23.

Wright, A., Aaron, S., & Sittig, D. F. (2017). Testing electronic health records in the "production" environment: an essential step in the journey to a safe and effective health care system. *Journal of the American Medical Informatics Association*, 24(1), 188-192.

Ruggiero, K. J., Bunnell, B. E., Andrews, A. R., Davidson, T. M., Hanson, R. F., Danielson, C. K., Saunders, B. E., Soltis, K., Yarian, C., Chu, B., & Adams, Z.W. (2015). Development and pilot evaluation of a tablet-based application to improve quality of care in child mental health treatment. *JMIR Research Protocols*, 4(4).

Gonzalez-Holland, E., Whitmer, D., Moralez, L., & Mouloua, M. (2017). Examination of the use of Nielsen's 10 usability heuristics & outlooks for the future. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 61(1), 1472-1475.

Eccles, D. W., & Arsal, G. (2017). The think aloud method: what is it and how do I use it? *Qualitative Research in Sport, Exercise and Health*, 9(4), 514-531.

Thomas, E., & Magilvy, J. K. (2011). Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing.*, 16(2), 151-155.