

FEASIBILITY IN USING MOBILE HEALTH  
APPLICATION AMONG CHRONIC KIDNEY  
DISEASE PATIENT ON HAEMODIALYSIS IN  
HOSPITAL UNIVERSITI SAINS MALAYSIA

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UNIVERSITI SAINS MALAYSIA

2021

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by

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Dissertation submitted in partial fulfilment of the  
requirement for the degree of Bachelor of Nursing  
(Honours)

JUNE 2021

## **ACKNOWLEDGEMENT**

First, I would like to say thank you to my supervisor, Mr Ali Aminuddin bin Mohd Rasani for his full guidance, support, suggestion and encouragement throughout the completion of this dissertation. Without his assistance and dedicated involvement throughout the process, this dissertation would have never been accomplished. Besides, I would like to thank Dr Norhasmah Binti Mohd Zain, the course coordinator for Research Project, GTJ 410/6 who has given me the help and support in finishing my study. Furthermore, I would like to thank the author of article “m-Health views and perception among Malaysia: findings from a survey among individuals living in Selangor” by Lee et al (2017) for the permission to use the questionnaire. Your study tool is instrumental in this study.

I wish to acknowledge the support and great love of my parents, Mr Che Johan bin Mhd. Amin and Mrs. Zarinah Binti Shahim Shah, my siblings and my friends for their constant moral supports. They kept me going on for me who have always been helping and encouraging me throughout the year.

I sincerely acknowledge the efforts of all those who have directly or indirectly helped me in completing my thesis successfully. I have no valuable word to express my thanks, but my heart is still full of the favours received from every person.

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## **LIST OF ABBREVIATION**

CKD	- Chronic Kidney Disease
NCD	- Non-communicable disease
Hospital USM	– Hospital Universiti Sains Malaysia

**KEBOLEHLAKSANAAN MENGGUNAKAN APLIKASI MUDAH ALIH  
KESIHATAN UNTUK PESAKIT CKD YANG MENERIMA  
HEMODIALISIS DI HOSPITAL USM**

**ABSTRAK**

Kesihatan mudah alih boleh menjadi alat penting untuk meningkatkan kesihatan penduduk, terutama bagi pesakit penyakit kronik. Walau bagaimanapun, kesihatan pengguna mungkin menghadkan potensi penuh aplikasi kesihatan bergerak. Tujuan kajian ini adalah untuk menilai kemungkinan penggunaan aplikasi kesihatan bergerak di kalangan penyakit ginjal kronik di Hospital USM. Kajian keratan rentas dilakukan yang melibatkan 100 peserta menggunakan persampelan bertujuan. Soal selidik menggunakan temu ramah secara bersemuka digunakan untuk pengumpulan data dari Februari 2021 hingga Mac 2021. Ujian korelasi Spearman digunakan untuk memeriksa hubungan antara tahap kemampuan dalam menggunakan telefon pintar dan tahap kesediaan dalam menggunakan aplikasi kesihatan bergerak. Hasil kajian menunjukkan bahawa majoriti 46% mempunyai kemampuan yang baik dalam menggunakan telefon pintar dan 78% bersedia untuk menggunakan aplikasi kesihatan bergerak. Terdapat hubungan yang signifikan dan kuat antara tahap kemampuan dengan tahap kesediaan dalam menggunakan aplikasi kesihatan bergerak ( $r = 0.4$ ,  $p < 0.05$ ). Kesimpulannya, maklum balas positif dari semua responden mengenai aplikasi kesihatan bergerak walaupun tidak semua responden dapat menggunakan telefon pintar sendiri tetapi mereka masih mahu menggunakan aplikasi kesihatan mudah alih untuk menguruskan kesihatan mereka di rumah.



**FEASIBILITY IN USING MOBILE HEALTH APPLICATION AMONG  
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**ABSTRACT**

Mobile health can be a significant tool for improving population health, particularly for chronic disease patients. However, the health of the users may limit the full potential of mobile health application. The aim of this study was to assess feasibility in using mobile health application among chronic kidney disease in Hospital USM. A cross-sectional study was undertaken involving 100 participants using purposive sampling. The questionnaire using interview face to face was used for data collection from February 2021 until March 2021. Spearman's correlation test was used to examine the relationship between level of ability in using smartphone and level of readiness in using mobile health application. The findings revealed that the majority 46% had good ability in using smartphone and 78% was ready to use mobile health application. There is significant, strongly, positive association between level of ability with level of readiness in using mobile health application ( $r=0.4$ ,  $p<0.05$ ). In conclusion, positive feedback from all respondents about mobile health application though that not all respondents able to use smartphone by themselves but they still want to use mobile health application for manage their health at home.

## **CHAPTER 1: INTRODUCTION**

### **1.1 Background Study**

Kidney disease is a non-communicable disease (NCD), which affects about 850 million individuals worldwide nowadays (World Kidney Disease, 2020). Chronic kidney disease (CKD) is encountered by one in ten people. CKD's global burden is growing, and by 2040, it is expected to become the fifth most common cause of years of life lost globally (World Kidney Disease, 2020). A significant cause of catastrophic spending on health is CKD. In high-income nations, the costs of dialysis and transplantation consume two to three percent of annual healthcare budget and spent on less than 0.03 percent of these countries' total population (World Kidney Disease, 2020).

Many people with kidney failure have limited access to lifesaving dialysis and kidney transplantation in low-income and middle-income nations. CKD affects 10 percent of the population worldwide, and millions suffer each year because they do not have access to affordable care. More than 2 million people worldwide are currently undergoing dialysis or kidney transplantation therapy to remain alive, but this can only account for 10 percent of people who truly need treatment to survive (National Kidney Foundation (NKF), 2020). The majority of the 2 million people who receive therapy for renal failure are treated in only five countries: The United States, Japan, Germany, Brazil, and Italy. These five countries account for only 12 percent of the global population (NKF, 2020). Only 20 percent of the people in roughly 100 developing nations, which account for more than half of the world's population, are treated (NKF, 2020).

Treatment with dialysis or kidney transplantation presents a significant financial burden for most people who need it especially in middle-income

countries. Many individuals in 112 other countries cannot afford treatment at all, resulting in the death of over 1 million individuals annually from untreated kidney failure (NKF, 2020). A nine-point zero seven percent prevalence of CKD in West Malaysia was shown in the National Health and Morbidity Survey (NHMS) in 2011. In Malaysia, CKD patient that requiring dialysis showed a rising trend with an incidence rate of 216 per million populations in 2016, compared to 96 per million populations in 2002 (Saminathan et al., 2020). At the end of 2016, a total of 37781 patients were on renal replacement therapy in Malaysia which at a rate 1159 per million populations that consuming an unsustainable amount of our national healthcare budget (Saminathan et al., 2020). In 2018, CKD prevalence was 15.48 percent in Malaysia, which is close to other Asian countries. Moreover, the prevalence of CKD varies, from 17.5 percent in Thailand, 17.2 percent in India, 15.6 percent in Singapore and 10.8 percent in China (Saminathan et al., 2020).

To avoid disease progression and to control symptoms, mobile applications are important components for people living with CKD (Kosa et al., 2019). Mobile applications (apps) are promising ways for people dealing with chronic health problems to provide health data and treatments. It is projected that 6.1 billion people worldwide will own a mobile phone by 2020 and 318000 health and fitness applications have been available on iTunes and Androids as of 2019 (Kosa et al., 2019). Nowadays, the number of smartphone users worldwide exceeds three billion and is expected to rise further in the next few years by several hundred million. The countries with largest number of smartphone users are China India and the United States with each country comfortably surpassing the 100 million user mark (Statista, n.d.).

Izahar et al (2017) reported that patient very good engagement and cost benefits of mobile medical apps used in diabetes mellitus patients with diabetes, comparative or randomized control trials are needed. In the meantime, treatment points should provide an introduction about how to integrate effective smartphone applications into patients' diabetes management. Not only are mobile apps educational and insightful, but they should be carefully designed for the target users, who are mainly elderly, to support and promote self-management. In addition, the adherence of patients can be strengthened by incorporating self-monitoring techniques that function better for groups of patients with a diabetes mellitus (Izahar et al., 2017).

Global scope, portability, fast learning, highly interactive user interface, and illustrations make educational resources very powerful for mobile apps. Sharing this experience of app creation will enable other medical educators to express their expertise in more creative ways, thereby helping to further in field of medical education (Bhatheja et al., 2018). Hence, mobile health application for CKD patient on hemodialysis very recommended because of patient can update their own health only in the apps everywhere and anytime. Other than that, CKD patient on haemodialysis need to take care themselves when at home about dietary, medication, fluid input and others.

## **1.2 Problem Statement**

Information and communication technology can be a useful tool for improving population health. However, mobile health's full potential can be limited by the health and technology awareness of users (Lee et al, 2020). Among the public and health care provider, the adoption rate of mobile devices and

tablets continues to increase (Bhatheja et al., 2018). However, this study explored access to digital technology, skills and experience, and preferences for accessing health information and advice among older adults using web-based and other digital technologies (Gordon & Hornbrook, 2018).

Using numerous health applications, the widespread use and use of mobile devices is opening new and innovative avenues to enhance health and health care delivery. In the preparation, tracking and achievement of personal health objectives, the Health Apps could be helpful and efficient (Singh & Alva, 2019). According Singh & Alva (2019), the smartphone has become more important in our daily life especially patient with chronic disease. Smartphones are becoming increasingly relevant in healthcare because of their versatility and potential, attracting the attention of researchers and developers of healthcare related to software. For topics such as physical activity tracking, patient monitoring, diagnosis and assessment, recent research has primarily centred on updating, evaluating and improving mobile applications (Singh & Alva, 2019). Mobile health is an electronic health (e-health) subclass, with the difference being that using a mobile device is required for mobile health (Pinem et al., 2020). For instance, Pinem et al (2020) share the aim of increasing both the quality and efficacy of medical staff in the provision of health services.

All the above-mentioned concerns have inspired the researcher to conduct a study on feasibility in using mobile application among CKD patients on haemodialysis in Hospital Universiti Sains Malaysia (HUSM). Otherwise, in Worldwide there is lack of research about this topic. Hence, the researcher wants to know more about this study. This study will give more benefit to CKD patient because it will be easy for them to self-managing about their disease.

### **1.3 Research Question**

- i. What is the level of ability in using smartphone among patients with CKD on haemodialysis?
- ii. What is the level of readiness among patients with CKD on haemodialysis in using mobile health application?
- iii. Is there any relationship between level of ability and level of readiness among patient with CKD on haemodialysis in using mobile health application?

### **1.4 Research Objective**

#### **1.4.1 General Objective**

To determine feasibility mobile health application among CKD patient on haemodialysis to use mobile health application in Hospital Universiti Sains Malaysia.

#### **1.4.2 Specific Objective**

- i. To identify level of ability among CKD patient on haemodialysis in using smartphone.
- ii. To determine level of readiness in using mobile health application among CKD patients on haemodialysis in HUSM.
- iii. To assess relationship between level of ability and level of readiness among CKD patient on haemodialysis in using mobile health application.

## **1.5 Hypothesis**

Null hypothesis: There is no significant relationship between level of ability and level of readiness among CKD patient on haemodialysis in using mobile health application.

Alternative hypothesis: There is significant relationship between level of ability and level of readiness among CKD patient on haemodialysis in using mobile health application.

## **1.6 Significant of the Study**

This study about to determine level of ability in using smartphone and readiness mobile health application among patient with CKD receiving haemodialysis in Hospital USM and to assess relationship between level of ability and level of readiness among patient with CKD receiving haemodialysis in using mobile health application.

This study may contribute the benefit in increasing the level ability and level of readiness for health in our country by using mobile health application and thus can make a patient that are more aware, understanding, and supportive towards people with CKD. Hence, the feasibility towards mobile health application can be develop more.

This study also able to make we become more welcoming and nurturing for the people with CKD or any long-term disease. Which is expected to help patients with the disease improve their quality of life.

## 1.7 Conceptual and Operational Definition

*Table 1.1: Conceptual and operational definition*

Term	Conceptual	Operational
Feasibility	<p>Feasibility is the possibility that can be made, done, or achieved or is reasonable.</p> <p>(Cambridge English Dictionary, n.d.)</p>	<p>For this study feasibility can refer to the probability of mobile application to be used by CKD patient on haemodialysis.</p>
Mobile application	<p>Mobile application is a type of application software designed to run on a mobile device, such as a smartphone or tablet computer, most referred to as an app.</p> <p>Mobile apps also serve to provide consumers with services that are close to those accessed on PCs. Small, individual software units with limited</p>	<p>For this study, feasibility of mobile health application as a guide to the study.</p>



	functionality are usually apps. ( Techopedia, n.d)	
Chronic Kidney Disease	<p>Chronic kidney disease is the progressive loss of function in the kidneys. The kidneys flush out waste from blood and excess fluids which are then excreted into urine. Dangerous amounts of fluid, electrolytes and waste will build up in body when CKD reaches an advanced stage.</p> <p>(Mayo Clinic, 2020)</p>	<p>In this study, CKD patient on haemodialysis at Hospital Universiti Sains Malaysia will be the respondent of this study.</p>
Haemodialysis	<p>Haemodialysis is treatment in which the blood is cleaned by a dialysis machine and a special filter called an artificial kidney or dialyzer. The doctor must make an access or entrance</p>	<p>In this study, patient who receiving haemodialysis in Hospital Universiti Sains Malaysia.</p>

	<p>into blood vessels to get blood into dialyzer.</p> <p>(World Kidney Disease, 2020)</p>	
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## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter reviews the current literature related to feasibility in using mobile health application for patient with CKD receiving haemodialysis as well as relationship between level of ability and level of readiness. The literature search was done by using main keywords include level of ability in using smartphone, level of readiness in using mobile health application and relationship between level of ability and level of readiness.

### **2.2 Patient's Ability in using Smartphone**

According to Gordon and Hornbrook (2018), efforts to develop e-health skills and adjust preferences among these adult members aged 65 to 79 (senior) of Kaiser Permanente Medical Care Program (KPNC) in Northern California who already have convenient access to digital devices and the internet would be more feasible for health care and community groups than resolving financial and other obstacles to patient access to the internet and digital devices. It has been seen in personal training programs that can be cured in libraries and community centres to improve the use of the internet for seniors to access health knowledge and advice. Instructions on how to use search engines, download and print materials, complete online forms, and use the website and patient portal of a health plan should be accessible as downloadable pdfs or hardcopy print materials, not just web-based guides that are hard to refer to while attempting to execute the tasks (Gordon & Hornbrook, 2018)

The outcome of Lee, Wong, and Lee (2020) research is consistent with

previous studies that found that the younger generation who grew up with technology were more likely to use technology to treat their health problems. Moreover, because younger respondents were more technology-savvy than their older counterparts, this makes it easier for the younger population to embrace technology as new technologies are implemented. (Lee et al., 2020).

Respondents stated that in different aspects of their health, such as keeping a balanced diet, taking their medication, exercising regularly, attending routine medical check-ups, or addressing their emotional needs in relation to their disease, they did not believe they had received enough support from their friends and relatives (Lee et al., 2020). A significant proportion of respondents have indicated inadequate compliance with their healthcare providers' orders, with 30.3% of respondents stating that they stopped their medication when they felt better, while 24.5% of respondents stopped their medication when it made them feel worse (Lee et al., 2020).

### **2.3 Patient's Readiness in using Mobile Application.**

The researcher only measures the readiness of the elderly to engage with these emerging interactive channels for health-related purposes in late 2013-2014 about readiness. The researcher conducted a survey of older adults in the Northern California health plan of Kaiser Permanente on access to skills and knowledge in the usage and preference for online and mobile modalities (Gordon & Hornbrook, 2018). This has been found for seniors as a whole and for anyone who can access the internet together or with assistance.

According to Gordon & Hornbrook noticed in their study noticed that from study Lyles and colleagues from 2016 concluded based on focus groups

conducted with black and Latino participants of the same health plan that many people did not feel that they could grasp information given by online contact alone adequately (Gordon & Hornbrook, 2018; Lyles et al., 2016). Blacks, Latinos, Filipinos and older seniors are also less likely to be able or willing to learn about or watch online health videos than whites, Chinese and younger seniors, as well as being less interested in receiving health newsletters. Less than 10% of all seniors and less than 20% of consumers of mobile devices are interested in using health-related apps and only about 5% are interested in listening to podcasts or entering online chat rooms (Gordon & Hornbrook, 2018; Lyles et al., 2016).

We noticed that younger people aged 39 and under, those with higher education status and those who owned 2 or more mobile devices were more involved in their everyday lives in adopting and using mobile health and health-related applications (Lee et al., 2020).

The medication reminder, tele monitoring and teleconsultation services are the most common health services or application they can use (Lee et al., 2020). In addition, these respondents reportedly showed a lack of interest in embracing and learning to care for their health through newer technologies such as mobile health. Therefore, in any future policy implementation, this needs to be considered, because most respondents thought that the existing traditional monitoring approaches were the best option for them (Lee et al., 2020)

In the Lee, Wong, and Lee (2020) survey, only one out of every five respondents reported using any health-related application/mobile health device. Adherence aids, or an application that was pre-installed with their glucose meters for self-efficacy for example receiving data, lifestyle advice, were the most used

unit. Most respondents also indicated that they had little knowledge of mobile health or mobile health devices but were willing to use these devices if respondents (42.7 percent) were given at no cost. Interestingly, the advantages of making the device more user-friendly were very limited as respondents indicated that their desire to use the device would not increase (Lee et al., 2020).

## **2.4 Relationship between Ability and Readiness.**

Kosa et al (2019) findings suggest that a mobile application based on engaging patients and promoting safe CKD self-management could be helpful in enhancing adherence to sodium, potassium, phosphorus, protein, calories, and fluid dietary restrictions. Kosa et al (2019) findings are consistent with those of Campbell and Porter, who found in their systematic analysis of five studies that in a CKD population there is "potential for therapeutic benefits of dietary mobile app interventions." In addition to supporting people living with CKD, mobile apps may also act as a knowledge translation tool to provide trustworthy information to friends and family members (Campbell & Porter, 2015; Kosa et al., 2019).

For this study, systematic review showed that not only behavioural and dietary effects, but also patient-reported usability and feasibility have also informed the creation and testing of apps. In order to study apps in paediatric and adolescent populations, how to resolve various types of learning styles to use apps effectively, and how and to what extent for apps can complement the work of teams of health care providers to optimize dietary adherence, future research is needed (Campbell & Porter, 2015; Kosa et al., 2019). The outcomes of the pilot studies included provide a framework for future research that should use more

rigorous design of the study and study larger and more representative samples (Kosa et al., 2019).

Preliminary data on the effects of a mobile app on Intradialytic weight gain, dietary and fluid intake habits, self-efficacy, perceived control, and perceived benefits among patients with haemodialysis were collected, according to Welch et al, (2013). We also collected data for users on the acceptance potential of the application. The key results of this study were that the implementation of dietary intake monitoring (DIMA) was a viable and appropriate intervention that had a marginal impact on some aspects of dietary and fluid intake. Before being evaluated in a larger sample, DIMA requires more refinement to boost use. (Welch et al., 2013).

Findings from Ebenfeld et al (2020) study suggest that supplementing a cognitive behavioural therapy training for panic disorder with a mobile application has the potential to improve adherence, usability, usage as well clinical outcome of the training. From a patient's perspective, using the app seems fun, is engaging and facilitates daily routines during the training such as performing interceptive exposure exercises or monitoring anxiety or depressive symptoms daily. In contrast, measuring data that is less predictable and more event-related was perceived as more difficult (Ebenfeld et al., 2020).

Lee, Wong, & Lee (2020) reported that usually younger and healthier, these factors could possibly explain the lack of urgency to maintain their health leading to the lacklustre uptake of mobile health. A low inclination on the use mobile health amongst baby boomers was expected as respondents' view that the use of technology was unable to improve their health compared to conventional methods (Lee et al., 2020). Furthermore, these respondents reportedly showed a