Article 1

Construction of i-KCare: Kidney Failure Self-Care Multimedia Courseware

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Abstract
Kidney failure is a condition where the kidney is unable to function normally. Currently, most of kidney failures patients are not aware of the importance of at home self-care and this may affect their health and consequently, sooner or later it will decline. The patients should be conscious of their proper diet, daily activities that they can perform, and other related information to avoid their kidney from worsening. The kidney failure patients need to understand all this information to help them in taking care of themselves at home. Thus, this multimedia courseware is designed and constructed for these patients to increase their knowledge and awareness on the disease. This project has applied one of the System Development Life Cycle (SDLC) models, which is Prototype Model and it had been tested using Acceptance Test and Heuristic Test. The participants for the tests are kidney failure patients, their family members, and nurses in dialysis centers. This courseware is expected to increase their knowledge and awareness on the disease, hence, helping them to have a better self-care at home.

Keywords: kidney failure, self-care management, multimedia courseware

Introduction
In 2014, World Health Organization (WHO) states that kidney failure is one of the diseases that causes the death rate to arise annually since the last 20 years, and currently, obesity is one of a compelling risk factors for the development of kidney disease. It escalates the risk of developing major risk factors of Chronic Kidney Disease (CKD) (World Health Organization, 2017).

A general term for kidney disease is heterogeneous disorder that gives impact to the function and structure of the kidney (Levey & Coresh, 2011). The kidney function is very important, to clean and filter blood, control blood pressure and keep the bones strong. Most people are not aware and do not realize the importance of having healthy kidneys and, what are the factors and symptoms of kidney failure.

Kidney failure patients are required to undergo kidney dialysis to survive, either through hemodialysis or Continuous Ambulatory Peritoneal Dialysis (CAPD). However, Clarkson and Robinson (2010) found that dialysis that is accompanied by restriction of dietary, fluids intake, fatigue and other causes that might limit the patients' activities. The patients should know what activities that they can do or cannot do to avoid their kidneys from deteriorating. Besides, there is a big challenge in improving their wellbeing with healthcare costs reduced (Coughlin, Pope, Leedle, 2006).

To help increase the public's awareness, a courseware has been developed to spread information about kidney failure and it is expected that the patients will have a better understanding of their health status, be more alert when a problem occurs, and pay less visit to hospitals. This courseware has utilized multimedia elements as multimedia technology can

excite people to produce strong interest in learning (Chen, 2012), thus leading to better understanding.

Background of Research
Some people who are suffering this disease are unaware of the importance of having good self-care at home. They need to know information about dietary habits, choices for treatment and symptoms (Ormandy, 2008), the activities that they can and cannot do. Self-care means that patients take care of their health and well-being on their own, while accepting support from people whether they are involved or not in the patients' care management (Ong, Jasal, Porter, Logan, Miller, 2013). Knowing the importance of self-care is the key to the exploration to a better quality of life for these patients (Sato, Yamamoto, Hirakawa, 2011). Self-care could enhance compliance with medical level, stimulate, aware of the early physical changes and facilitates the patients' autonomy (Hagger & Orbell, 2003; Lorig& Holman 2003). It is vital for the patients to know about dietary habits and activities or routine that they should do or avoid as it may affect their health. For example, food intake including grains, fruits and vegetables are essential, but they need to limit or avoid whole grains and certain fruits, and not to drink too much water as these can harm them, and so on. The patients need to know this information as a precaution to maintain and take care of their kidneys and their current health.

They need to know about kidney failure disease to understand more about the disease and help them to have a better self-care at home. Therefore, a multimedia courseware was developed as one of the ways to improve the understanding about kidney failure. Multimedia technology has been integrated in this courseware and it means a technology that included different types of information such as text, animations, videos, images, sounds, or graphics by using computer are included to establish human-computer interaction and logical relationship (Chen, 2012). Multimedia can influence users to have strong interest in gaining knowledge. These multimedia elements were used in the courseware design and developed with the aims to help people increase their awareness and gain knowledge about kidney failure disease and help the kidney failure patients to have a better self-care at home. This project is a significant endeavour in improving the kidney failure patients', and the other users' knowledge and awareness about kidney failure, thus helping them to have a better self-care at home. Other than that, the users' family members also can use the courseware to learn more about the disease.

Related Works
i. CAPD (Continuous Ambulatory Peritoneal Dialysis) eBook
This eBook is developed to help the patients to adapt CAPD in their daily life by using multimedia elements, for example text, sound, animation, and graphics to make its users easier to learn during the learning process (Rosmani, Shalahudin, Ahmad, Ismail, 2012). CAPD is one of the treatments that kidney failure patients can choose to eliminate wastes from their body, such as extra water and chemicals. It is a continuous treatment that has four to five dialysis exchanges daily, which connects tubes and solution bags to manipulate the gravity to fill and drain the peritoneal cavity (Zabat, 2003). One of the advantages of this application is that it can help the kidney patients to learn and perform CAPD. By adapting the Persuasive Technology principles, this application is able to enhance its users' learning process. This is proven based on the results of the tests. For the usability test, it was conducted to measure the multimedia application criteria, such as, objectives of the application, content, interactivity, interfaces, sound and navigation. Most of the results gained the mean value 4.20 and above.

On the other hand, according to the Heuristic Test result, 33.3 percent of the participants chose "strongly agreed", and 66.6 percent chose "agreed" for the effectiveness of the Persuasive Technology principles adaption. However, one of the disadvantages of this application is it is in the Malay language. Non-Malay who do not understand Malay may find it difficult to understand the application content. The content should be in English or both Malay and English.

ii. i-KS: Composition of Chronic Kidney Failure Disease (CDK) Online Informational Self-Care Tool

This courseware aims to develop a multimedia application that will help kidney failure patients by providing guidelines in managing themselves. The guidelines are essential to monitor the patients' health and to make sure they can live like normal people (Rosmani, Mazlan, Ibrahim, Zakaria, 2015). Two tests were used to evaluate this application, which were Usability Test and Heuristic Evaluation, to make sure it meets its goals. This courseware offers a user-friendly courseware as the interfaces are attractive and easy to understand. This will ease users whether elderly or young people to understand and use the courseware. By providing attractive and understandable interfaces, it also attracts users' attention to learn more. However, it demands users to use internet access and it will be difficult to use if there is no internet access or slow internet connection.

Methodology

To develop the courseware, one of the SDLC models is chosen. The chosen model is Prototyping Model (Kumar, Zadgaonkar, Shukla, 2013), and this model was mapped to the methodology. The basis of this model has six phases, which are requirement gathering, quick design, building prototyping, customer evaluation, refining prototype, and engineer prototype. Prototype models provide flexibility for the users as they always interact with the developer. Hence, this reduces risk of failure, as potential risks can be identified early and actions can be taken to remove that risk (Ji & Tiwari, 2015).
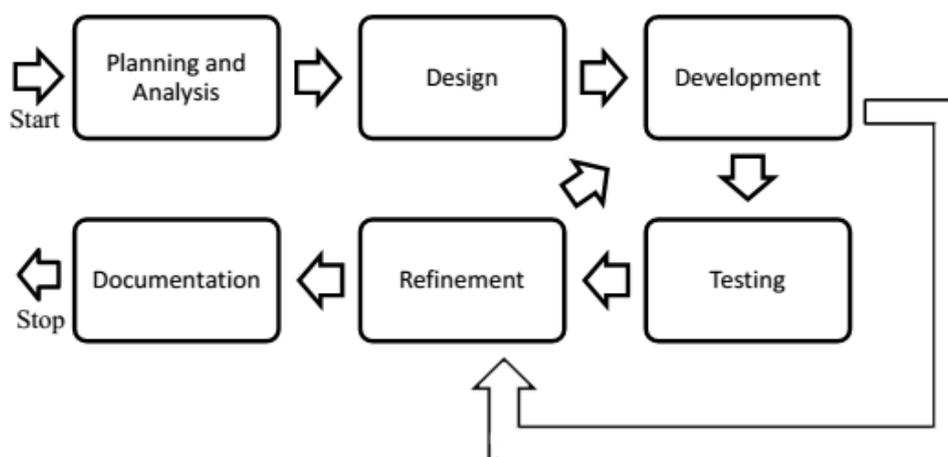

Figure 1: Methodology (based on Prototyping Model)

- Planning and Analysis: Find information about kidney failure and understand the user requirements.
- Design: Change the requirements details description into structure.
- Development: Create a flow chart and storyboard to design the multimedia courseware interface and its content.

- Testing: Users will evaluate the courseware and give feedback.
- Refinement: Refine the entire design and development. If there are errors or problems, the problems or errors need to be solved.
- Documentation: Document all the activities as a project report

Though, this paper will focus only on the main part of this courseware which is the design and development phase.

i. Storyboard Design

Storyboard is a graphic organizer, such as a sequence of illustrations or images, showed in series (Rosmani, Wahab, 2011). Storyboard was created in design phase to demonstrate the idea visually and as guidance for development phase so that the development process will be maintained on its track. It gives us ways to make decision on how we will control and manage the project. This storyboard was created using sketchbook, based on information collected before proceeding with the development phase.
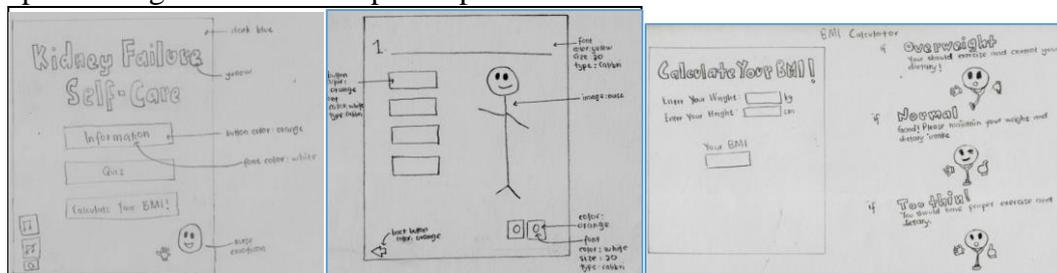

Figure 2: Storyboard examples

ii. Project Development

In the development phase, some information needed was collected for this multimedia courseware to make sure that it meets all the requirements. The information collected was gained through the internet, and a hospital. After that, the design phase began by sketching the interfaces using a sketchbook and a pencil. Then, the development phase was started using Adobe Flash software.

There are 3 main sections in this courseware as shown in Figure 3 below which are: 1) Information section, 2) Quiz, and 3) BMI Calculator
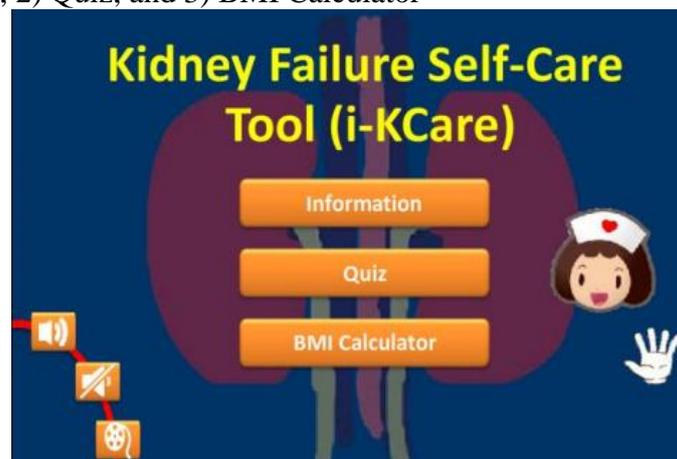

Figure 3: Main Sections of Kidney Failure Self-Care Tool (i-KCare)

This is the home page where users can choose whether to click on "Information" to know about kidneyfailure disease, "Quiz" to answer few questions about kidney, and "BMI Calculator" to calculate BMI.

i. Information Section

In the information section, as shown in Figure 4, users can choose which kidney disease information they want to read. They can read about what kidney failure is, kidney failure factors and symptoms, people who tend to get the disease, ways to detect it and its effects if it is not detected early, ways to prevent it, activities the patients can do, food that they can and cannot eat, and information about blood test.
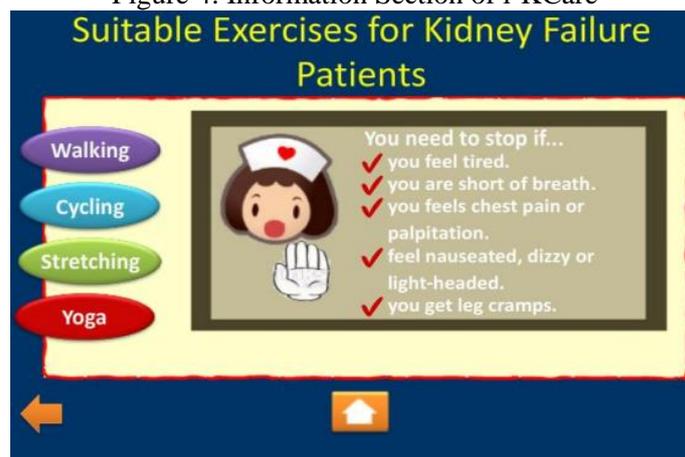

Figure 4: Information Section of i-KCare

Figure 5: An example of information in Information Section in i-KCare

This is one of the interfaces for the kidney information section and it allows users to click the home button to go back to the home page, back and next buttons to go to the previous page and next page.

ii. Quiz

The front page for "Quiz" is as shown in Figure 6. When users click on "Start Now!" button, it will start the quiz. The back button will go to the home page. For this page, users choose the answer by clicking on one of the answer provided. The next button will bring users to the next question, and the back button will bring users to the previous page. The quiz section will automatically calculate marks for the correct and false answers.

Figure 6: Quiz

iii. BMI Calculator

BMI calculator will calculate its users' BMI weight. Users need to insert their height in centimeter (cm) and weight in kilogram (kg). Then, users need to click on "Calculate" button to know the result. The result will show in the result text box as shown in Figure 7.
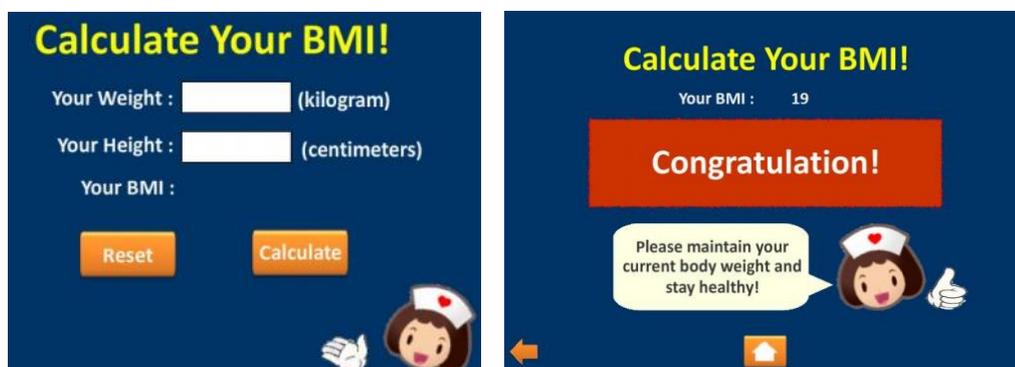

Figure 7: BMI Calculator

Findings and Discussion

To identify users' feedback and suggestion about this project, 2 tests were conducted, which were Heuristic Testing and Acceptance Testing. Heuristic Test was conducted on UiTMCawangan Perlis lecturers from Computer Science Department and Acceptance Test, was conducted on a few non-patients and patients of Zaharah Dialysis Centre, which is located in Kangar, Perlis.

i. Heuristic Test

It is a method where a group of experts evaluate a user interface for design problems based on usability principles or heuristics (Manzari& Christensen, 2006). By conducting this evaluation, developers can gain early feedback during the design process (usability.gov, 2017). Thus, this testing can help in improving the user interfaces and the ease of use to the courseware users. This evaluation is conducted with the help of four examiners, who are lecturers of UiTMCawanganPerlis. The examiners are given some time to use the courseware and after that, they were given a questionnaire to answer. The examiners agree that most of the contents, text, colours, and images used are appropriate.

Here are the percentages of users' satisfaction based on the appearance of i-KCare. 75% of the participants agreed that the objectives or goals are clear, 50% agree that i-KCare employed a clean and simple design, pleasing colour scheme, and consistent in the used of text and colour.

Next, 25% of them agree that the courseware's icons were easily understood, the images usedwere meaningful and purposeful, and all the users strongly agree that the design is consistent. From the result, most users were satisfied with i-KCare appearances. Next is the results on text used, 50% agree that text used is minimum, buttons are clear and follow its convention, and it was easy to find needed information. Other than that, 25% of the respondents agree that the title is easy to understand, and the terminology used is clear and finally,75% of them strongly agree that the courseware load easily, support undo and redo, and easy in finding related information.

Conclusion and Recommendation

In conclusion, most of the users, including both patients and non-patients, were satisfied and they did not have any problem to use i-KCare and strongly agree that the courseware can deliver positive impacts in their daily life, thus, it shows that this project has achieved its objective, which is to increase knowledge and awareness about kidney disease. Hence, hopefully this project can give benefits to its users by helping them enhance their knowledge and awareness, and have a better self-care at home. Some of the recommendations for future works are to provide multiple languages that can be chosen by its users as some of the users might not understand English, especially the elderly, more interactivity with its users, and use of more pictures instead of text as users might get tired of reading and a commercial look for its use in the health industry.

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