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Developing Mobile Application for Asthma Self-Management and Education

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Abstract

Asthma is one of the common chronic diseases in the world. The condition results from the inflammation in the airways and in the lungs, causing difficulties in breathing. Other symptoms associated with asthma include severe coughing and wheezing. As a long- term condition, self-management is the most ideal and recommended practice that the patient adopts to control the condition. With proper self-management, the patient can live for a long time with the disease without much worries. Asthma patients are supposed to visit the health educator for instructions on how to manage the ailment on their own. Unfortunately, most patients do not see the need for seeking health education. This tendency increases the prevalence of the disease and its rate of morbidity.

To address this issue, adoption of the technology solution is acceptable approach. The study uses internet search to gather relevant literature suitable for analyzing this particular topic. After thorough scrutiny of materials, it is clear that asthma patients require persuasive intervention to develop consistency in self-care. Features of the said persuasive technology should fit the preferences of the user to make it acceptable. The system should have features that allow users to interact with it and obtain positive outcome.

keywords: "asthma management" and "attractive technology" as primary keywords, "self-management strategies" and "childhood asthma" as secondary keywords, and "mobile applications" and "mHealth systems" as supplementary keym,,.words

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1. Introduction

Asthma is one of the chronic diseases that affect people across the world, which results from lung and airways inflammation diseases and causes Bouts of breathlessness, harder for a person to breathe in and out, coughing and wheezing (Whitehead & Seaton 2016). In Saudi Arabia, over 2 million have asthma (Almutairi, Vlahu-Gjorgievska and Win 2024). In Australia, significant percentage of the population has asthma. It is estimated that 1 out of 10 people has asthma (Weber et al. 2017).The exact cause of asthma is currently unknown, although researchers think that one of the major contributors to disease development merely is genetics. Like other chronic health conditions, people whose family has a history of asthma are at a risk of contracting the condition. Also, respiratory complications at early stages of development can cause asthma. Exposure to some toxins in the air was also considered as a potential factor. Asthma attacks or symptoms can be avoided by avoiding trigger materials. For most people, symptoms may appear through exposure to things like pollen, pet droppings, or large amounts of dust. Exercise is also known as cold air and common problems. Indeed, this chronic disease can affect anyone at any age, although most cases develop during childhood (Arrieta et al. 2015).

There is no particular medication for curing asthma; the patient survives by managing the disease through the assistance of a health practitioner. The care provider and the patient use inhalers to administer asthma drugs. It is known that the most common inhaled species is the bronchodilator antigen. Beta stimulants are used to provide quick relief for a cough, wheezing, and chest tightness associated with asthma. These stimulants eliminate inflammation by relaxing the bronchial muscles, hence allowing smooth passage of air to the lungs through the airways. One or two inhalers can be taken every 4 to 6 hours to ensure that the symptoms ca lm down and stop any discomfort. If the inhaler fails to perform its intended function, symptoms persist or worsen; it is strongly recommended that you take a trip to the hospital. There is strong evidence that self-management can help patients to prevent and manage complicatio ns, optimize control, clinical outcomes, and improve quality of life (Cole-Lewis et al. 2016). In nutshell, Self-management is critical for those patients who living with Asthma.

There is no solution for asthma. However, many people can control the condition and lead an ordinary and dynamic life. Currently, with the development of communication and information technology, there are tools that aid patients and their care providers to manage the disease appropriately. In this case, there are support tools that facilitate patients to enhance the management of chronic disease (Cole-Lewis et al. 2016). Obviously, there are many of informatics tools that could help Asthma patients to improve their management. The purpose of this report is to propose a technology solution for asthma management for consumers to improve their management regarding both medical treatment strategies, education and self-care management strategies that are developmentally appropriate for patients with asthma.

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2. Methodology

2.1 Search methods

In this report, the researcher utilized the internet to collect and identify scholarly articles that would be relevant and suitable references for this particular research. The potential related studies that have been published between 2001 and 2024 were searched. During the study, the researcher utilized the following keywords: "asthma management" and "attractive technology" as primary keywords, "self-management strategies" and "childhood asthma" as secondary keywords, and "mobile applications" and "mHealth systems" as supplementary keywords. After gathering relevant articles from academic databases, the researcher scrutinized and read these scholarly works in details to understand the content before undertaking the critical analysis and review. In this regard, the study will propose a technology solution for self-management of asthma on the basis of literature review.

2.2. Inclusion and exclusion criteria

2.2.1 Date of publication

The selection of the sources was focused on the articles published between the periods 2003 and 2024.

2.2.2 Intervention type

The applications and web based which used technology solution to diagnose, manage, and treat on Asthma disease.

2.2.3 Articles type

The report focused only on journal articles and handbook form government website.

2.2.4 Type of Language

Only articles published in English language were included in this study.

2.3 Exclusion criteria

Articles were excluded by determining whether they were related to the addressed topic or not. Next, the more relevant references were analyzed, and then duplicate sources were eliminated. After reviewing the remaining sources, thirty-two (32) were eligible. Finally, Twenty nine (29) articles were included in the final analysis of this study.

2.4 Results

The bibliographic review comprised of twenty nine (29) scholarly works, which qualified as references for this particular study. Seven articles (Mosnaim et al. 2012; Orji et al. 2017; Orji et al. 2014; Rhee et al. 2014; Silva et al. 2018; Whitehead & Seaton 2016; Wicks et al. 2012) reflect the using mobile technology in aiding self-care among patients. These articles advocates for adoption of mHealth techniques to improve self-management and reduce negative patient outcomes. Whereas, the rest of some articles focus on the prevalence of asthma among children

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and young adults in their adolescence age. They depict the applicability of mHealth approaches in improving self-management of asthma among children and adolescents. Other articles provide insight on application of technology in healthcare management. From online search, adoption of mobile technology for improving self- management of chronic ailments such as asthma seems to take the centre stage. Majority of scholars argue for the use of technology to improve self-care among patients hence curbing the rising prevalence of chronic diseases in the world.

3. Critical analysis of literature

3.1 The importance of self- management

Patients undertake self-management as a way of making life bearable despite having the chronic ailment. This task enables the patient to carry out other duties in day to day life (Pinnock et al. 2015). In this study, internet search focused on this description of the term "self-management" when selecting articles, with qualified and potential criteria for including the mobile application intervention system in the management of chronic diseases. Value drivers are defined as entities that have increased the user's product value (Shegog et al. 2001). For example, utilization of mobile application in asthma management helps to enhance patient commitment, improved and access to care with lower health costs. Analysis of the pertinent challenges and existing gaps in the management of asthma is used to determine assistance that patients should receive from the health educator. As a result, the overall goals and objectives of a specific digital or mobile intervention program were found to contribute significantly to improving asthma management.

3.2 Use of Mobile Applications to Enhance Self-Management

Several Scholarly articles advocate for the use of mobile health (mHealth) applicatio ns in managing asthma among patients. (Australia 2014; Hollenbach, Jessica P et al. 2017)argue that mobile technology is a significant invention for enhancing care for childhood asthma. The literature demonstrate how the mobile application provides real-time data, which enables clinicians to make more accurate decisions in the course of delivering care to asthma patients especially children. Also, mobile technology is a solution to adolescents' adherence since it counters forgetfulness and inattention (Rhee et al. 2014). Furthermore, the mobile technology is likely to facilitate long-term partnership between patients and care providers. The technology provides relevant information that clinicians require to deliver personalized care (Hollenbac h, J. P. et al. 2017). Hui et al. (2017) argue that mobile applications support self-manage ment hence reducing morbidity rate associated with asthma. The technology engages the attent ion of patients and encourages adherence to the prescribed medication and preventive measures. Hsia et al. (2018) seek to investigate the relationship three variables; age, asthma knowledge, and asthma outcome. The literature established that asthma-Educator mobile applicatio n increases knowledge and improves outcome among patients. In particular, younger patients respond positively to the use of mobile applications compared to old patients.

Monitoring asthma is an essential part of self-management. Holtz and Whitten (2009)

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demonstrate that mobile phones can be useful tools for effective management of the disease using short message system. Scholars state that mobile application increase knowledge about the disease and short messages enhanced adherence among patients. Hosseini et al. (2017) state that use of mobile health technology is an essential approach towards alleviating systems and manage asthma. Utilization of mhealth systems enable the patient to note the change in environment that would increase attack, hence preparing the patient in advance. The wireless sensing system increases adherence and compliance, which facilitates accuracy in self-management of the disease. Silva et al. (2018) point out that mhealth application increases adherence to self-management. The research proposes the implementation of mobile health applications to enable patients to manage the disease.

3.3 Web-based Systems for Asthma Management

Two references evaluate the use of web-based technologies in enhance self- management of asthma and increase knowledge on the disease. Coughlin et al. (2017) states that patient web-portals enables easy access to information that aids in disease manageme nt. The portal is password-protected to facilitate privacy of patients' information. Also, the bibliography presents the availability of patient-centered information as the main benefit of web-portals, an element that enhances self-management of asthma. Al Rayssi et al. (2017) discusses the use of web-based systems to alert patients on the environmental risk that would affect their health conditions. HelpMeBreath is a web-based system that collects data from weather stations and relays the information to the patient. With this system, the patient is able to manage asthma condition.

3.4 Relevance of mHealth Technology in Self-Management of Asthma

Proper control of asthma requires strict adherence to self-management among patients. Hollenbach, J. P. et al. (2017) admit that low adherence is the main factor associated with high morbidity and prevalence of asthma. Low adherence contributes to 1.8 million visits to the emergency hospitalization and high budgetary allocation in United States. Introduction mHealth applications helps to address the challenge of adherence to self-management of asthma. Hui et al. (2017) implies that high rate of morbidity across the world is as a result of low adherence. Scholars states that self-management reduces the morbidity rate significant ly. According to this article, mobile application serves the purpose of enhancing adherence since it engages patient's attention and provides vital information that aids self-manageme nt. Scholars add that mobile apps have become increasingly acceptable and people use them to monitor their health.

Coughlin et al. (2017) present the relevance of web-based patient portals and how they enhance uniformity of information relayed to patients. The research demonstrates that use of web portal enables patients to access vital information on their health, which facilitates self- medication. In this literature, access to information on self-management guidelines forms the basis of research. According to Hsia et al. (2018), patients who have adequate information on their health are more likely to adhere to self-management. This study, therefore, insinuated that the major role of mobile applications is to provide information that would lead to adherence. Al

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Rayssi et al. (2017) single out the issue of access to information as the main factor that contributes to self-management. The article presents web-based system that provides information that aids asthma patients to take proactive measures for managing their health condition.

Besides providing information, cost of care is another factor that contributes to low adherence. Holtz and Whitten (2009) point out that use of mobile technology to manage asthma is affordable to all patients. The research argues that mhealth systems addresses the issue of cost of self-management of the disease, hence reducing prevalence rate and increasing adherence. Hosseini et al. (2017) view that mobile health is an approach that helps patients to access critical information that would enhance adherence. With the availability of mobile apps across the world, the research depicts that mHealth technology enhances patient education, adherence to prescribed medication, as well as accurate monitoring of the disease. Silva et al. (2018) view that mobile-based systems are essential tools for self-management of diseases among low-income populations. It allows patients to access information that helps them to get knowledge on disease management. In a nutshell, use of mobile phone applications to manage health has enabled people from poor backgrounds to enhance self-management, hence addressing the challenge of low adherence and high prevalence of diseases such as asthma.

4. Theoretical prospective

Technology solution is one of the recommended interventions that provides guideli nes for asthma management, whose compelling evidence in self-care among patients (Lee et al. 2010). Recent scholarly works advocate for the adoption of interventions that support and motivate patients towards self-management. Technology approach is therefore an ideal solution for challenges of asthma management. Studies analyzed indicated that adoption of technology solution is a viable option, which enhances self-management among patients with asthma. Technology interventions, such as mobile applications and web-based systems, facilitate enhancement of knowledge on asthma hence ensuring patients understand the condition better and become aware of the need to control and manage the condition. Such patients are better equipped with relevant information that help them make right decisions on the asthma self-care. Moreover, using technology solutions for Asthma self-management can be success by implementing some necessary strategies that includ ing, monitor, identify problems, implement solutions and evaluate as shown in table 1 below (Shegog et al. 2001). Therefore, this paper stat that self-management is the key in the treatment process of chronic illness such as asthma. Moreover, this self-management will be achieved with the support of technological solutions such as mobile and web applications.

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Monitor	Identify problems	Implement solutions	Evaluate
■ Screening asthma symptoms in reference to medical criteria by use of object metrics. Object metrics monitor symptoms and compares with personal health data. ■ Monitoring of personal environmental incentives ■ Monitor and compare asthma management efforts with Personal standard	■ Use monitoring to determine when a problem exists.	■ Maintain regular appointments with healthcare providers ■ Perform on the basis of asthma self-management action plan. ■ Preserve the asthma drugs for medication of the disease as per the prescription. ■ Maintains the recommended level of exercise for patients with asthma. ■ Modifies drugs, on the basis of both symptoms and environment, which includes drugs for rescue according to doctor's prescription. ■ The technology solution helps to eliminate factors that trigger asthma symptoms. ■ The technology alerts the patient and notifies the healthcare provider in the event of an emergency. ■ Communicate	■ Assess the success of the procedures and return to monitoring

Table 1. Self-Asthma Management.

5. Design Consideration

5.1 User Interactive

User interactive are designed to interact targeted users (such as patients) to improve changes in health behaviour and disease management, However, their ultimate success depends on whether targeted users find that application is useful or no. In health care domain, health technologies are interactive hence motivating patients towards adopting self-management. This aspect has facilitated crucial changes in health practices (Mosnaim et al. 2012). These

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transactions are defined as an individual, resident, care provider or professional interactio n using mobile application technology to access, monitor, share or send health informat io n, especially to communicate, using interactive system rather than desktop platform, to users of the information. Mobile applications support sharing of medical data among various interested parties such as patients and healthcare professionals. This element of sharing enhances decision-making in healthcare domain, which supports self-management and other healthy behaviours that promote longevity. Many studies have succeeded in improving the health outcomes of a variety of patients using different technology solution to help patient managing their illness.

5.2 Enthusiasm

The adoption of information technology in healthcare, especially in asthma control and management, raises enthusiasm from users. To determine the efficiency and cost-effectiveness of the health technology, it should first undergo randomised trials (Mosnaim et al. 2012). To make the randomised trials viable and realistic, various factors need to be considered during the implementation of the technology; diverse and large sample size, objective behaviour outcomes, long-term follow-up, cost effectiveness, and technical assessment. The outcomes of this study are useful in healthcare domain, since the technology solution fits into daily lives of asthma patients with ease. The technology facilitates the continuous and consistent self-management for patients with chronic conditions. The innovative approach, in this regard, is a valuable tool that promotes effective clinical practice.

5.3 Usability

Various elements are used to determine the usability of the technology solution: easy to learn, user-friendliness, integrity, and efficiency. Along the entire development process, mobile application must have features that facilitate user-centeredness. For instance, the system should have features that match users' needs and preferences. The end-user should be at the centre of development of the system and should influence design hence maximizing its usability. To optimize the usability of the system, several factors should form the basis of its design. These factors include the assessment of the intended user, analysis of tasks and technical requirements, prototype analysis, evaluation of design alternatives, possible usage problems, testing features and user interfaces. However, the usage of the application is limited to giving feedback in terms of effectiveness. In other words, the system should promote healthy behaviours and outcomes. Normally, obtaining reports on events during various stages of system design and testing.

5.4 Personalize

Research in the field of persuasion and behavioural change is supporting a number of scientific challenges that offer significant opportunities for research development in this area. One of the most important of these challenges is the issue of personalization of compelling techniques. Personalization of persuasive techniques is a detailed work of the persuasive techniques of the

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target audience to increase their suitability, motivational attractiveness and, consequently, overall effectiveness (Orji et al. 2017). Although the latter Research has shown that personalization of persuasive systems will increase their effectiveness in stimulating desired behaviour change, and that a convincing approach that works well with one group of people may degrade a different group (Orji et al. 2017).

5.5 Persuasive Strategies

The health intervention should have persuasive features, which influence people towards engaging in a healthy lifestyle such as living harmoniously with the environment and avoiding negative behaviours. Many people find it difficult to adopt behaviours that are beneficial to themselves and the environment. For instance, behaviours such as healthy diet, physical activities, and smoking cessation requires the use of persuasive systems. Adoption of technology solution is one of the persuasive approaches towards addressing health challenges in relation to self-management among patients diagnosed with asthma.

Currently, people across the world highly depend on technology and have integrated it in their day-to-day activities. Integration of technology allows people the opportunity to adopt healthy behaviours through persuasion. The ability of the technology to stimulate emotions and influence behaviour attracts the attention of health practitioners. The technology helps people to change attitudes towards a certain behaviour, hence playing a significant role in adoption of healthy habits. Self-management of asthma and other chronic diseases require behaviour change, which is possible through the adoption of mhealth technology.

5.6 Tailoring Persuasive Strategies to Users and User Groups

People have diverse opinions on health and more particularly the essence of healthy behaviour. The study conducted by Orji et al. (2014) show that contra design strategies have negative outcome and are likely to give a different result. The study focused on healthy eating habits, which stimulated strong negative reactions from participants. In this case, it is clear not all technology approaches stimulate desired behaviour. The effectiveness of the strategy in motivating positive behaviour depends on choice of approach, which needs to match the preference of the intended user. In a nutshell, the persuasive technology becomes successful in changing behaviour when the strategy is consistent with user's preferences, thus the need for tailored features and design (Chen & Amresh 2015).

When the persuasive technology has tailored features, it increases the likelihood of stimulating positive behaviour from the user. The main limitation to this end is the huge cost associated with developing a model that matches preferences of the intended user, and difficulty in adjusting the system spectrum. Consequently, tailoring a persuasive intervention to fit various user groups on the basis of common features of groups is an essential aspect of system development. For instance, cultural background of the user should be considered when developing a strategy in order to achieve the desired outcome. Therefore, using strategies that are suitable for each group is critical to adapt the PT interventions to different cultural groups

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(Orji et al. 2014). Individual players were more satisfied with the individual version of the game than when they were playing the overall version. Subsequently, The influence of some strategies, that preferred by more users to certain characters while others do not prefer. It acquired important characteristics to adapt strategies to better suit the needs of users. Simila r ly, if it is possible to increase the effectiveness of convincing messages by adapting the message to the recipient's personality. As the adaptation of persuasive messages to the fact-find ing mission was an effective means of increasing the message's impact on the recipient (Orji et al. 2014).

Although many of the researchers had adopted the mission to adapt their requests, the adequacy of the fact-finding mission to design convincing games had been questioned. Therefore, focusing on alternative approaches to compelling sewing games. For example, Tan et al. (2013) examined the effectiveness of sewing the feedback in a compelling game for various personal genres, ranging from introverted to the neck and found that feedback is noticeably designed to improve the player's experience. Most of the current work has focused on adapting skills to the use of the mission. This suggests that there is considerable homogeneity between persons belonging to the same type of personality and that the same disguised approach or equivalent can be used to target them.

5.7 Community

The online community is essential to patients' overall quality of life and well-being. IT has a vital role among patients in reducing stress, mitigating suffering from diseases, increasing access to emotional and tangible support, medication adherence and enhance treatment plans (Kazmer et al. 2014). It also facilitates access to communicate with a health educator through this platform. In other words, it leads patients to prompt contacting whether the educator or patients who have the experience to find the information they seek (Frost & Massagli 2008). According to Yan and Tan (2014), this modern asthma community helps patients to be a self- care process. Specifically, in the emotional aspect, a patient can share their happiness and sadness by sending a signal that the patient is not alone, that patient is mitigated his/her burden that stem from the disease. Besides that, the Modern community can build and develop the trust and intimate relationship among patients; it leads to encounter asthma and continues the therapy (Lamberg 2003). Online community rapidly enhances the patient's' confidence in sharing and receiving messages by giving patients the opportunity to engage with society during ill and not to shy from their suffering. Also, tracking asthma disease stages is the feature of this community leads to better understanding of sickness and learn more about symptoms which is a demand of health care provider to reduce the load on physician and health educator (Wicks et al. 2012).

Furthermore, due to limits of time, patients may find impossible to communicate with no internet when the support is needed. However, the online community provides service with no geographic boundaries which means everywhere at any time. Yan and Tan (2014) observed that patients benefit from giving and gaining emotional support; they often receive emotiona l

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messages once they posted supportive and motivational words. Again, the study indicates that patients' experiences with self-management exercise and doctor's role of clinical care and control are essential elements in the development of persuasive strategies. The technology is designed to enhance clinical control, meaning, it considers the role of the doctor rather than that of the patient, which however encourages self-management of the patient to cope with the chronic disease (Libraries 2013). Persuasive technology is therefore a viable tool that fosters interact between the patient and the doctor, where patients feel more engaged to the self-management of the health condition. Patients are in position to make positive decisions concerning their condition. Community intervention is therefore critical factor in the management of asthma; patients are happier and they find it easier to provide feedback to the doctor. This feedback are ideal springboard through which the health professional address the expectations of patients especially in monitoring the level of the risk factors and symptoms of the disease.

On the other hand, Volunteers play an essential role in enhancing patient's sense and cheer by allowing them to access the online community that enables volunteers to take part to support patients to be faced asthma. Although they are neither physicians nor medical staff, they have the capabilities to minimise the depression and stress severity of patients through the conversation in a friendly way. Also, there are several volunteers had suffered from a disease, and then they gained with the experience to fight the disease and recovery, through volunteer s' experience and knowledge they can motivate the patients positively in terms of psychologic a l or physical.

5.8 SMS System

Asthma is highly prevalent among adolescents and can be prevented and addressed through self-management. In this regard, appropriate strategy is required to facilitate consistent self-management of the chronic ailments among young adults. Mobile technologies are portable and easily accessible among teenage patients (Rhee et al. 2014). Again, mobile phones form a strategy that matches interests of patients in this particular age group. The study indicates high response rate, which ranged between 81% and 97%. The average messages, according to study, was nineteen messages per teenager, the rate that depicts high response rate on self-management of asthma. Symptoms of the condition form the majority of text messages exchanged among teenage patients. The result of this study demonstrates the level of acceptability of mobile phones as persuasive strategy, as applicable and viable self-management tool among the adolescents. The tool is widely acceptable and highly useful in self-management of asthma among young adults.

5.9 Interface Design

The interaction between the user and the application is a crucial aspect, which should be considered when designing the persuasive technology. It is through the interface that users interact with the system. The function of the interface is three-fold; receiving user's commands,

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giving system feedback in form of command results, and initiating actions of the user.

The interface provides users with multiple buttons and a text field to allow smooth interaction with the system. There are interface parts that allow users to modify settings hence facilitating customization. Such functions include options for adjusting system volume and sharpness of colour. Also, it is through the interface that the user accesses text input options, digital video fields for selecting acceptable content, and audio feedback to validate actions of the user. Range of interface aspects exists to initiate actions, and the first common feature is variety of buttons. In this regard, a button is the feature that allows users to click in order to give a command to the system.

The vital aspect of mobile interface is the option of doing what the user desires. Multiple buttons and application options enables the user control the activities of the system.

Depending on the level of user's understanding, he/she is able to command the system to perform tasks which he likes. Users may have data in their heads that interface designers need to consider. For instance, buttons are pushed, knobs are tuned, and there may be functions that require only touching such as sliding to unlock the desktop of the mobile phone. These features make the system more interactive, user-friendly, and tailored to the needs and interests of the user. Interface should therefore be integrated into planning to reflect practicality and efficiency on the part of the user.

6. Current available information and/or applications

Mobile apps are application programs developed for use on portable / portable devices such as personal digital assistants, tablets, or mobile phones. By searching on iTunes using IPhone and iPad apps, 13 apps have revealed and currently running on the iPhone / Apple operating system to help consumers with self-management of asthma. Table 3 below shows the current running application on the iPhone / Apple. Similar search found that 5 apps running on Android-based applications as shown in table 2 below (Mosnaim et al. 2012).

Application	Device	Details	Cost
Asthma Tracker and Log	Android 2.1 and up	Tracks symptoms, triggers and peak flow readings	Free on Android Market; Ad free version $0.99
AsthmaCheck	Android 2.1 and up	Track peak flow and medications; push notifications; smoking and sport tracking; e-mail transfer available	Free on Android Market
Asthma Journal	Android 1.5 and up	Track symptoms, triggers and medications daily	$4.99 on Android Market
Peakflow	Android 1.6 and up	Track peakflows	Free on Android Market
AsthmaTracker Pro	Android 1.5 and up	Track asthma triggers	$2.99 on Android Market

Table 2. Android-Based Application

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Application	Device	Details	Cost
Asthma Journal (symptoms, peak flow measurements, medication usage); news on asthma research, prevention, and treatment	iPhone, iPod touch, iPad; iOS 2.0 or later	$4.99 on iTunes Pro	Journal requires
Asthma-Charter medication recording application; includes a doctor reporting feature	iPhone, iPod touch, iPad; iOS 3.0 or later	$0.99 on iTunes	Peak flow and
iAsthma in asthma medication usage, peak flow record, school and sports forms, action plan and emergency contacts; targeting children	iPhone, iPod touch, iPad; iOS 4.0 or later	$0.99 on iTunes Control	Includes requires
AsthmaMD journal (tracks medications, peak flows and triggers), can manage multiple users, creates color graphs	iPhone, iPod touch, iPad; iOS 3.0 or later	Free on iTunes	Asthma
AsthmaPulse symptoms, peak flows, triggers and medications; browse asthma related news; personalized action plans	iPhone, iPod touch, iPad; iOS 4.2 or later	$3.99 on iTunes	Track
Asthma Tracker flow, inhaler use, FEV1, and zone; graph data	iPhone, iPod touch, iPad; iOS 3.0 or later	Free on iTunes	Track peak
AsthmaCheck flow and medications; push notifications; smoking and sport tracking; e-mail transfer available	iPhone, iPod touch, iPad; iOS 3.0 or later	Free on iTunes	Track peak
Inhaler Tracker many puffs of inhaler have been used and how many are left	iPhone, iPod touch, iPad; iOS 2.2.1 or later	$0.99 on iTunes	Tracks how
Asthma Tester asthma control	iPhone, iPod touch, iPad; iOS 4.0 or later	Free on iTunes	Monitors
Asthma-Charter medication recording application; includes a doctor reporting feature	iPhone, iPod touch, iPad; iOS 3.1.2 or later	$0.99 on iTunes MMC	Peak flow and requires

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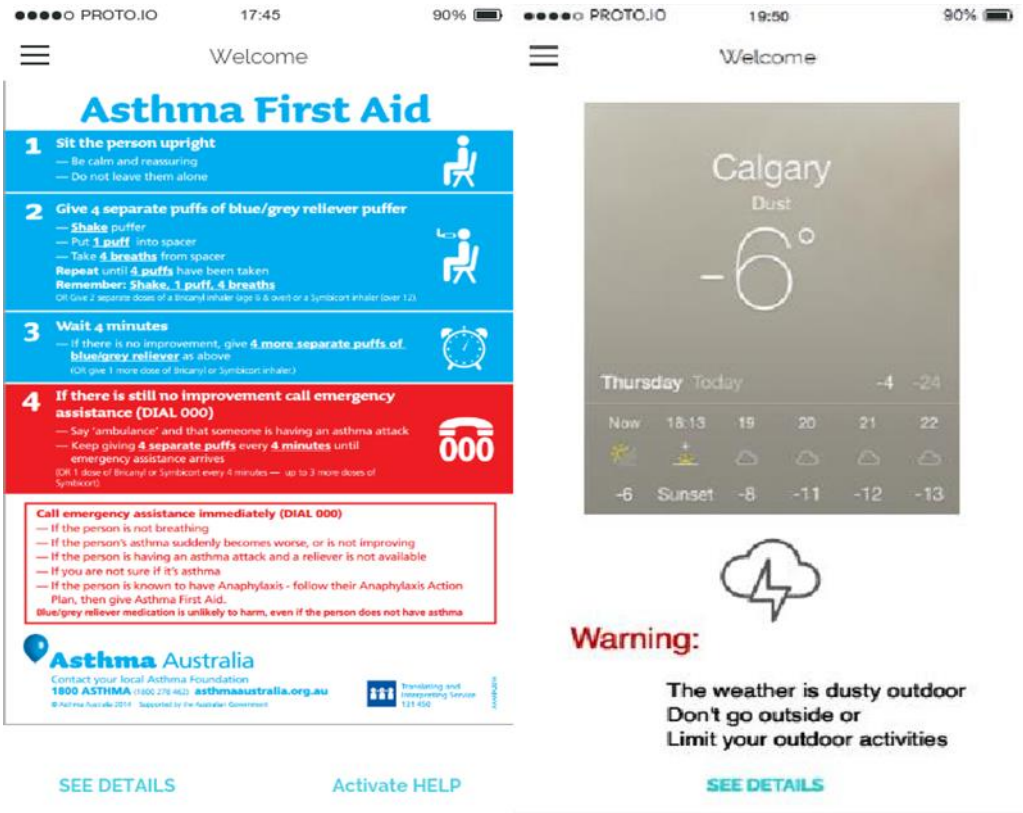
iAsthma GPS location of asthma attacks, temperature, time of year and other info	iPhone, iPod touch, iPad; $0.99 on iTunes Tracker HD	Record requires iOS 3.0 or later (Lite version free) (Lite version available)

Table 3. Mobile Operating System Compatible Applications in iPhone/Apple

7. Proposed System

7.1 Proposal

This paper proposes a mobile application as a technical solution for Asthma self- management and Asthma education.



7.2 Technical specification

System will contain multiple pages which can be navigated through the home page. These pages will be as following; discussion platform, education page, diet page, exercise page, medication page, weather warning page, gaming and ranking page, action plan page.

7.2.1 Home page;

Home page contains the navigator books which holds link profile, menu and NEWs. This page can be customise by users as their preferences features. To illustrate that, a window of exercise

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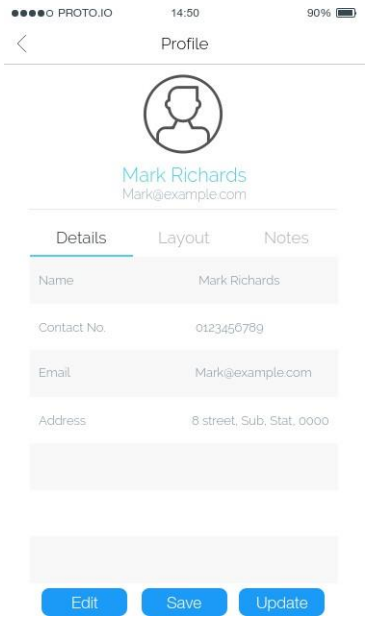
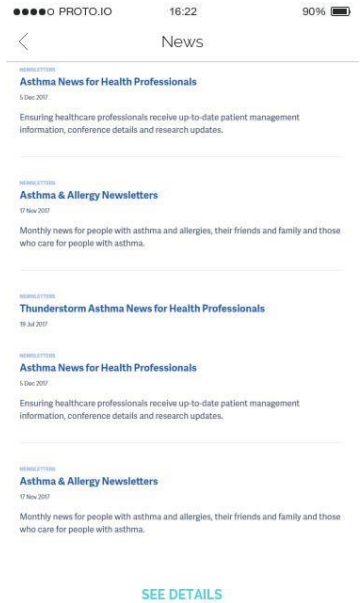
page as well as diet page which hold users' needs of both of them. The notifica t ion record as well as latest News will be appeared on home screen. Moreover, Home page has weather warning notification that is predicted the weather condition, and then notify patient to take it in consideration if the weather will harm patient due to asthma condition.

7.2.2 Profile page;



In profile page, users have the abilities to add further self-information such as pictures, gender, age and their interests to share through the community. Furthermore, profile page contain more option in terms of personal information such as password, contact information.

7.2.3 News page;



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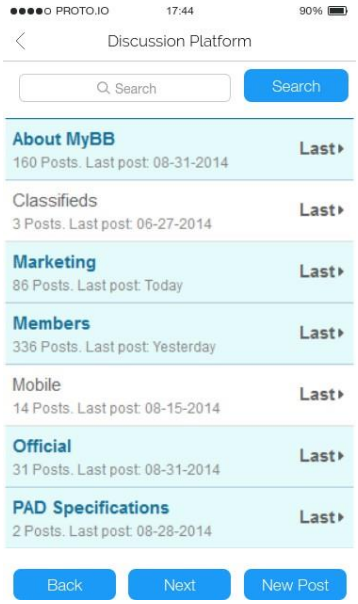
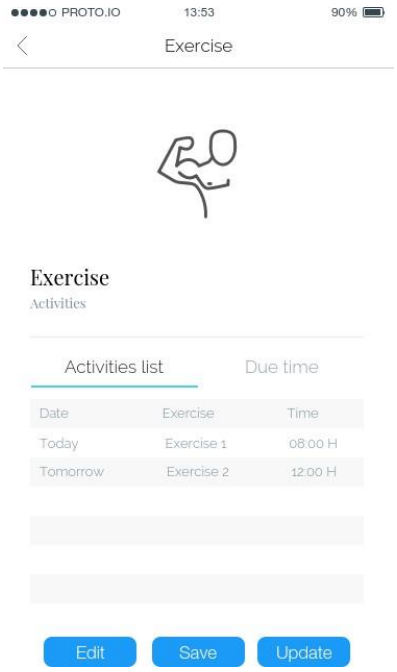
News pages provides more information in regards the Asthma and the medical center.

7.2.4 Discussion platform;



Allowing members to post and share their knowledge in discussion platform.

7.2.5 Exercise page;



Exercise page will guide users everyday exercise based on patients condition and educator recommendation. It also can appear in the notification. Nevertheless, every single activity the user done will be monitored and sent to patients profile through EHR (Electronic Health

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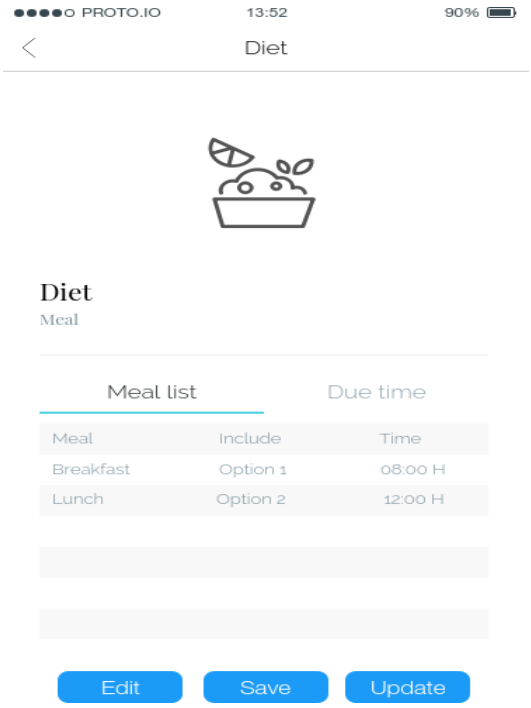
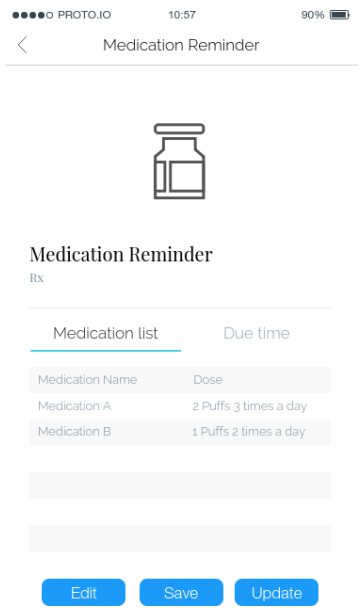
Record).

7.2.6 Diet page;



It provides daily diet recommendation based on patients' condition and nutrition. This recommendation will be created by educator. Every single completion the user done will be sent to patients' profile through HER (Electronic Health Record).

7.2.7 Medication page;



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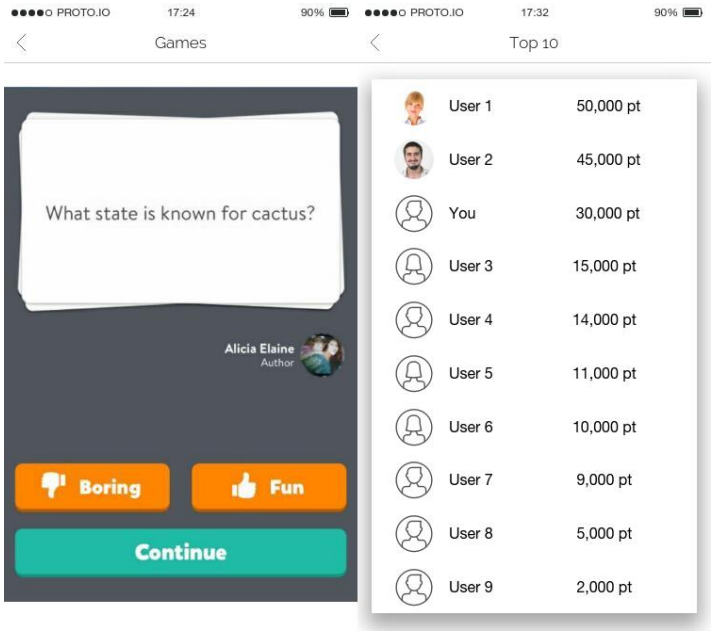
This page contains on going medicine as instructed by pharmacist. The on-going medication list will be obtained from HIS. Once the medication is taken by user, it will be sent to patients' profile through HER (Electronic Health Record) according to the due time of the medication.

7.2.8 Education page;

Education page provides specific information in terms of patient case. For example, if the patient is child, the information will be specific for children with asthma. On other hand, if patient is pregnant, the information will be specifically contained information about asthma in pregnancy.

7.2.9 Game and rank;



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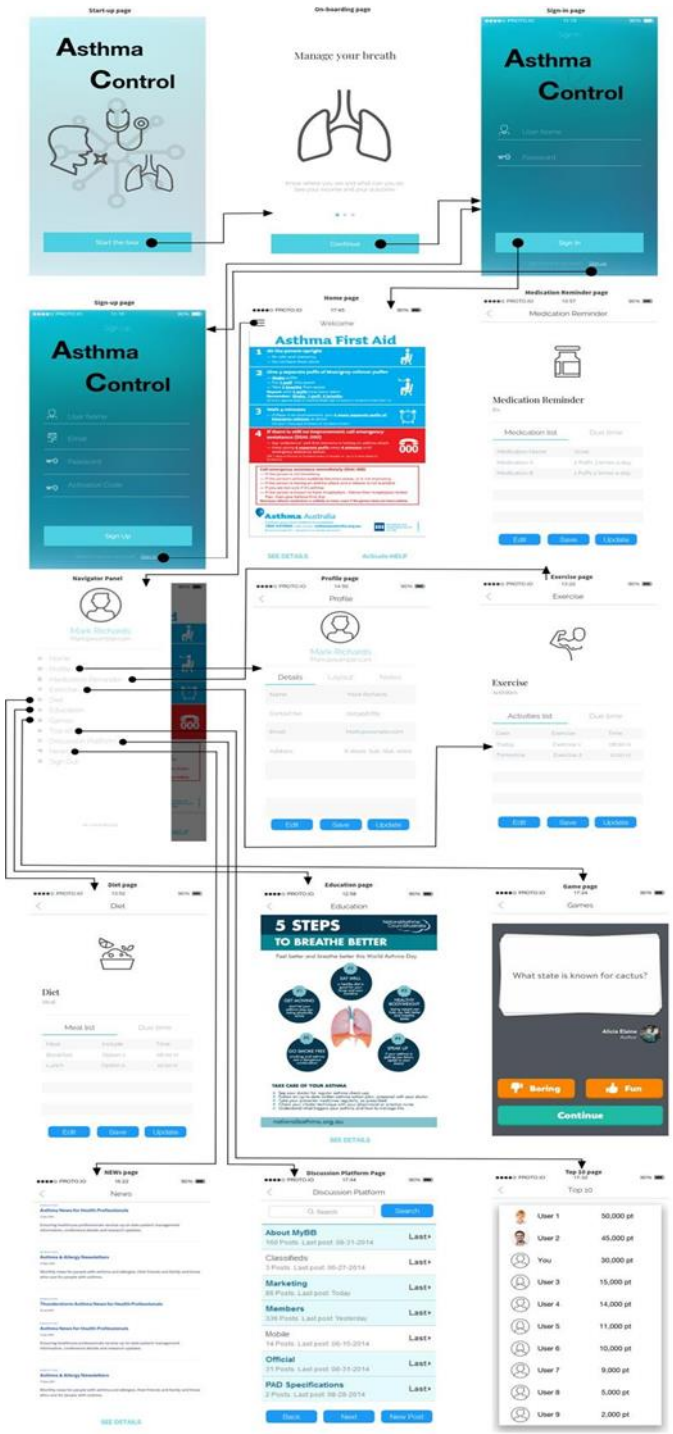
This page will contain education games about asthma. For example, augmented reality for children to guide them how to use reliever in case of asthma attack. Moreover, there is a competition which is launched by medical provider. The rank content will show the top ten participants who control and manage their asthma.

7.3 wireframe & prototype



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8. Features of Application

- Easy to use
- Personalize
- Social networking capabilities
- Less keyboarding and more touch
- Responsive design for varying screen sizes
- Allow for user feedback
- Allow customization

9. Discussion

Healthcare and other sectors of society, lacks new technologies that can increase knowledge and empower the community with health information. In this context, an emerging challenge has been the need to expand adolescents' access to health information. Adolescence is a critical period for the development of personal and interpersonal skills and of abilities to live and make decisions, it is necessary for adolescents to have access to quality informa t ion on aspects related to disease prevention and health promotion.

There are several applications that can be used in health education for Asthma patient, among which are listed: text messages through cell phones, virtual games, blogs ...etc. Browsing the internet for health information is simpler and more convenient, especially for teens, than reading specialized literature or consulting a health professional. Using the Internet and mobile applications to promote asthma education and improve its outcomes reveals innovation and promise. The developers of these interventions benefit innovatively from technologies that are part of our daily lives to effectively involve participants in decision- making in improving health. However, despite the attraction of asthma-based interventions to technology, most of these studies are still in early pilot stages with mixed results and small sample sizes. On the other hand, the use of text messaging through a cell phone is an innovat ive way to engage users in learning and preventive health practices. Text messages can enable efficient delivery of health information and are a discrete way for users to obtain important health content.
In our innovation, the application performed and intercreative self-management action with the users through the monitoring of their exercise, diet and their medications complain. Moreover, the application offers a game platform between the users (Asthma Patients). This interact action between Asthma patient will develop social connection which may lead to positive effect in their condition. In addition, the application offers a good resource and daily data follow from the patient themselves to their care provider. This data can be noticed in the complaining of the

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patient to their asthma action plan. In other word, the care provider will be aware if the patient follows their diet, exercise, or medication complain. Therefore, in the next visit the decision will be more accurate regard their treatment plan.

Furthermore, the application presents the personalization option to the user. This personalization can be noticed in the action plan of diet and exercise. In other word, the user their preferred meal or their preferred exercise depending on the recommendation from the educator. Moreover, through the homepage, the user can customize their interest and their most prioritise pages. In addition, the notification can be customized through the setting of the application to avoid the Alarm fatigue as well as the user interest.

The application improves the self-awareness of the user through enthusiasm by competition between others. In other word, the application has the ability to show a table of patients ranked based on the user self-management score. This self-management score can be calculated through points system. Each activity completion calculated based on the type of the activity and the impact of it in self-management process. These calculations will be according specific clinical approach.

The application will be described as information bank for the users. Moreover, it will support the user via the animation, videos, and pictures. In addition, a caution messages will be appearing to the user depending on the importance of the events. For example, in a dusty weather a notification will be created to advice the users to not be outside or limit the outdoor activities. In addition, medium level events such as Local asthma education campaign can be explored in the news page.

In future, when the application goes live nationally, it can predict the level of education across the region. In other words, the application will be data source for the administra t ion towards building strategies in the treatment of Asthma. Moreover, these data figures will identify the weakness and the strengths in each area. For example, if area “A” lack exercise complain, the administration must consider fitness motivation in their strategies to treat asthma in this area.

10. Conclusion

Asthma is one of the common chronic diseases, and it results from lung and airway inflammation. The condition causes various health challenges such as loss of breath, breathing difficulties, coughing, and whizzing. In Saudi Arabia, around 2 million have been diagnosed with Ashman disease. In Australia, significant percentage of the population has asthma. It is estimated that 1 out of 10 people has asthma, hence making it a common long-term diseases. Although the exact cause of asthma remains unknown, researchers associate the disease with genetics. If there is a history of asthma in the family lineage, there is a likelihood of one to contract the disease. Respiratory complications during childhood can also cause asthma. Also, consistent exposure to toxic air is likely to cause asthma. Avoiding cold air or pollutants such as pollen and dust is one way of preventing asthma attacks. This ailment can attack people at any age, however, people contract asthma during childhood in most cases.

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The main challenge facing patients diagnosed with asthma is lack of education on self-management while at home. Besides taking the medication through the use of inhalers, asthma patients require proper and consistent self-management of the condition. Patients are supposed to consult health educators to get instructions on effective management of the condition through self-care. Unfortunately, majority of asthma patients do not visit health educator, hence lack self-management skills. Also, people who practice self-management lack consistency to do so hence high prevalence and morbidity rate. To address this pertinent challenge, there is a need for a technology solution. It is through the technology approach that patients would find self-management easier and fun. This approach enhances motivation towards asthma self-care among patients.

With the current technology and its application in healthcare, asthmatics can overcome the challenge associated with poor and inconsistent self-management of the condition. The technology has enabled the development of support tools that facilitate self-management of chronic diseases. Today, there are various mhealth informatics that help patients improve self-management, thus controlling asthma. The main purpose of utilizing technology solution is to enhance self-management; the approach that helps asthma patients to live a dynamic life for a long time despite having a chronic disease. Use of mhealth tools ensures that the patient sticks to the medication and control measures throughout his/her life. To realize this end, mhealt h technology for asthma is designed to monitor the symptoms and the environment. The main function of the mhealth monitoring tool is to alert the patient on exposure to risk factors, thus helping one to take precaution measures.

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