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BUILDING ALLAS: CREATION OF AN ASTHMA AND ALLERGIES APP

A Scholarly Project Submitted to the Graduate School
in Partial Fulfillment of the Requirements
for the Degree of
Doctor of Nursing Practice

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December 2016

BUILDING ALLAS: CREATION OF AN ASTHMA AND ALLERGIES APP

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BUILDING ALLAS: CREATION OF AN ASTHMA AND ALLERGIES APP

An Abstract of the Scholarly Project by
Benjamin Joseph Cochran

The purpose of this project was to determine the potential need for an app to allow patients to self-manage their asthma and allergies. Through a substantial literature review, the need for an app as well as a desire for this population to manage their disease was demonstrated. Determination was made to have three separate components to create an all-inclusive app, an education component, an asthma tracker, and a personalized allergy profile. The app was storyboarded before being sent to providers and small focus group for proof of concept and functionality of components. The app, ALLAS, was constructed and housed on goodbarber.com allowing the creator to update information and push that information out immediately as features or along with the establishment of an LLC (Limited Liability Corporation) and trademarking of ALLAS. Content will continue to be added and beta-testing will occur in early 2017 in preparation of a general release to all mobile device download stores. For sustainability, ALLAS is currently funded by the creator, with the ability to have advertising on screens in the app.

TABLE OF CONTENTS

Chapter I Introduction.....	1
Description of the Clinical Problem	1
Significance.....	2
Specific Aims/Purpose.....	4
Theoretical Framework.....	5
Project Questions	7
Definition of Key Terms	7
Logic Model of the Proposed DNP Project	8
Summary	11
Chapter II Integrated Review of Literature.....	12
Introduction.....	12
Literature Review.....	12
Asthma and treatment	12
Allergies and treatment.....	17
Mobile applications.....	20
Asthma applications.....	22
Summary	25
Chapter III Methods	27
Project Design.....	27
General Application Creation	27
Application Explanation	28
Legal Considerations	30
Target Population.....	31
Procedure	32
Application Construction	32
IRB (Institutional Review Board) Approval.....	33
Timeline of Project Phases.....	33
Resources Needed.....	33
Market Analysis	34
Plan for Sustainability.....	35
Summary	36
Chapter IV Evaluation Results.....	38
Introduction.....	38
Description of Population	38
Description of Key Terms/Variables	39
Analyses of Project Questions/Hypothesis	40

Summary	43
Chapter V Discussion	44
Relationships to Outcomes to Research.....	44
Observations	45
Limitations	46
Implications for Future Projects/Research.....	46
Implications for Practice	47
Conclusion	48
References	49
Appendix A.....	54
Appendix B.....	55
Appendix C.....	56
Appendix D.....	58

LIST OF FIGURES

Figure 1 Asthma Mobile Application Logic Model.....	10
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CHAPTER I

Introduction

Description of the Clinical Problem

Asthma is a chronic disease that affects all ages, socioeconomic, and racial groups. According to the Centers for Disease Control (CDC), 39.5 million Americans have been diagnosed with asthma and, of those, almost 19 million adults and over 7 million children still have asthma (2013). Because asthma affects all ages, from birth to elderly, self-management is imperative for appropriate control of symptoms and improvement of health. Even with attempts at self-management, asthma accounted for 3,404 deaths and 14.2 million office visits in 2010 alone (Centers for Disease Control and Prevention, 2013).

For the purposes of this project, the CDC definition of asthma will be utilized. “Asthma is a common chronic disorder of the airways characterized by periods of reversible airflow obstruction known as asthma episodes or attacks” (Centers for Disease Control and Prevention, 2013, p. 1). Advances in asthma have been made in the last several years to assist with management and self-management. Treatment advances include long-acting inhalers for daily use (instead of twice a day) and rescue inhalers that no longer require spacers to evenly distribute the medication. Education has been advanced as well following evidenced-based guidelines to improve patient outcomes and

hospitalizations. Asthma transcends all boundaries of typical chronic diseases and can affect all races, nationalities, and socioeconomic status. Asthmatics will also have different triggers for their disease as well as vary in severity. All these factors can make managing the disease challenging.

Allergies are another component that has to be considered. Treatment of allergies can decrease the severity or frequency of asthma. “Early intervention may change the natural course of allergic rhinitis, preventing the progression to asthma” (Passali, Bellussi, De Corso, Passali, & Passali, 2013, p. 1194). Treatment of allergies as well as determining the offending agents and avoidance of the agents will provide patients with decreased asthma symptoms or even prevent asthma from occurring.

The fundamental problem as it presents itself is proper self-management of asthma and allergies and proper evidence based education for patients pertaining to asthma and allergies. With the knowledge that more people own mobile phones than toothbrushes (Qualman, 2014) and that patients, even adolescents (Panzera, et al., 2013) and children (Ekim & Ocakci, 2013), have a strong desire to manage their asthma themselves, the logical answer is to create a mobile application, or app, that will provide education to patients as well as self-management tools for asthma and allergies.

Significance

According to the American Association of Nurse Practitioners, there are 205,000 nurse practitioners in the United States, with approximately 54% of those being in family practice (2015). Likewise, there are approximately 208,000 physicians in a family practice type setting, according to the Agency for Healthcare Research and Quality (2014). These providers cared for patients in those 14.2 million office visits, for asthma,

in 2010. Because of a large number of patients presenting with asthma or allergies, providers need to remain knowledgeable in the latest evidence and treatment of these chronic disorders.

Patients have a strong desire to manage their chronic conditions, including asthma and allergies. One such tool that has been developed is the AAP (Asthma Action Plan). This plan provides the patient with an idea of the severity of their current asthma symptoms and the subsequent treatment regimen. However, patients are unlikely to carry this paper around with them but would be more likely to carry their phone. Providers could use the app built in this project to upload a personalized AAP for the patient. This will allow them access at any time to their plan of care. Couple that with evidenced-based education for patients in the app and providers have a handy tool to decrease office visits for asthma as well as improve the health of their patients.

Another aspect of significance in relation to creation of the app is portability. The app can be installed on free-moving devices, such as phones and tablet computers. Therefore, transient patients, such as soldiers, business travelers, or vacationers will be able to have their asthma and allergies records with them in the palm of their hand. Additionally, of consideration is parents of asthmatic patients. These parents will be able to send their children to summer camps, band camps, and sleepovers and still be able to login to the application and monitor their children's symptoms. Divorced or separated parents could also monitor their children's symptoms while at different homes. This app will allow parents that peace of mind to allow their children to be more like their non-asthmatic friends.

The other aspect of the app that will be significant to the nursing profession will be the allergy component. After conducting RAST (Radioallergosorbent test) testing or scratch allergy testing, the patient can select their specific allergens and develop a personalized allergy profile. This will provide the patient with evidenced-based information regarding avoidance of allergens and ways to improve their health.

By providing patients with tools to enhance their overall well-being, this app is very significant to improving and advancing the nursing profession.

Specific Aims/Purpose

The specific aim of this project, in regards to patients, is to improve a person's self-management of asthma and allergies through the use of a smartphone application. The likelihood of a person keeping their smart phone in their immediate vicinity, makes this an ideal platform for education and implementation of strategies to improve their overall health as well as manage their chronic condition. The person will have immediate access to evidenced based education regarding their symptoms and personalized information for themselves, whether it be a modifiable AAP or a personalized allergy profile.

From a provider standpoint, the specific purpose of the project is to improve the health of patients. For the provider, this application will be a tool to assist with the highly individualized care of the asthmatic or allergy patient. In assisting with improved more individualized self-management, the patient will be in overall better health, resulting in a lower number of office visits and illnesses.

Personally, the specific aim for this author is to create something from nothing. This author has always wanted to create an app and the opportunity to create an app that can be revolutionary and life-changing is too great of a prospect to pass up.

Theoretical Framework

The theoretical framework that is the basis of this project is the health promotion model. This model was originally designed by Nola Pender in 1982 as a counter theory to health protection models. The premise of health protection is to recover following an assault to the health. Pender acknowledged that while it was significantly important to reestablish homeostasis, there was no theory that address the aspect of attempting to achieve optimal health. The theory that was developed was the health promotion model. “Health promotion is defined as behavior motivated by the desire to increase well-being and actualize human health potential” (Gonzalo, 2011, Major Concepts section, para 1). The premise of health promotion is seen in primary, secondary, and tertiary preventative care as the goal is to reestablish or improve the baseline health of the patient.

Pender created the model with the assumption that people had a desire to regulate and control their own health. In her mind, patients would become proactive in the management of their diseases to improve their functionality and decrease or limit exacerbations. “Pender saw health promotion as comprised of activities designed to increase the level of well-being and self-actualization of individuals, families, communities, and society” (Raingruber, 2014, p. 77).

Health promotion model was selected because the goal is improvement of the overall well-being of the patient and should result in improved health and a better quality of life. “The perceptions of long-term rather than short-term benefits from health-

promoting behavior may influence the likelihood of continuing those behaviors” (Raingruber, 2014, p. 77). With asthma and allergies, the assumption is that most patients will see the long-term benefits of proper management and seek out techniques, avenues, and devices to assist with that goal. “The importance of health is clearly within the client’s value scale; however, if the health is not a priority or highly valued, the client may be less likely to act” (Galloway, 2003, p. 251). Asthmatics and allergy sufferers, for the most part, place their health high on their value scale, and therefore will be more apt to be receptive to health promotion techniques. This subset of the population, as research has shown, also maintains a strong desire to self-manage their chronic disease. The combination of a higher value on health with a strong desire to manage their asthma means that these patients will seek out techniques, such as the application being created.

Another component of health promotion techniques is cues for the patient. There are internal cues, such as the endorphin release after a long run, and external cues, such as patient reminder cards. “Intensity of cues may vary depending on the level of readiness to act and locus of control of the participant” (Galloway, 2003, p. 251). The app will hope to serve as somewhat of an integration of internal and external cues. Internally, patients will assist with monitoring the peak flows of patients to monitor the status of their asthma. Externally, the app will provide reminders to log peak flows and provide important educational information to prompt the user to improve their overall health. The app will improve the quality of life and lead to overall improved health while providing cues and promoting health. This is why health promotion model was selected and will be utilized throughout the project.

The other framework that will be used is healthcare delivery innovation. The research and creation aspect of the scholarly project will be state-of-the-art with the desire to improve the health of a particular medical condition, asthma and allergies. “Clinical teams are exploring the benefits of redefining care around medical conditions... [and] often include an intervention or innovative approach to healthcare delivery that has an ultimate goal of positively affecting outcomes” (Moran, Burson, & Conrad, 2014, p. 132). The app will provide necessary education and self-management tools to allow the users functionality to improve their overall wellbeing.

Project Questions

This project has four questions.

- What mobile applications are currently available for asthma and allergy patients?
- What functions on these applications are lacking that would benefit asthma and allergy patients?
- Can a mobile application be created to assist with asthma and allergies?
- Can the mobile application that is created produce those functions that are lacking to improve the application usage for asthma and allergy patients?

Definition of Key Terms

For the purposes of this project, the following definitions are provided to assist with clarification:

- Allergies – a hypersensitivity response in the body to a specific substance (allergy, n.d.).
- Application or “app” – a small program downloaded onto mobile devices.

- Asthma – “a common chronic disorder of the airways characterized by periods of reversible airflow obstruction known as asthma episodes or attacks” (Centers for Disease Control and Prevention, 2013, p. 1).
- Asthma Action Plan (AAP) – “provides instruction and information on how to self-manage one’s asthma daily, including taking medications appropriately, and identifying and avoiding exposure to allergens and irritants that can bring about asthma symptoms” (National Asthma Education and Prevention Program, 2008, p. 20).
- Beta Testing – preliminary testing of a program or application for errors or needs to change prior to general release.
- Clinical Practice Guidelines – “statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options” (Institute Of Medicine, 2011, pp. 25-26).
- RAST – Radioallergosorbent test. Allergy testing via blood to test for specific allergens.
- SCIT – Subcutaneous immunotherapy for allergens.
- SLIT – Sublingual immunotherapy for allergens.
- Smartphone – a phone capable of data, internet connectivity, and downloadable apps.

Logic Model of the Proposed DNP Project

The biggest inputs, other than this author, will be the App Store® and Google Play™ stores. Throughout the logic model and the external factors, the approval from

the App Store and Play store will be significant to obtain the eventual general release.

The activities are divided between the app creator and the beta testers, as those will be the integral part of the subsequent success of the application. The activities will include app drawing board, wire framing, designing, building, and transitioning to appropriate mediums for Apple® and Android™ and then prepare for beta testing.

The outcomes were divided into short, intermediate, and long-term goals. These goals were also differentiated between the creator of the app and the beta testers. In the short term, the goals are more focused on the app and educational aspects. The long term goal for patient is improvement of symptoms and better self-management, while the long term goal for the creator is a general release of the app.

The assumptions are that all agencies in which approval is required will provide adequate approval. Those agencies include Apple App Store, Google Play store, the Irene Ransom Bradley School of Nursing, and Pittsburg State University. The full logic model for the asthma application is shown in Figure 1.

Project: Asthma Mobile Application Logic Model

Goal: To create an application that will allow users to improve their self-management of their disease.

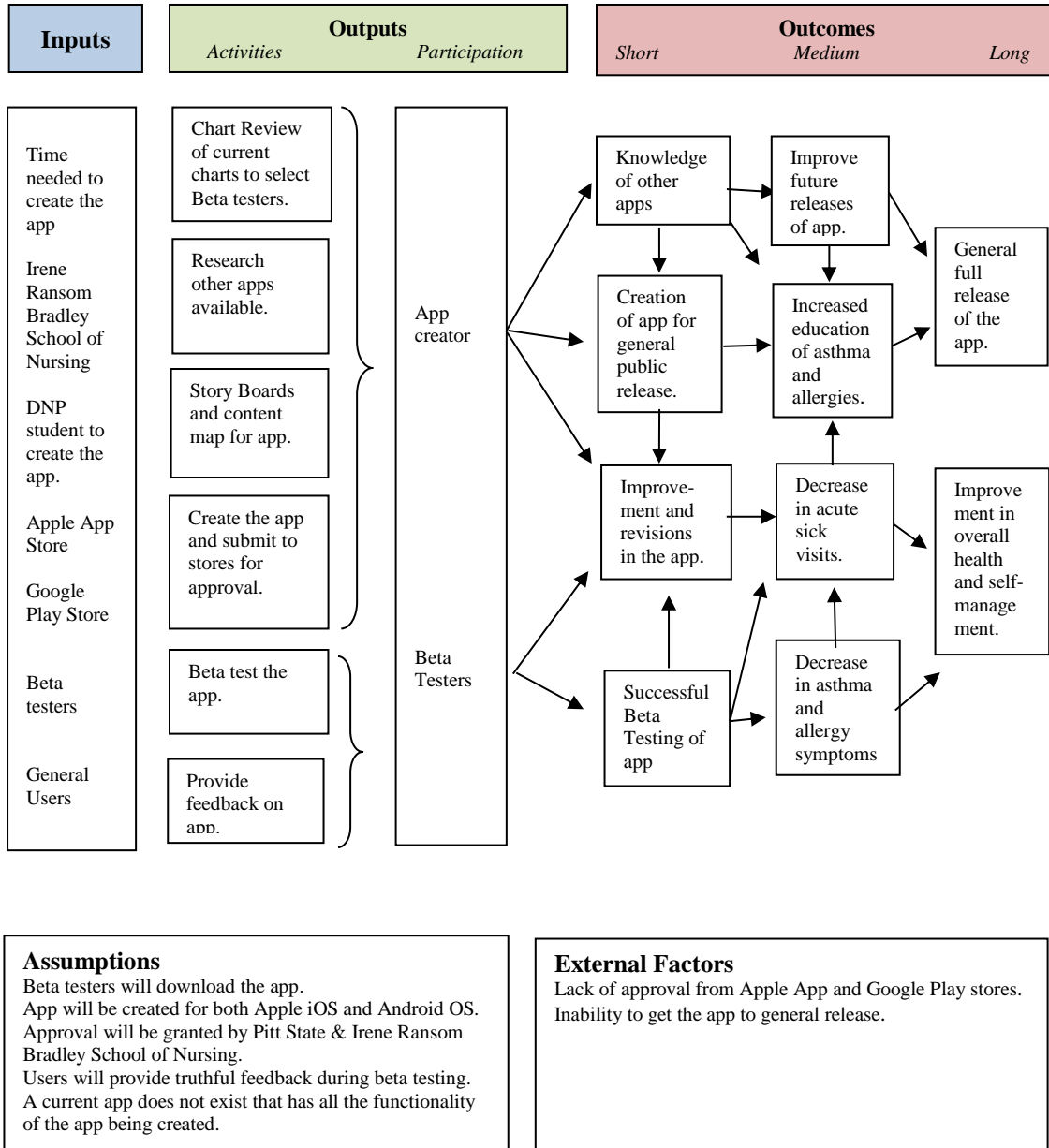


Figure 1 – Asthma Mobile Application Logic Model

Summary

Asthma is a chronic disease that symptoms and severity can increase without proper education and self-management. Studies have demonstrated that patients, even children, have a desire to manage their asthma more effectively. Often, allergies are in conjunction with asthma. Learning the allergen triggers, along with management to decrease those triggers, can prevent the progression to asthma (Passali, Bellussi, De Corso, Passali, & Passali, 2013). If patients can effectively manage their own symptoms and triggers, it will improve their health while subsequently decreasing office visits and hospital stays.

Through the use of Pender's Health Promotion theory and the framework for Health Design Innovation, an application for smart phones will be created. The application will be created after a thorough literature review as well as a review of the more than 140 apps available for asthma or allergies. It is of note that studies have demonstrated that the apps currently available are lacking at least one vital component to make it all-encompassing. The application created will provide evidence based education for asthma patients, as well as allergy patients, and allow for symptom tracking. The application will be designed for both Apple iOS and Android OS. The application will promote an overall improvement of health of the users and will be innovative and focus on one specific group of patients. The application will have several components that will make it user-friendly and informational.

CHAPTER II

Integrated Review of the Literature

Introduction

A significant number of articles have been published examining several aspects that are covered in this project. The majority of the aspects are covered individually, though a few articles are specifically pertaining to asthma applications. For ease of reading, the literature review will be divided into subtypes: asthma and treatment, allergies and treatment, mobile applications, and asthma applications.

Literature Review

Asthma and treatment. Over the past several years, a significant number of articles have been written improving the management of asthma through evidenced-based practice. Along with articles, there have also been establishment of clinical practice guidelines. The beginning of treatment is the establishment of an AAP. “Many patients have difficulty recalling instructions for care that are given by their healthcare provider. A written AAP provides instruction and information on how to self-manage one’s asthma daily, including taking medications appropriately, and identifying and avoiding exposure to allergens and irritants that can bring about asthma symptoms” (National Asthma Education and Prevention Program, 2008, p. 20). A proper AAP will provide the patient with an understanding of the different levels of treatment depending on their severity of

symptoms. Some of the guidelines do place responsibility on the patient for management of their chronic health condition. This coincides with the transitions to patient centered care and the patient being directly involved in their care. Two aspects focusing on patient responsibility are scheduling routine appointments and controlling environmental exposures. Scheduling routine visits is something that is recommended by the provider but is the responsibility of the patient to set the appointment and ensure they follow up. The frequency of appointments and routine monitoring is provider discretion though recommendations do exist. “Patient visits should be scheduled at 2-to- 6 week intervals while initiating therapy or stepping up therapy to achieve control; at 1-to-6 month intervals after asthma control is achieved in order to monitor if asthma control is maintained” (National Asthma Education and Prevention Program, 2008, p. 29). Another aspect of treatment that needs to be considered is the prevention of symptoms. If triggers can be located and avoided the patient will likely have better symptom control and fewer exacerbations. The National Asthma Education and Prevention Program (2008) states “evidence demonstrates that, for an allergen- and irritant-sensitive person who has asthma, substantially decreasing exposure to inhalant allergens may significantly reduce inflammation, symptoms, and the need for medication” (p. 32).

One aspect of proper asthma management is proper treatment observance. One group this can be lacking in is teenagers unless they are motivated to take their daily medications. One article explored a way to improve motivation by utilizing the self-determination theory in urban African American teens specifically, because of a critically low adherence regimen. (Bruzzese, Carcone, Lam, Ellis, & Naar-King, 2013). Through the study, the researchers determined that parental support wanes with age but integrating

the medication regimen into family activities improved adherence. “Because family routines and adolescent competence were correlated, it is plausible that, when asthma care is better integrated into the family’s daily routine, the shared experience of asthma care helps adolescents develop greater competence in caring for their asthma” (Bruzzese, Carcone, Lam, Ellis, & Naar-King, 2013, p. 463).

Asthma is a chronic disease that can be thought of like a job to be managed appropriately. One study took that premise further by interviewing asthmatics to develop a job description for the management of asthma. While the study did have a significant limitation of a small sample size, four women, it does provide insight into the mind of asthmatics. Managing the disease appropriately is effective self-management that asthmatics are striving for. Deacon & Rickards (2013) state “effective self-management is critical to adapting and adjusting to the experience of a long-term condition and nurses have a responsibility to promote this process” (p. 77). One of the first things the participants made note of is a mindset of it’s not if, but when, there will be an exacerbation. “For them living with difficult asthma resulted in a variable quality of life and it cast a shadow over the better times because it could always return to disrupt living once again” (Deacon & Rickards, 2013, p. 79). The participants also described the feeling of severe exacerbations. This author has felt this feeling before and is hoping with better management with the app less asthmatics will have to feel this way as well. Deacon & Rickards (2013) explain “they described an experience of suffocation and struggle to breathe which, if not effectively treated, led to a near death phase of peaceful drifting off” (p. 80). The difficulty to plan ahead also proved to be challenging as they knew their health could change or worsen in a few days or even hours. The resounding

theme of the participants was that it was their disease and their responsibility. “The strength of the job description is that it is centered on the work that the patient has to engage in. It is their long-term condition to effectively manage” (Deacon & Rickards, 2013, p. 84). The development and subsequent use of the app should allow for better management of their long-term condition.

This is a disease that affects all populations, so children and management of their asthma needs to be considered as well. There have been a few studies developed to examine this aspect of asthma. One study examined children between the ages of seven and 12 and the other study examined teenagers. Getting children to comprehend their asthma and successively manage it, starts as they improve cognitively. “At school age, with the development in cognitive and psychomotor skills, children can start taking responsibility for their own asthma management. The initiation of children in taking responsibility for their disease management is a highly critical period” (Ekim & Ocakci, 2013, p. 289). The study had an interesting approach in that it compared the students feeling of their ability to manage with their parents’ feelings of their ability to manage. Parents felt that it was their responsibility to start treatment when symptoms develop and to decide the need for inhaler treatment, but the children felt significantly differently. Parents felt that starting treatment when symptoms start while Ekim & Ocakci (2013) found that “87.5% of [their] children claimed the opposite. Additionally, 56.9% of the mothers stated that the ‘take a regular inhaler’ task belonged to them while 80.6% of children claimed that they shared the responsibility equally with their mothers (p. 292). The development of an app that children can install on their phones will allow for better self-management and in future releases of the app, the parents can monitor symptoms as

well to assist with intervening as necessary. “Some 8- to 10-year-old children whose parents will not let them assume any responsibilities are unable to protect themselves from asthma triggers, and negligence of required interventions might cause asthma episodes” (Ekim & Ocakci, 2013).

Panzera and associates (2013) conducted a study specifically on teenagers and how social media helped them manage their asthma as opposed to assistance from their parents and both groups were surveyed. Social media has become a juggernaut of a tool to get information out to the general public, and more specifically the younger population. Teens spoke freely about the barriers to care such as forgetting daily medications or forgetting to notify parents of needing refills. (Panzera, et al., 2013). Both groups expressed interest in the teenagers managing their own asthma and being more responsible for it. The teens conveyed it would be a “peace of mind” (Panzera, et al., 2013, p. 925) and caregivers stated that teen’s control of the asthma would “relieve their own anxieties” (Panzera, et al., 2013, p. 925). Both groups felt that social media, videos, or even an application would benefit the teen’s ability to manage their disorder. “Recommendations were received from teens and caregivers on how best to adapt digital and social media to meet their daily health needs, and ultimately, to design usable and acceptable practical tools for teens that will reduce barriers and enhance the benefits of asthma control” (Panzera, et al., 2013, p. 928). The specifics from the study in regards to development of an application will be discussed further in the appropriate lit review section. However, it should be noted that asthmatics, even as young as seven, could potentially benefit from development of an application to assist with self-management.

Milnes, McGowan, Campbell & Carey (2012) conducted research in the development of a guide for teenagers prior to asthma visits. The necessity for this came from the need for this age group to develop those self-reliant skills. “First, patients need to be able to identify patterns of change in their condition, when to seek advice and how to describe symptoms. Second, patients need to be prepared to articulate their health concerns and to negotiate a treatment plan” (Milnes, McGowan, Campbell, & Callery, 2012, p. 92). The teenagers felt that providing them with vital information would help them to be well-versed in conversations with providers. It would assist with providing evidenced-based education similar to what the application will convey. “The effectiveness of educational/health care resources can be more relevant to the target population if patients’ insights into the management of their condition are incorporated” (Milnes, McGowan, Campbell, & Callery, 2012, p. 98). With this information, the education provided in the application can ensure that it’s not overly simplified but not at a level greater than can be understood by younger users.

Allergies and treatment. The premise of “One respiratory tract, one respiratory disease” has been established, with the progression from allergies to asthma, in some cases (Passali, Bellussi, De Corso, Passali, & Passali, 2013). Suffering from allergies was reported by 94% of asthmatics and having asthma was reported by almost 40% of allergy sufferers that were studied (Passali, Bellussi, De Corso, Passali, & Passali, 2013). Part of the application created will be an allergy profile that will focus on education, allergy treatment, and immunotherapy. If allergies can be treated or triggers can be avoided, it will lower the allergy levels and improve symptoms and severity of symptoms

and in some cases prevent the progression to asthma. It is these reasons that allergies are included in this literature review.

Passali and team (2013) conducted one of the longest studies of allergic rhinitis. It was a 32-year longitudinal study to examine the progressive effects. The study started with children in 1980 with allergies and monitored them through adulthood. Over the years, the participants were divided into three treatment groups; symptomatic drugs (allergy meds, steroids), immunotherapy, and no treatment. “We believe that it is extremely important to stress that among our patients, asthma, the most dangerous and invalidating complication of allergic rhinitis, developed only in the non-treated group” (Passali, Bellussi, De Corso, Passali, & Passali, 2013, p. 1193). Throughout the years, the symptomatic drugs were most efficacious after three years and the immunotherapy was most efficacious after six years. Symptomatic treatment demonstrated to be an extremely valuable weapon but not as effective as immunotherapy. “Data obtained in 32 years of follow-up (the longest period ever published), we can conclude that the use of immunotherapy guarantees, in a large number of patients, remission of local symptoms and valid protection against local and bronchial complications”(Passali, Bellussi, De Corso, Passali, & Passali, 2013, p. 1194). With the development of the personal allergy profile after RAST testing, the app users will be provided the positive benefits for immunotherapy. Along with the profile, users will be educated to which ones could be considered for treatment via immunotherapy versus even consideration of symptomatic treatments.

Several articles were located to strengthen the educational aspect of immunotherapy. Some of the articles pertain to sublingual versus subcutaneous (Saporta,

2012a) while others explore the efficacy of immunotherapy in children (Kim, et al., 2013) (Peng & Liu, 2013). Another article explores the improvement of asthma with immunotherapy, specifically peak flow readings (Saporta, 2012b) while another article explored the use of grass specific immunotherapy via sublingual tablet (Reich, et al., 2011). In looking at younger children, the thought of immunotherapy via injections weekly can be a scary proposition, therefore newer treatment options have been developed such as sublingual therapy. In a retrospective chart review conducted, both subcutaneous and sublingual provided a reduction in the need for allergy medications. (Saporta, 2012a). With both being found to have similar efficacy, one should consider using sublingual if available. “Given the increased risk and difficulty in treating asthmatic and young patients, these results would suggest that SLIT [sublingual] should be considered as the main treatment modality for these patients, considering SCIT [subcutaneous] only for treatment failures” (Saporta, 2012a, p. 5). Peng and his team through a two-year period of immunotherapy were able to examine children with asthma and allergies to monitor potential for improvement of asthma symptoms with immunotherapy. “Onset age of wheezing and AHR were significantly correlated with the clinical response to s.c. ASIT” (Peng & Liu, 2013, p. 683). A large majority, 72.9% of the children in the study, demonstrated good response and improved symptoms. It was noted however, that if children are younger than three, the provider should be cautious in considering immunotherapy. This seems to be consistent with the prevalence of diagnosing a child of this age with reactive airway disease as opposed to asthma. Kim and researchers conducted a thorough systematic review of SLIT and SCIT to determine the effectiveness in children. “We found ... evidence that SCIT improves asthma and ...

rhinitis symptoms and improves conjunctivitis symptoms, lowers asthma medication scores... We found high-strength evidence that SLIT improves asthma symptoms and improves rhinitis and conjunctivitis symptoms and decreases medication usage” (Kim, et al., 2013, p. 1184). With significant data like this, immunotherapy will be a good portion of education in the application. In continuing with the theme of immunotherapy improving asthma symptoms, an article was reviewed demonstrating specifically peak flows in reference to immunotherapy. A retrospective chart review was conducted with patients from the ages from 4-75. Immunotherapy showed sustained improvement in peak flow values in approximately 60% of patients (Saporta, 2012b). The theme of one tract, one illness is prevalent again. “If it is accepted that the allergic condition affects the whole organism, then it is only logical that the lower airway of an allergy sufferer will be involved” (Saporta, 2012b, p. 7). This continues to support that asthmatics need to be considered for treatment for not only allergies but strong consideration needs to be given to the discussion of immunotherapy. Lastly, the study examining the use of grass immunotherapy via the use of a sublingual tablet. The study was conducted to show that starting the treatment in season does show effectiveness, which is likely when patients would present to the office for treatment options (Reich, et al., 2011).

Mobile applications. Because there will be creation of a mobile app, research needed to be conducted on mobile app usage in healthcare. Consideration also needs to be given to the FDA (Food and Drug Administration) ruling on mobile healthcare apps, that has not been enforced yet, and HIPAA (Health Insurance Portability and Accountability Act) considerations as well. “There is currently no regulation of the

information that is included in the apps or guidelines for recommended use” (Murfin, 2013, p. 38).

Healthcare apps are being created rapidly and can prove to be beneficial to patients, if constructed correctly. “Across the country, innovative organizations and clinicians are using mobile apps and devices to provide more convenient, safer, and higher quality care” (Williams, 2012, p. 96). Several aspects are discussed in the article, in an attempt to get hospitals to create applications. The idea of creating the application lies in the improvement of care of the patients. One of the takeaway messages from this was to keep it simple for patients. “If we had designed something with 1,000 steps for patients to complete to get through the process, it would have hindered our success” (Williams, 2012, p. 101). In creation of the app, it needs to also be considered user-friendly for patients but also providers. “The physicians who helped design [the app] were really focused on creating a tool that not only would be convenient, but also would provide the information they needed to treat a patient appropriately” (Williams, 2012, p. 101).

With technology becoming more prevalent in the exam room and patients becoming more technology savvy, providers need to embrace the electronic age. “A 2007 study surveyed 770 patients who shared information they obtained from the Internet with their clinicians... those clinicians who engaged with and encouraged their patients to seek information had patients who were more significantly satisfied” (Phillips, 2015, pp. 79-80). Providers should use technology to improve self-care of chronic disease, much as has been described in the reasons for development of the app being built. “Support of a patient’s self-management is a recognized key component of effective chronic care.

Self-management has moved well beyond handouts provided by the physician's office and other forms of clinical "bibliotherapy" (Phillips, 2015, p. 80). The use of technology needs to be incorporated into provider visits and patients should be encouraged to research and bring information to office visits to discuss. Provider need to remain cognizant to reputable sites and apps to recommend to patients.

Apps for use in healthcare are seemingly created overnight, thus providers should develop an approach to evaluate apps that patients utilize. Murfin (2013) provides a systemic approach to evaluating applications. First, know the origin of the app whether it was developed by a private individual, a group of health care providers, health professional students, or a professional organization" (Murfin, 2013). The next step in evaluating potential apps would be to examine the sponsors. "Some apps are directly marketed by pharmaceutical companies, while others may be subsidized or funded under a grant... Knowing who is behind the information helps the user determine if emphasis placed on a particular treatment option is warranted" (Murfin, 2013, p. 39). The next step in evaluation is to examine the references to the app. "Quality mHealth apps should contain references that support the content" (Murfin, 2013, p. 101). The provider will evaluate the protocols to determine if they are evidence-based or if there are other ways that information is confirmed to follow accepted standards of practice. The apps should clearly delineate this. Lastly, is how frequent is the app updated. "Outdated information is not useful and can be harmful when making patient care decisions" (Murfin, 2013, p. 101).

Asthma applications. To determine the best possible way to build the application, a review of current asthma applications and online services was evaluated for

efficacy and usability. Panzera and his team conducted a study with adolescents to examine social media outlets for asthma self-management, however, also found during the study was aspects that would improve self-management such as applications. “A concept for an app was presented to the teens. The proposed app would allow them to enter personal asthma information into a database and receive tailored feedback. Feedback was described as being in the form of alerts and reminders with information shared between teens and health care providers” (Panzera, et al., 2013, p. 926). The teenagers suggested an app that created a personal profile and also had the ability to send text message reminders and alerts. The reminders would be to take daily medication or do peak flows. (Panzera, et al., 2013). This information proves to be invaluable as the teens will ultimately be the ones to use the application.

In 2011, a trial was conducted to determine if web-based portal usage would improve management of chronic diseases, specifically asthma. In view of this being a trial, one group utilized the web-based portal to assist with management while the control group managed without the use of the portal. “Health information technologies (HIT) can offer novel opportunities to enhance patient self-management and patient-provider partnerships by facilitating: 1) active disease monitoring and feedback with the care team; and 2) patient education about successful adoption and maintenance of health behaviours between clinical encounters.” (Ahmed, et al., 2011, p. 2).

Utilizing technology to improve management is something that providers and healthcare systems need to consider. Technology can impact the patient-provider flow. “The challenge remains to develop integrated systems of care that permit easy access to information, enhance collaboration between clinicians and patients, and emphasize a

patient-centered approach to care by addressing the self-management needs that are most relevant to patients” (Ahmed, et al., 2011, p. 13). The results from this trial will examine the feasibility of using technology to manage chronic asthma.

Huckvale, Car, Morrison, and Car conducted two separate research articles, one in 2012 and one in 2015, examining every asthma application available for use and download. The apps were investigated for evidenced-based education and for features that was determined should be included. “We adapted principles from systematic literature reviews to assess the content quality of smartphone and tablet apps for asthma against objective criteria derived from evidence-based guidelines” (Huckvale, Car, Morrison, & Car, 2012, p. 2). In 2012, there were over 100 asthma apps available for download. The authors systematically reviewed each application’s education based on criteria of what would be an all-inclusive app. Huckvale and associates (2012) explained the criteria were: basic facts about the nature of the condition; the nature of treatment relievers and preventers; allergen and trigger avoidance; how to use treatment; self-monitoring and assessment skills; the role of a written, personalized action plan; recognizing and responding appropriately to acute exacerbations; personalizing the definition of good asthma control. None of the apps included all components and some apps provided information that was not in line with current practice. “Four apps recommended avoiding conventional medical management because of the risks of side effects, addiction and worsening of the condition” (Huckvale, Car, Morrison, & Car, 2012, p. 6). In looking at tracking of symptoms functionality, there were 29 apps that were reviewed. “None were able to vary the number of steps in the action plan, nor the thresholds at which the action plan steps were triggered (50 and 80%) (Huckvale, Car,

Morrison, & Car, 2012, p. 7). In the first article, Huckvale and associates stated that no app was all-encompassing in providing education and symptoms tracking. In the second article, Huckvale and researchers conducted another systematic review of new apps that had been released since the last study. The number of apps had almost doubled, yet the apps were still lacking evidence and functionality. “Over a quarter (28%, n = 22/78 unique apps) included in the original review had been withdrawn, and a similar proportion (24%, n = 19/78) updated, between 2011 and 2013” (Huckvale, Morrison, Ouyang, Ghaghda, & Car, 2015, p. 4). Final analysis was conducted on 147 apps and was done for both education aspect and usability of the tools/symptom tracker. “While choice has increased, newer apps for asthma were no more likely than those available in 2011 to satisfy evidence-based recommendations for information content or the design of self-management tools” (Huckvale, Morrison, Ouyang, Ghaghda, & Car, 2015, p. 10).

Summary

A thorough literature review was conducted in regards to asthma, allergies, and use of mobile applications with the premise of creating an app that will assist with self-management of those chronic conditions. The application will address education, treatment options, and self-management of those conditions and will be user-friendly enough to ensure that ages from young to old can comprehend and use the application.

Asthma and allergy treatment has evolved with evidenced-based practice and providers need to be cognizant of this. Despite the evolution, the use of AAPs is still the gold standard in treatment guidelines; though, the plan should be individualized for each patient. The plan for the app will be to have the ability to have an AAP but also looking at the capability of making it customizable, one of the downfalls of current apps

(Huckvale, Morrison, Ouyang, Ghaghda, & Car, 2015). It is apparent that asthmatics are looking for options to assist with self-management and improvement of their overall health. The literature reviewed, including clinical practice guidelines, will be used to build the educational aspect of asthma and allergies for the app.

In order to determine if using the application is feasible, the literature review also focused on use of apps in medicine and also the use of asthma apps specifically. The FDA has released a ruling on medical app regulation though it has not been enacted yet. “As described, FDA intends to apply its regulatory oversight to only those mobile apps that are medical devices and whose functionality could pose a risk to a patient’s safety if the mobile app were to not function as intended” (FDA, 2015, p. 13). This has to be taken into consideration so that either the app will be built to not be classified as a medical device or the app will meet the guidance to get approved by the FDA. HIPAA is also concern and the app will need to be designed to ensure HIPAA compliance as well. The review of the asthma apps specifically was exceptionally beneficial. Teenagers were interviewed and discussed what they would like to see specifically. The explanations from the literature review will be scrutinized as the app is designed, built, beta-tested, and eventually released to general public release.

CHAPTER III

Methods

Project Design

The design of the project will be the creation of an app for smart phone and other mobile devices. After beta-testing, the app will be released for general release through Apple App Store and Google Play. Apple App Store would make it available for all Apple devices and the Google Play store would cover android devices. This section describes the design of the application from idea through completion of the first version of the application that will be ready for beta-testing.

General Application Creation. The application will be built from idea through completion in preparation of beta-testing and eventual general release. There are several steps in designing and developing an application. The steps as listed below were obtained from *Forbes* magazine (Haselmayr, 2013). After the idea is devised, the creator needs to begin sketching of the basic screens. This allows the creator to visualize and begin thinking about layout and structure. After the initial sketching, the creator will create a wireframe, or prototype, of the app. There are several websites, including *Mockingbird*, *Mockflow*, and *Balsamiq*, that allow the creator to design exactly how the application would look on the mobile device. Some of the sites allow for button functionality when testing the app in wireframe mode. Due to the click through

functionality, this is also when the creator will need to draw a storyboard or roadmap of the app. In storyboarding, the creator will know the navigation through each screen and where each button click will lead to. Once the prototype is built and storyboards are completed, the creator needs to think of the back end of the app. The back end of the app is the functionality, database, and storage for all of the functions of the screens of the app and the creator needs to think about how this information will be stored, whether on a hard server or cloud-based. Consideration needs to be made for the amount of storage needed and how many users will be accessing the app at any one time. The next step is to allow a small group of colleagues to test the prototype, while in wireframe mode. They should examine for proper flow and dead buttons or links. Once the prototype has passed that initial check, the creator will need to begin building the back end of the app, as was described above. Given the comfort level of the creator with programming, this can either be done by the creator or contracted out to a programmer. Skin design is the next step in the process. Skins are high resolution versions of the designs during the wireframing process. At this point, the app will need to be uploaded to a site like *Solidify* or *Framer*. These sites allow you to directly import your app design and attach the links to the buttons. This is different from the wireframing in that this is the actual app that is being tested and not just the skeleton. After any modifications are made from this testing it will be time to install the app files into live or semi-live environment. For Android, the app can be installed into the live environment for beta testing. For Apple, the app will need to be installed into TestFlight® for beta testing.

Application Explanation. The application that is being created will start with a screen to select the user, as there will be the ability to build multiple profiles. Each user,

after building their profile and providing basic information about their condition, will be able to obtain evidence-based education on asthma and allergies. The information presented in the app will be easily readable by those who understand English. The education will cover topics in asthma and allergies that providers may not always have time to cover with patients during a routine office visit. There are several criteria that need to be included in the education and several specific items that will need to be covered in the education as well. Huckvale and researchers listed eight topics and several criteria under each topic for education that needs to be included in an app. These include stating that asthma is a lung disease characterized by inflammation of the airways, that asthma's cause is unknown, that preventer medication needs to be regularly to be effective, and that an asthma action plan is needed. (Huckvale, Car, Morrison, & Car, 2012).

The remainder of the app will be devoted to allowing users to create personalized asthma and allergy profiles within their initial profile selection. In the asthma section, the user will be able to create and alter an AAP for themselves. This AAP will be able to have values input into it for both the peak flow readings, and the percentage for each section. The user will be able to then import their peak flow reading and have it display on the AAP. Future functionality, ideally, would include a peak flow meter that would Bluetooth or actually connect directly to the device and input the reading automatically into the application. The readings will be stored in a diary that can be saved and emailed to the provider for monitoring purposes. In the allergy section, the user will be able to create an allergy profile by selecting the specific allergens. They would obtain this information from having either RAST testing or Scratch allergy testing done. Once the

allergens are selected, the app will create a personalized allergy profile to give users specific ways to lower or avoid their specific allergens.

Legal Considerations. There are several legal aspects that will need to be considered in the creation of the application. At a minimum, the app will need to be able to comply with the terms of service for both the Apple App Store and Google Play Store. These terms of services will be reviewed thereafter to ensure proper compliance.

Another significant legal aspect to be considered is the FDA guidance on medical apps. “The Food and Drug Administration (FDA) recognizes the extensive variety of actual and potential functions of mobile apps, the rapid pace of innovation in mobile apps, and the potential benefits and risks to public health represented by these apps” (FDA, 2015, p. 4). In examining the current guidance, the app that is being created should fall within an “exempt like status”. According to the guidance:

Mobile Apps for which FDA intends to exercise enforcement discretion (meaning that FDA does not intend to enforce requirements under the FD&C [Food, Drug, and Cosmetic] Act... mobile apps that help patients (i.e., users) self-manage their disease or conditions without providing specific treatment or treatment suggestions” (FDA, 2015, p. 15).

While that is the current recommendations, they will be reviewed routinely to ensure there has been no change in the FDA regulations that would require the app to have FDA approval.

Lastly, HIPAA has to be a large consideration given the chance that patient data could be stored on the device as well as data servers. The data would have to be identifiable protected health information that could be used to identify a patient. With

mobile devices, HIPAA is a major concern because mobile devices can be easily lost or stolen and are frequently not adequately encrypted and password protected. Due to this, any medical type app designed for mobile devices need to be cognizant of HIPAA rules and regulations to ensure compliance and prevent HIPAA violations. In reviewing several articles in regards to HIPAA and mobile apps, the app doesn't have to be compliant with HIPAA regulations as long as information is not transmitted to a provider.. "If your app is used to record and share patient information with a covered entity in any way, it must be HIPAA-compliant" (Wang, 2014). Due to the time that it would take to become HIPAA complaint, the initial build of the application will not transmit information to covered entities, such as providers. This feature will remain a plan for future versions.

Target Population

The target population for the app will be asthmatics and allergy patients that have mobile devices and are capable of utilizing the application. According to the CDC, there are 39.5 million asthma sufferers in the United States (2013). Allergy sufferers number over 50 million per the American College of Allergy, Asthma, and Immunology (2014). These sufferers will be the target population of the app. The user will also need to be able to read and understand English as that is the language the initial version of the app will be written in. The app will also be targeted to parents of pediatric asthmatics and allergy patients as a way to assist with education and tracking symptomology of their children while at school or away from home. Given the number of asthma and allergy sufferers mentioned previously, the anticipation is a wide general release in both Apple and Android markets with the hope of a significant number of downloads.

Procedure

Application Construction. Upon approval of the Doctor of Nursing Practice (DNP) Scholarly Project Committee, the application building process will begin. The first step will be to sketch the design of the main screens. An account has been created on *balsamiq.com* to allow for wireframing of the app and bringing the sketches to life. There is a small cost with membership of the site, but is a vital step in the application design. This website will also assist with the mapping of the app from screen to screen. Adding button functionality to the wireframing will ensure the buttons will go from screen to screen as imagined. Once the wireframes are built and the mapping is completed, the backend of the app will be considered. Research will be conducted to determine the best service for housing of the data that will be generated for the app and by the users. To lower startup costs, the best option will be a cloud based storage service. There are several relatively inexpensive options. For example, Firebase™ through Google™ offers a plan for 100 users (at any one time) for a small monthly fee. The other benefit to this service will be scalability as the app grows in users, the database ability can expand as well albeit for an increased cost. As the account is being created for the database, the wireframe app will be sent to several colleagues and technology advanced friends to test the prototype. They will be provided a basic idea of what they are to be testing to ensure that the prototype screens are readable with no grammatical errors or other issues. The database build will begin after the prototype testing. The database will be the location of the educational information that is provided to the user, as well as the user created account information and personal allergy or asthma profiles of each user. After the backend is completed, the app will go through final designing of each screen in

a more high-definition fashion. This will also take into consideration the comments made during the prototype testing. The app can then be uploaded to Testflight, the Apple beta testing site, and to the Google Play store for Android devices. The beta-testing occurs in a live environment in the Google Play store.

IRB (Institutional Review Board) Approval. This scholarly project is the creation of an application. There will be no human testing or human subjects involved in the project, therefore IRB approval is not required. However, before construction of the app begins, approval will be sought from members of the Pittsburg State University Irene Ransom Bradley School of Nursing DNP Scholarly Project Committee.

Timeline of Project Phases. The process of app construction will begin approximately March 2016. Wireframing should be completed by April, with a one-week prototype testing period. The database building will take place from April through August. While this is a significant period of time, it is anticipated to be the largest and most tedious aspect of the project. The final designing will begin mid-August with a target final trailing date sometime in October, before completion of the project and defense of this DNP Scholarly Project. As a DNP prepared nurse practitioner, the project will continue to beta testing and general release after graduation.

Resources Needed. There are several resource avenues that need to be examined to assist with successful completion of this project. Fiscally, the project will be funded by this author. Current estimations are a monthly cost of less than twenty dollars a month, as the app will be launched after completion of the project. In the event that the cost is substantially more during the construction and housing the database, the Pittsburg State University Graduate and Continuing Studies offices will be contacted to discuss

financing options. Personnel wise, this author will look to the DNP project committee for guidance. Each member of the committee brings expertise and will be relied upon throughout the process. The possibility of needing expertise or specialist experience during the building of the database is noted and will remain an option. Technology will be one of the larger needs to be addressed. An up-to-date laptop with a strong internet connection is needed and has already been obtained. Accounts at the websites will be created to ensure the wireframing, designing, and databasing can occur as needed. An Apple device with TestFlight is needed and available. BlueStacks™ is a PC based Android device. This program has been downloaded and will allow for testing of the app on the Android system without the investment of an Android device.

Market Analysis. According to Huckvale and researchers in a 2015 article, there were 147 apps marketed toward asthmatics found during their systematic review of every app on both the Apple and Android market. “Newer apps were no more likely than those available in 2011 [their first published study] to include comprehensive information, such as the use of action plans, or offer guidance consistent with evidence” (p. 1). There are eight evidenced based criteria that should be included in the education component of the app and none of the apps reviewed contained all components of the eight criteria. The other major issue determined was the lack of customizability of the AAP. There are several allergy apps available for download; the majority however, are designed and marketed by allergy pharmaceutical companies, like Zyrtec®, for example.

In examining the market, there is a notable niche that this app will fill. First, there was no app that combined asthma education, AAP, and personalized allergy profiling. The educational aspect will incorporate all eight evidence-based criteria to ensure users

are getting the most up to date information. This information will be reviewed biyearly to ensure that information is timely. The current goal for the AAP is to make both the peak flow readings as well as the percentages for red, yellow, and green customizable. Asthma is a different experience for every patient, treatment is customized for every patient, therefore the AAP should be specific for every patient as well. Lastly, the allergy component will allow the user to truly generate a personalized experience for each user with allergen reduction strategies tailor made for each user. The combination app created will be revolutionary and after beta testing the anticipation is that the app will be very well received and obtain a substantial number of downloads.

Plan for Sustainability

The plan for sustainability for the proposed app itself is to complete the beta-testing and then the app will be released for general release. A social media campaign will be created to advertise the app as well as local, regional, and national conferences. The app will be offered to providers via word of mouth advertising and with the prior beta-testing. The hope is that there will be significant hype about the app prior to its general release.

In examining the sustainability of the design and backend of the app, the database will be built on a server that allows for scalability to allow more users and more storage as needed. The number of downloads and users will be monitored routinely to gauge when that scalability will need to be implemented. The skin of the app will be stored both in the cloud as well as on a hard drive for redundancy and can be updated as needed.

In regards to the sustainability of the financial and business side of the app, there will be steps taken to protect the app and the creator. A Limited Liability Corporation

(LLC) will be established as this protects the creator's personal finances and assets. The name of the app, ALLAS Profile, will be trademarked through the United States Patent Office to ensure that the name cannot be used by other agencies or applications. The coding of the application is considered an original work of art and therefore can be copyrighted. The copyright will be filed with the United States Copyright Office to protect the integrity of the app and the work that was put into the building of the app against copyright infringement. Financially, if the costs of the database housing increase substantially, then options, such as ads, will be explored. As long as the costs of the app remain low, the app will be privately funded by the creator and will remain free to download. The option of a buyout of the app by a larger company could be an option if the app obtains a considerable number of users.

Summary

This DNP Scholarly Project is the creation of a mobile application that will combine asthma and allergies into one seamless app to allow for proper education and management of these chronic diseases. The app will be designed from idea through creation of the first version of the app, prior to beta testing, for this project. The steps have been described in detail and will be done from sketching to database build to final skin design. The target population of the app will be patients with asthma and/or allergies. The other population targeted will be parents of asthma and/allergy sufferers as they will be able to track symptoms of their child, even while the child is away from home. This population will be targeted after successful beta testing. The actual construction of the app is the project; therefore, IRB approval is not needed as there are no human subjects involved.

The application will be designed on a wireframing website and the same website will be used for the final skin design. The database will be built using a Google database server named Firebase. Database building will likely be the most time-intensive aspect of the project and one potential resource available will be technical assistance with the build. Other resources needed include a working laptop, internet connection, and capability to test the device on apple and android servers. Financially, the app will be financed through the creator as the estimated start-up costs are low. In examining the market, there is no app currently available that incorporates all aspects that the proposed app will and therefore the anticipation is a large market share once the app is released in general release.

The forecast of the sustainability of the proposed app is good. Upon completion of the project, extensive beta testing will occur followed by a large-scale general release with marketing via social media, conferences, and word of mouth advertising. The design and skin of the app will be stored both in cloud form as well as on the network drive of the creator. The database will be stored in a cloud-based format on Firebase servers. Those servers allow for scalability as the app grows so can the number of users accessing the app, and therefore database, at any one time. Financially, the creator will support the app until such time that the app becomes large enough that advertising or selling of the app is an option.

CHAPTER IV

Evaluation Results

Introduction

The purpose of the project was to determine what asthma and allergy apps were currently on the market and what features were lacking from that apps that would be beneficial to asthma and allergy patients. Once that was determined, the focus switched to could an app be created and could that app that was created have those features that are lacking from other apps.

Description of Population

The ideal population for this project are asthma and allergy sufferers. There are millions of potential users in United States alone, that are diagnosed with these ailments. Asthma and allergies affect all populations, ethnic groups, and socioeconomic status. The population will need to be able to operate a mobile device, though the app design caters to easy use and more and more children are embracing the use of technology. Because socioeconomic status was a strong consideration, the app has been designed as a free app. As the costs increase, will look to sell advertising space to maintain low to no cost for users. The app was created to be available on Apple and Android devices to ensure higher number of downloads, as opposed to limiting it to just one type of device. This will allow any population to have access to the app.

One of the biggest challenges with any project is reaching the appropriate population and this project is no different. To adequately reach asthma and allergy patients, a Facebook page was created promoting the app. This aspect will focus on the usability and easy understanding of the application. Because it will be patient focused, the Facebook page, will provide up to date information and other features to entice users to download the app. Advertising will also be done in local, national, and global provider foundations and groups. As this will be targeted toward providers, the information will focus on the evidence-based aspects of the app, as well as the improvement in the ability to track AAPs and personalized allergy profiles. If the ALLAS App can become the app that is recommended by providers to asthma and allergy patients, that will increase the population using the app significantly.

Description of Key Terms/Variables

The app was built to provide education and better management of asthma and allergies. An app is an application or program that is designed and built to run on a mobile device. The author had no previous experience building an app so that made for a challenge at times. The education component contains information for patients that will be easy to understand. The age of potential users has been taken into consideration for the education. The education also includes photos and videos to enhance the learning. The program that was utilized to build the app allows for real-time updating with the ability to push that information out to the app with the click of a button. This feature will also be beneficial as evidenced-based education could change over time. The action plan and personalized allergy plans will be added and upgraded after beta-testing.

There were no dependent or independent variables for this project. There are some variables after the app is released that will be uncontrollable. Apps are appraised by two variables; number of downloads and rating from users. Both of these variables are not controlled by the app creator but have a substantial impact on the app itself. Number of downloads will assist with generating ad revenue. This is achieved because the more downloads the app has, the more people that will see that advertisement will generate revenue which will make the app a more sustainable business model. The rating is generally a star rating from 0-5 with an option by the customer for free texting. This rating allows other potential customers to see how the public likes the app and its functionality. The free texting option allows both the public viewing of the comments but as a feedback mechanism for the app creator to consider future releases and bug fixes.

Analyses of Project Questions/Hypothesis

There were four questions to be addressed in this project. Each question will be addressed individually to ensure that it is answered thoroughly and completely. The questions were designed to build upon the information from previous questions to obtain a greater understanding of the project being done.

The first question the project sought to answer was what mobile applications are currently available for asthma and allergy patients? Both the App store and the Google play store were explored by the author for asthma and/or allergy applications. Some of the more popular, highly downloaded apps were examined and studied. The other aspect that was thoroughly scrutinized were the two articles by Huckvale et al. published in 2012 and then 2015. These two research articles assessed all apps that were available for download based on functionality and evidenced based criteria for educational aspects.

By judging each app by the same standard, shortcomings and areas of excellence were easily identifiable. The project author not only researched the articles but also downloaded and studied all the spreadsheets and research information created for those two articles. The answer to the question ended up being several hundred mobile applications that were available for download at the time of the project. Initially, this seemed discouraging because of the high number already available. However, despite the number of apps available, none had all the features, like modifiable AAPs and personalized asthmas profiles, that should be included in an all-encompassing app. This is what will set ALLAS head and shoulders above the others, an app that has the features that are needed while being easy to use.

The second question sought to be satisfied was what functions on these applications are lacking that would benefit asthma and allergy patients? This author mimicked criteria that Huckvale et al. used in the two published articles about asthma apps in 2012 and 2015 to determine what aspects were lacking. There are two substantial components to be assessed: an educational element and a self-management element. For the education aspect, there are eight criteria that need to be considered based on current evidenced-based practice guidelines and each will be discussed here to enhance the understanding of the importance of each aspect. First is basic facts about the disease. Some of these facts would include the basic definitions of the diseases, common symptoms, cause, and curability. Next is treatment both prevention and relievers. Aspects in this section include side effects of treatment and early treatment can prevent worsening. Another section would be regarding allergen avoidance and treatment to include the importance of knowing personal triggers. Next is the proper usage of

treatment (inhalers). This segment discusses proper technique and insuring non-expired medications. Next aspect is the self-monitoring. This aspect discusses a change in homeostasis and the use of a peak flow meter. Next aspect is the importance of the personalized action plan to include the purpose and step therapy characteristic of the plan. Another vital aspect is recognizing and responding to exacerbations appropriately. This component would provide information regarding worsening of asthma and layman management of asthma. Final aspect is the personalizing of good asthma care. This section discusses personal goals and self-management of asthma, while encouraging dialogue with providers.

Beyond the educational aspect, the other deficiencies were related to the diary and symptom control elements. There were apps that had asthma action plans were determined to be non-modifiable. This is a significant issue given the need for personalization of the care of asthma patients. Given that no single app had the ability to record data (PFTs) and has the ability to modify the asthma action plan, that is a large deficit that needs to be rectified and ALLAS will serve to meet these deficits.

The third project question was to determine if it was possible to create an asthma and allergy app. The app was first storyboarded on balsamic.com and then the skeleton of the app was created on goodbarber.com. Use of goodbarber.com, allowed for better management of functionality that will be added to the app as it is constructed. Goodbarber.com also allowed for database storage as well as push notifications to users for the app at a reasonable price.

The fourth and final question sought to determine if the mobile application that is created produce those functions that are lacking to improve the application usage for

asthma and allergy patients. The educational aspect is completed. Through utilization of this site, as described above, education can be added and changed as evidenced-based recommendations change and then pushed out to the users and will update real time. The other two major components (asthma action plan and personal allergy profile) are still under construction and likely will be for several months post project completion. The app has buttons for those functionalities when they are finishing but they currently say “Coming Soon”.

Summary

The objective of this project was to create an asthma and allergy app. To that end, several project questions were derived to be answered in preparation of the construction of the app. Research was conducted on the apps currently available as well as the shortcomings of those apps. In reference to the shortcomings, the most prevalent was lacked of compete evidenced based education and lack of modifiable asthma action plans. An app was created that will incorporate these features that were lacking as well as a personalized allergy profile. ALLAS will be an all-encompassing asthma and allergy management tool to improve the health and well-being of patients.

CHAPTER V

Discussion

Relationships to Outcomes to Research

The overall purpose of the project was to determine if there was a need for an asthma and allergies app and then subsequently construct an app to fill that need if the need was determined. Apps have become a common way for patients seeking to understand and manage their chronic illnesses. There are almost 40 million Americans that have been diagnosed with asthma and millions more worldwide that have a desire to manage their chronic disease. Likewise, there are millions of patients that have allergy that are seeking strategies to better control outbreaks. Through the research of the previous apps, a significant shortcoming was discovered and that became the focus of the app that was built, ALLAS.

Through this author's scholarly project, ALLAS was built, which will provide users with education that is evidenced based in nature. Education will have the ability to be changed in the event that evidenced-based practice changes. ALLAS will also have an AAP component to allow asthmatics to track their symptoms and will also allow for patients to create an allergy profile to determine the best way for them to reduce allergens thereby controlling their allergies.

After the idea of ALLAS was envisioned, storyboards were created to show a mockup of the screens and to demonstrate the colors and button functionality. The storyboards were then used to create the wireframes and to prepare it for general release and features and education will be added as they are created and then pushed out immediately. ALLAS will also have the database feature for the education that is retained on the website that is also housing the app for a monthly fee.

To protect ALLAS and the ideas associated with the app, the LLC was established (Appendix A). This also allowed for more reliable financial tracking for the costs associated with startup and maintenance of the app. The LLC also allowed for easier filing of trademarks for ALLAS Profile (Appendix B) and will be beneficial for future copyrighting or any other business ventures as they might arise.

Observations

The most difficult hurdle for the project was construction of ALLAS. The development of the idea into a DNP scholarly project happened eighteen months ago and ended up being relatively easy in comparison to the actual development. Initially, this author set out to learn coding in order to develop the app and painstakingly write every line of code. Due to lack of previous experience with coding and the expert level of skill to code an entire app, that idea had to be altered to allow for project deadlines to be met. Several web services were tested, under free trials, to determine which service would be the best fit for the app. The first build of ALLAS, on the site that is housing it, was deleted by the housing site because it was not purchased prior to the end of the trial period. While this was a setback, it created a learning opportunity on the importance of deadlines and attention to detail. ALLAS had to be recreated, and space subsequently

purchased to ensure the safe housing (Appendix C). The purchase allowed for ALLAS to be stored and housed for the next year, as well as allotting for updating the education and building of future functionality.

Beyond the app itself, other observations during the project were related to the business aspect. The development of the LLC was a learning process as was the development of a trademark application and submission of the application to the patent and trademark office. This experience for the project has provided knowledge that will be beneficial if other development ideas or business opportunities present in the future.

Limitations

The limitation of the app at the point of project completion is the lack of full functionality. ALLAS has been developed and some aspects of the education have been built. Future plans include building to the AAP section and the personalized allergy profile section. The education component has also not been achieved to the level that will provide adequate education to patients and parents of patients. With those limitations, the app has been modified but future functionality will allow those components to be built and beta-tested before general release.

Implications for Future Projects/Research

There are several phases for the future of the project and subsequent app. After completion of the project, the educational component will be enriched with more topics, to ensure all evidenced-based educational standards are met, and more helpful informational videos/diagrams. The AAP section will be coded and built that will allow users to input their peak flow reading into a modifiable plan and the allergy profile

section will be coded and built to allow users to create personal profiles to lower allergen exposures specific for their allergies (Appendix D).

From a sustainability standpoint, ALLAS has been funded through the LLC and will continue to be so for the immediate future. With that being said, the housing company does have functionality for advertising to be added to ALLAS. Once there are a substantial number of downloads, then advertising space can be sold to supplement the sustainment costs. Likewise, ALLAS and ALLAS Profile, LLC will have the ability to be sold in the event that an entity would like to purchase it. Another aspect of sustainability that has been considered is marketing. A Facebook page has been created and posts can be marketed to a large number of social network users. This marketing scheme will allow for ALLAS Profile to have a large general worldwide release once it is ready for release.

Implications for Practice

The implications for practice and care of patients could be far-reaching. ALLAS will have evidenced-based education for patients along with elements to allow patients to manage their asthma and allergies. Ideally, ALLAS will enable patients to improve their health and therefore require less office visits and hospitalizations. With proper marketing and advertising on social media, ALLAS will have the ability to be downloaded worldwide from the respective marketplaces. This will expand the impact ability of the app to improve patient's health.

From the provider standpoint, it has been built by a provider and has evidenced based practice education for patients. ALLAS will be marketed to providers at conferences and potentially published in journals. Recommendations are that providers

should scrutinize apps before suggesting its use to patients. With it being created by a provider and advertised to providers, the likelihood of its recommendation is improved exponentially. ALLAS will also improve their practice by improving the health of their patients.

Conclusion

The purpose of the project was to create an asthma and allergies app that would allow patients to assume better management of their chronic condition. Through the course of the project, apps and articles were studied to determine what could set the new app apart from the others. ALLAS was built with the idea of one respiratory tract, one disease and therefore one app to manage both asthma and allergies. This is also in part where the name for the app came from as well. ALLAS is a combination of the words allergies and asthma and is similar to the German word, alles, which means “all” or “encompassing”. It was designed as an encompassing app for asthma and allergies. It was storyboarded on balsamiq.com and then created on the goodbarber.com. This site allows for different components to be created and also allows for educational aspect to be built and changed as evidence changes the information that patients need. A limited liability corporation (LLC) was created to allow for tracking of the financial aspects of the app moving forward as well as other business aspects, such as filing of trademarks, as they arise. ALLAS has been built and will be submitted for general release. Currently, ALLAS is slated for general release in the first quarter of 2017.

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APPENDIX

Appendix A


Screenshot of Establishment of LLC

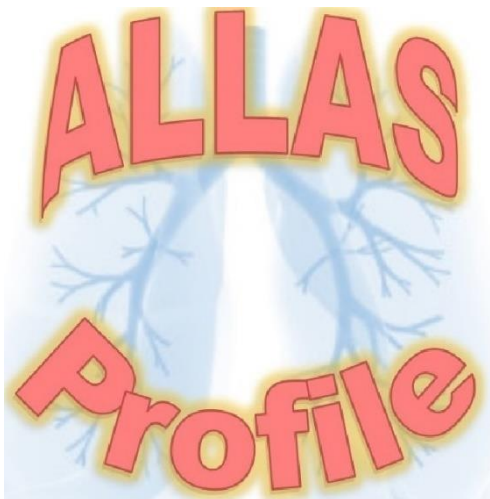
Business Summary

Current Entity Name	Business Entity ID Number
ALLAS APP, LLC <input type="button" value="File Name Change Online"/>	8238388 <input type="button" value="View History and Documents"/>
Current Mailing Address: 406 S Illinois, ALTAMONT, KS 67330 <input type="button" value="Update"/>	
Business Entity Type: KANSAS LTD LIABILITY COMPANY	
Date of Formation in Kansas: 03/22/2016	
State of Organization: KS	
Current Status: ACTIVE AND IN GOOD STANDING	
<input type="button" value="Certificate of Good Standing"/>	
Resident Agent and Registered Office	
<u>Resident Agent:</u> BENJAMIN COCHRAN	
<u>Registered Office:</u> 406 S Illinois, ALTAMONT, KS 67330	
<input type="button" value="Update Resident Agent/Office"/>	
Annual Reports	
The following annual report information is valid for active and delinquent status entities only.	
<u>Tax Closing Month:</u> 12	
<u>The Last Annual Report on File:</u> 00/0000	
<u>Next Annual Report Due:</u> 04/15/2017 <input type="button" value="File Online"/>	

Appendix B

Screenshot of Trademark Application and Symbol being trademarked

STATUS		DOCUMENTS	
Generated on: This page was generated by TSDR on 2016-10-15 01:53:31 EDT			
Mark: ALLAS PROFILE			
		ALLAS Profile	
US Serial Number:	87081872	Application Filing Date:	Jun. 23, 2016
Filed as TEAS Plus:	Yes	Currently TEAS Plus:	Yes
Register:	Principal		
Mark Type:	Trademark		
TM5 Common Status	LIVE/APPLICATION/Under Examination		
Descriptor:		The trademark application has been accepted by the Office (has met the minimum filing requirements) and that this application has been assigned to an examiner.	
Status:	Approved by the examining attorney for publication but has not yet published for opposition. Although rare, withdrawal of approval prior to publication may occur after final review. The opposition period begins on the date of publication.		
Status Date:	Oct. 11, 2016		
Mark Information Expand All			
Mark Literal Elements:	ALLAS PROFILE		
Standard Character Claim:	Yes. The mark consists of standard characters without claim to any particular font style, size, or color.		
Mark Drawing Type:	4 - STANDARD CHARACTER MARK		
Disclaimer:	"PROFILE"		



Appendix C

Screenshots of the app





Appendix D Storyboards of future functionality

