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Video education: A quality improvement project for patients with type II diabetes

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Video Education: A Quality Improvement Project for Patients with Type II Diabetes

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Abstract

Background: Quality diabetes education is a key to successful diabetes treatment. Factors that hinder quality diabetes education include: allotted time for appointments, provider-patient communication, inter-personal relationship between provider and patient, and patient's educational level. Locally speaking, the Central Virginia area has a higher rate of diabetes then compared to the average rate of diabetes in the State of Virginia. To complicate this more, the local area has a higher percentage of poverty when compared to the average poverty level of the state. Combining these two characteristics places these individuals at a higher risk for disease complications and expresses a need to remove barriers to quality diabetes education while providing a solution to the delivery of quality education during primary care appointments. The setting for this quality improvement project was a family medicine residency clinic in Central Virginia that provides care to a high number of these lower-socioeconomic patients, as compared to other localities, many of which have Type II diabetes. The aim of this quality improvement project was to design and introduce standardized education to primary care appointments. Outcome measurements included knowledge gain and patient satisfaction with the educational intervention.

Methods: The IHI Psychology of Change provided the framework for this quality improvement project. The IHI Psychology of Change framework utilizes five domains that intercorrelate to help produce and sustain quality improvement. Through these domains evidence-based interventions are implemented to improve patient care. The five domains include: Unleash Intrinsic Motivation; Co-Design People Change; Co-produce in Authentic Relationship; Distribute Power and Adapt in Action. In the context of this project, motivational change occurred at two levels, organizationally and individually.

Design thinking was the method used to design the educational intervention. The intervention was a video education module that was designed to meet stakeholder needs, including the end-users as patients, providers, and the institution.

A convenience sample of clinic patients who are 18 years or older and diagnosed with Type II diabetes were recruited to participate along with providers and institutional representatives. Qualitative interviews were used to gather data at each iteration. The Brief Diabetic Knowledge Test was used pre/post intervention to gather basic trends to further guide the design of the educational video which was the intervention in this study.

Findings/Results: Through 2 prototype iterations, a video education module was produced that satisfied the needs of a local group. The overall themes from both patients and providers was, "Patients with Type II diabetes need an achievable vision of a whole, healthy life". This theme provided the foundation for the video education modules that included basics of Type II diabetes, nutrition, and safety. Patients that viewed the final prototype displayed an overall increase in Brief Diabetic Knowledge Test scores and perceived the video education as a valuable tool with a favorable score of 4 or higher in all categories of the End-User Satisfaction Survey. Utilizing Design Thinking method, the focus of the education was on the end-user. The methodology helped to produce a product that was patient-focused and also efficient in the clinical setting.

Conclusions : Individuals doing clinical education research in similar settings should look for an achievable vision to live a whole and healthy life. The Brief Diabetic Knowledge Test is likely to be useful for evaluating diabetes education. Design thinking can be used to create an intervention based on stakeholder needs in the clinical setting. When supported by other evidence-based research methods, design thinking can be a robust tool for quality improvement.

Key words: diabetic education, quality improvement, design thinking, access to care

Introduction

Available Knowledge

The Center for Disease Control (CDC) (2017) estimates that there are 30.3 million individuals in the United States (U.S.) with diabetes. This represents approximately 9.4% of total U.S population and the percent of Americans with diabetes is slated to increase with an estimated 1.5 million new cases diagnosed each year and approximately 37,000 new cases in the state of Virginia (CDC, 2017; Virginia Department of Health, 2018). Even more concerning, diabetes is listed as the 7th leading cause of death in the U.S. (CDC, 2017).

Health knowledge plays an important role in the care of patients with Type II diabetes. It is directly related to ability to understand disease processes, improving self-efficacy and adherence with self-care behaviors (Cavanaugh, 2011). The current educational system fails to meet the needs of patients with Type II diabetes. Approximately 43% of patient with Type II diabetes never receive formal diabetic education (CDC, 2014). The state of Virginia reports a slightly worse figure of approximately 46.3% of diabetic patients not receiving self-management classes (CDC, 2017). Based on these trends there will be approximately 700,000 newly diagnosed Type II diabetics nationally and 17,000 newly diagnosed Type II diabetics in the state of Virginia without important disease training. These numbers compound annually creating a major gap in care.

Nationally, the majority of patient education is being delivered through face-to-face encounter with primary care providers during standard office appointments. There are many obstacles, known in the literature, that hinder the opportunities for diabetic education both within the context of education during appointments and in other educational settings. Barriers such as patient's education level, interpersonal relationships between provider and patient, the communication style of the provider, and time allotted for appointments can all have a negative

impact on patient education and patient outcomes (Richard, Glaser, & Lussier, 2017). Furthermore, research has also shown that patients only retain 40%-70% of information that is provided during these office encounters (Richard et al., 2017). These are troublesome facts when considering that health knowledge is directly related to health outcomes in chronic disease management (Alicea-Planas, Pose, & Smith, 2016). Nationally, improving health knowledge is important to managing diabetes yet there are many known barriers to improving this knowledge.

Locally speaking, most of the diabetic education is occurring in one, or both, of two ways; during routine office visits and as a specialized consultation. This education, beginning at diagnosis, is intended to provide patients with Type II diabetes the skills to self-manage their disease. First to explain education during regular office visits, patients with diabetes are seen by a provider (a nurse practitioner, physician, physician assistant) 2 to 4 times a year. Each appointment is limited to a 15-minute time slot. During these appointments patients receive a variety of care that includes: a physical exam, medication adjustments, review of care plan and disease education. With several tasks to complete during appointments, time is a limiting factor in providing an adequate level of education for patients with Type II diabetes in the local setting. It is estimated that most providers may spend less than 5 minutes educating patients. Moreover, it is unknown explicitly what providers are teaching and why, thus there is the potential for substantial variability within this education. Next to explain the second type of education for patients in the local setting, the specialized referral education that occurs for some patients. Patient that are newly diagnosed with Type II diabetes are typically referred for specialized diabetes education, however locally there are two potential reasons that individuals with Type II diabetes fail to receive quality diabetic education by these specialists. First there is lack of access to diabetes educators in the local area. The health system has two diabetes educators and these individuals cover inpatient and outpatient diabetes education that limits their ability to provide educational appointments daily. It is important to note that the local prevalence of diabetes in the Lynchburg,

VA area is approximately 10% with adjacent counties reporting rates as high as 12% (County

Health Rankings, 2019). This leaves more individuals that need diabetic education than the

current staff can handle and more concerning a section of the population lacking important

disease education. Second, there are socio-economic factors that limit diabetic education. The

team in the Central Virginia area report that only 30% of individuals with referrals show for their

diabetes education (Denton, 2019). There are many factors that contribute to this figure, including

patients lack transportation, inability to take time off from work, and child care. This can be

potentially explained by a higher level of poverty in Central Virginia area when compared to

other areas of Virginia. The U.S Census Bureau (2018) reports that approximately 18.8% of the

individuals in the Lynchburg area live in poverty, which is 8.2% higher than the state average of

10.6%. Accounting for these figures: the growing number of diabetics, higher level of poverty in

the Central Virginia area, and the lack of access to certified diabetes education can explain the

gap in care that is being experienced in the Central Virginia area. To address this gap and

growing demand, a new innovative solution for quality diabetic education is needed during

primary care appointments.

Patient with type II diabetes should receive structured education. Given the current

limitations to educating patients during their routine visits and to referrals to diabetic educations

sessions the local system implemented a video education intervention for patients with Type II

diabetes. Thus, the literature on this educational mode was reviewed. The 2017 National

Standards for Diabetes Self-Management Education and Support is a program that promotes self-

care behavior for patients with Type II diabetes (Beck et al., 2017) Through the 10 standards

outlined, patients with Type II diabetes are educated on ways to implement and sustain health

behaviors. Technology is one method that is being embraced to create access to education,

increase utilization of taught material, and improve outcomes (Beck et al., 2017).

Available Knowledge on Video Education for Diabetics

Video education has been used in a variety of studies and has demonstrated benefits in Type II diabetic management (Baraz, Shahbazian, Miladinia, & Zarea, 2015; Chau et al., 2012, Dyson, Beatty, & Matthews, 2010; Huang et al., 2016; Kandula et al., 2009; Majid et al., 2012; Rice et al., 2017; Sunsoa, 2008). These benefits include increased knowledge gain during visits, increased self-efficacy and increased patient satisfaction with the education process. Literature from 2008-2018 has been reviewed to assess evidence on video education for this quality improvement project.

Video education has demonstrated the ability to increase the knowledge for people with Type II diabetes. Three different studies concluded that individuals with low health knowledge could benefit from the use of video education (Sunsoa, 2008; Kandula et al., 2009; Dyson, Beatty, & Matthews, 2010). Sunsoa (2008) studied twenty-two diabetic patients in South Asia. The focus of this study was to assess diabetic education delivered through a soap opera drama. The video focused on diet, medications, blood glucose monitoring, lifestyle changes for a whole family, and complications from diabetes. Knowledge gain was tested in a pretest/post-test format utilizing the Statements to Assess Diabetes knowledge questionnaire. Sunsoa (2008) demonstrated that 86.4% of the patients had an increase in Type II diabetic knowledge through their intervention. Kandula et al. (2009) had similar results when measuring functional health knowledge in 190 individuals. The participants with and without Type II diabetes were recruited from a federal qualified health center and an academic health center. The researchers created two 5- minute video education modules entitled Understanding Diabetes and The Ups and Downs of Blood Sugar. In this study, research outcomes included knowledge gain (using a 17-item diabetes knowledge pre/post questionnaire), and a health literacy measurement (using the Short Test of Functional Health Literacy in Adults questionnaire). In this assessment, by Kandula et al. (2009), participants received video education showed an increase knowledge gain (p = 0.001) in all literacy levels during this study, however the degree of knowledge gain was higher in individuals with adequate

to marginal health literacy compared to those classified as inadequate health literacy. In a similar study, Dyson, Beatty, and Mathews (2010) introduced video education to individuals newly diagnosed with Type II diabetes. In this study, 42 patients newly diagnosed with Type II diabetes who had not previously received any formal diabetic education. The participants where then equally split into either the control group or the video intervention group. The control group received usual diabetic care and received formal education from a clinic nurse. Whereas, the intervention group received all the above care and was granted access to three lifestyle videos to watch on their own time. The video intervention consisted of three 15-minute videos titled: Food Choices, Physical Activity, and Weight Management. Dyson, Beatty, and Matthews (2010) measured knowledge gain at baseline and 6-months utilizing the ADknowledge questionnaire. Through this measurement, video education delivering lifestyle education significantly increased (p <0.0001) diabetic knowledge compared to education provided by a clinic nurse.

The adoption of selfcare behavior is essential to successful diabetic care. This second group of studies support the use of video education to increase self-efficacy and selfcare (Baraz et al. 2015, Huang et al., 2016; Rice et al., 2017). Baraz, Shahbazian, Miladinia, and Zarea (2015) examined the effects of video education on the quality of life of 30 individuals with Type II diabetes in Iran. The researchers utilized the Short-Form 36 item health survey to plan educational topics. This needs assessment, by Baraz et al. 2015, resulted in a video education intervention that was created with the following topics: diet, medication, glycemic control, and physical activity. The participants received five 1-hour sessions during a two-week period, and the results of this demonstrated that video education increased the adoption of taught material and improved self-efficacy (Baraz et al., 2015). Huang et al. (2016) had similar results when studying 76 individuals with Type II diabetes in a Taiwanese hospital. The participants were divided into two groups: a control group and an intervention group. The control group received education via a diabetic educator and printed pamphlets on insulin injections skills. In contrast, the intervention

group received education from a video education program with the following topics: Introduction

to diabetes; Medication and treatment; Managing hyper and hypoglycemia; Diabetes

complications; and The Experience of Two Model patients concerning insulin injections (Huang

et al., 2016). Measurements by Huang et al. (2016), were taken on knowledge, insulin injection

skills, and self-efficacy. These measurements were taken during five different times frames that

included: pretest, day prior to discharge, first week post discharge, fifth week post discharge, and

thirteenth week post discharge. Huang et al. (2016) demonstrated that over the 5-time periods

both groups had significant self-efficacy gains, however the video intervention group showed

higher scores when compared to the control group (p< 0.01). Similarly, Rice et al. (2017)

conducted a video education pilot study for the Hywel Dda Health Board in South Wales. The

research group recruited 68 patients with Type II diabetes from 7 primary care practices. Each

participant was prescribed 8-11 videos to watch with included topics: diet, weight, foot care,

medication, and monitoring. Then Rice et al. (2017) placed the videos on the internet via a Pocket

Medic application. Biometric measurements, Hemoglobin A1C, were measured at baseline and in

3-months. Rice et al. (2017) reported a study of 68 participants, of which 49 participants did not

watch a single video, and 19 watched a median of 4 videos. The researchers were able to correlate

the difference in Hemoglobin A1C results from the non-watcher group versus the watcher group.

The watcher group demonstrated that watching at least one diabetic educational video had a direct

linkage to a significant reduction in HgA1C (p = 0.0008). Which led to the conclusion that video

education modules can assist with self-efficacy in diabetic management.

The final group of studies support the use of video education to increase patient

satisfaction (Shue et al., 2010; Majid et al., 2012; Chau et al., 2012). Shue, O'hara, Marini,

Mckenzie, and Schreiner (2010) developed a video intervention to help patients with low-health

literacy better understand their disease process and communicate effectively with their health

team. This group created nine multi-media videos on the following topics: patient Empowerment,

type I Diabetes, type II Diabetes, Diet, warning signs for acute problems, glucose monitoring I

and II, preparing for appointments, and exercise. The videos in this study were considered an add

on to already existing diabetic management that included appointments with a diabetic educator

and regular provider appointments. Shue et al. (2010) recruited 100 patients with diabetes and

divided them equally to the intervention group or the control group. Measurements were obtained

on literacy, participants perception of their disease control, willingness to change, and their

current health behaviors. Shue et al. (2010) showed that patients in the video education group

perceived video education to be informative and perceived it to help facilitate better

communication with primary care providers. The areas that received the highest remarks

included: more willingness to ask questions, great graphics to help with understanding, enjoyed

real life illustrations from other patients, and clear messaging. Majid et al. (2012) studied video

education to promote daily physical activity in 20 patients with Type II diabetes. The video

intervention was a 15-minute educational video that addressed effects of exercise on diabetes,

preparations for beginning exercise, types of exercise, safety considerations and goal setting

(Majid et al., 2012). The videos were rated by participants on a 1 to 5 Likert Scale, 1- not

favorable and 5 highly favorable. Study participants scored the video education with a favorable

rating of 4.75. Majid et al. (2012) conducted a qualitative review following the intervention, and

patients were able to verbally explain the importance of exercise on blood glucose control. Chau

et al. (2012) also showed that 115 participants with Type II diabetes in Hong Kong perceived

diabetic video education to be helpful, user-friendly, and informative. The research team

developed a web-based video education program to help people with diabetes self-manage their

disease in titled *Caring for yourself: Managing your diabetes*. The video intervention covered 35

video clips, sorted in 11 chapters that consisted of a total video time of 7 hours. Participants were

educated on topics that included: overview of diabetes, management, self-monitoring, oral

medications, insulin therapy, meal planning, exercise, health, and support groups. Chau et al.

(2012) measured satisfaction with the intervention using two separate surveys, the Computer-

Aided Learning Evaluation Questionnaire (CLEQ), and the End-User Computer Satisfaction

Questionnaire (ECSQ). Both surveys consist of questions that are rated on a 5-point Likert Scale,

1 strongly disagree to 5 strongly agree. The CLEQ showed a score of 4 or greater on items of

enjoyment, easy to use, informative, and likelihood of using again (Chau et al, 2012). Similarly,

ECSQ showed equally favorable scores on format, content, and accuracy. However, participants

scored timeliness at 3.86 and ease of use 3.80 during this survey. Further, a qualitative review in

this study revealed that patient reported better retention of information with video

demonstrations.

Evidence in the literature confirms that video education can be successful for educating

patients with diabetes and that patients are satisfied overall with video education. What is

unknown is how the local stakeholders, both patients and providers, will respond to the idea of

video education. It is also unknown whether the local population has specific educational needs

or preferences.

<div align="center">

Rationale

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Type II diabetes is a costly and growing problem in our population (American Diabetes

Association, 2018). Based on the literature review, video education has the potential to transform

diabetic primary care appointments. Little is known about the local population and their needs,

whether video education will work to meet those needs, and what specific content is needed to

address the local educational needs. Thus, a local assessment and intervention design are needed.

The Institute of Health (IHI) Psychology of Change framework provided the theoretical

rationale for this work and rationale for use of the design thinking method (Figure 1). The IHI

framework recognizes that there are human behaviors that support or hinder the ability of quality

improvement projects to succeed. The IHI Psychology of Change has five domains that must be

satisfied for a quality improvement project to succeed and to be sustainable (Hilton & Anderson,

2018). These domains include: Unleash intrinsic motivation, Co-design people driven change, Co-produce in authentic relationship, Distribute Power, and Adapt in Action (Hilton & Anderson, 2018). Successful diabetic treatment relies on quality diabetic education and adaptation of taught material on self-care behavior by the patient with Type II diabetes. The IHI Psychology of Change provides the rationale for co-designing this video education with patients with Type II diabetes in order to sustain their own changes and also the changes at the institutional level. At the individual level the implementation of health behaviors by patients with Type II diabetes is a key goal. Utilizing auditory and visual cues, the hope is to motivate individuals with Type II diabetes to implement and sustain health behaviors that will help prevent health complications and promote quality of life. The framework also explains how involving providers can help provide the motivational level of the healthcare team to sustain the implementation of video education. As reasoned in the IHI Framework these individual changes are also important for sustained quality improvement.

Unleash Intrinsic Motivation

Tapping into sources of intrinsic motivation galvanizes people's individual and collective commitment to act.

Adapt in Action

Acting can be a motivational experience for people to learn and iterate to be effective.

Co-Design People-Driven Change

Those most affected by change have the greatest interest in designing it in ways that are meaningful and workable to them.

Activate People's Agency

Distribute Power

People can contribute their unique assets to bring about change when power is shared.

Co-Produce in Authentic Relationship

Change is co-produced when people inquire, listen, see, and commit to one another.

(Hilton & Anderson, 2018)

Empathize ⟹ Ideate ⟹ Design ⟹ Prototype ⟹ Test

Phases of Design Thinking

Figure 1. IHI Psychology of Change and Design Thinking demonstrating the methods for this project.

Design thinking is the quality improvement method that provided the methodology for this work. Kelly and Kelly (2013) state, "Design thinking is a way of finding human needs and creating new solutions using the tools and mindsets of design practitioners". Design thinking methods align well with the concepts in the IHI Psychology of Change model. Human centered design methods provided a framework for co-designing with all stakeholders and in doing so shares power. The specific alignment between the theoretical framework, the design thinking method, and the planned intervention are outlined in the Methods Section that follows. Design

thinking has been used extensively for quality improvement. Peterson and Hempler (2017)

utilized design thinking to support patients newly diagnosed with Type II diabetes through a

mobile application (app). The mobile app focused on five functions: overview of diabetes, games,

goals, and well-being data. The results of the design demonstrated that patients with Type II

diabetes found the technology to be valuable and helpful for navigating the health system. Yu et

al. 2014 also showed favorable response of design thinking and the use of technology to meet the

needs of individuals with Type II diabetes. The project team utilized three iterative cycles to

develop a web-based self-management tool for patients with Type II diabetes. The result of the

projects demonstrated that patients desired access to knowledge about their condition, and also

desired the ability to share their experiences with Type II diabetes. Kelly and Kelly (2013)

provided an example of how an individual in the airline industry was able to prototype procedures

that reduced weather-related flight delays recovery by 40%. Another example of design thinking

improvement was focused on the experience of pediatric patient undergoing magnetic resonance

imaging (MRI). In this project a lead designer for General Electric developed a new look to MRI

machines after a chance encounter with a pediatric patient and noting a need to change the

appearance of the MRI machine to make it less scary to pediatric patients (Kelly & Kelly, 2013).

The result was the "Adventure Series" MRI machine, which has resulted in a 90% reduction of

children needing sedation during the imaging process (Kelly & Kelly, 2013). These are two

examples of quality improvement projects, but design thinking has also led to an improved

incubator project in rural Nepal to improving the experience of purchasing bras for women who

are recovering from mastectomy (Kelly & Kelly, 2013; Sutton, 2016). Moreover, similar process

has been used within education to design educational interventions. Educational design is an

iterative process that seeks to find solutions to educational problems (Mckenney & Reeves,

2019). Through this design, rigors of basic science on education can be translated in a way to be

utilized in an application setting (Mckenney & Reeves, 2019). Traditionally this has been utilized

in an academic setting, however this project is going to use aspects of this design to help meet the

needs of patient with Type II diabetes in a healthcare setting. Utilizing this design approach

alongside of design thinking, the project team will focus educational elements that are important

to patients with Type II diabetes. Ultimately producing a product that will provide the best

educational experience and end-user experience to provide quality Type II diabetes care.

Specific Aims:

The purpose of this project was to design an educational video intervention to meet the

needs of the local patient with Type II diabetes, assess the effects of the video intervention and

recommend best practice in the future development of the full-length video education material.

Specifically, within the context of the local assessment the intervention design aims were to:

1. Design an educational intervention based on needs of the end users, including patients,
   providers, and the institution
2. Assess participants who are patients, their knowledge pre/post iterative versions of the
   education during prototype development and testing
3. Assess participants satisfaction with the educational intervention

Methods

Context and Stakeholders

The setting for the project was a family medicine residency clinic in Central Virginia.

The clinic is a composed of thirty-two providers and approximately forty support team members.

Most providers are only in clinic 2-3 times a week because of the educational setting. This limited

role in the outpatient clinic potentially can make it difficult to obtain full support of the project.

To garner support, the project director provided an orientation session at the provider staff-

meeting to draw support for the project. This provided the greatest opportunity to meet with

faculty-physicians, resident-physicians, and advanced practice professionals at one time. The

project director also provided an orientation session with nurses at the nursing huddle to obtain

additional support for the project, and to assist with patient recruitment. Having success in the intervention hinged on the support of the entire team at clinic. The medical director was key support agent in this project. This individual provided administrative support that was required to move the project forward. Also, the patients with Type II diabetes at the family medicine residency clinic were stakeholders in the project. The characteristics of the local setting and in particular the patient group were described in detail in the Introduction section. Supporting this population and providing a readily accessible educational program removed some of the barriers to quality education.

Intervention

IHI Psychology of Change Model.

Reviewing the following five domains illustrates the connection of the IHI Psychology of Change model to the design process in this quality improvement project. *Domain 1: Unleash intrinsic motivation* **-** Unleashing intrinsic motivation helps individuals affected by quality improvement projects to see the benefit of the change (Hilton & Anderson, 2018). The intrinsic motivation in this project was to create a system that allowed individuals to receive quality education. It required the healthcare team to partner with the design team to understand the importance of quality diabetic education and how it could improve patient care/outcomes. Through this change, the project enhanced current primary care appointments by providing a cost-effective video education for people with Type II diabetes. The second level of intrinsic motivation was the patients with Type II diabetes. By designing something that met the needs of the end-users, it was likely that the education provided could tap into the intrinsic motivation of those who watched it. *Domain 2: Co-design people driven change,* is the process of allowing all individuals affected by the change to have input on the design (Hilton & Anderson, 2018). For this quality improvement project, input from providers, staff and patients was essential. Ensuring that the intervention didn't impede office flow was important. Utilizing input from nurses, and

providers helped the quality improvement project move forward. Also, the input from the patients was important. Acknowledging what was important to their educational experience was an essential component to success. Allowing the patients with Type II diabetes to provide honest feedback helped to determine future areas of education, user-friendliness of intervention, other formats for making the video education more accessible and maintaining sustainability. *Domain 3: Co-produce in authentic relationship* - Co-produce authentic relationship is the process in which individuals are treated as valuable members of the quality improvement project (Hilton & Anderson, 2018). Utilizing feedback from providers and patients helped to produce both an authentic relationship and video education implementation plan that was flexible. Providing this opportunity helped both groups to share in the leadership of the project. D*omain: 4 Distribute Power* - Distribute the Power is a process in which individuals are empowered to achieve a task (Hilton & Anderson, 2018). Implementing a process into an organization with power that has been distributed along all levels helps bring the team together to a shared goal and purpose (Hilton & Anderson, 2018). In this quality improvement process all levels of staff were utilized. Nurses and providers were oriented to the common goal of the project and were provided an opportunity to share responsibility in the quality improvement process. Likewise, patients were given the power to weigh in on the specifics of the educational video, thus given them power to affect change. *Domain 5: Adapt in Action* - is the process in which the quality improvement projects are modified during their implementation (Hilton & Anderson, 2018). This process allowed for the project developers to identify problems and create solutions for these problems.
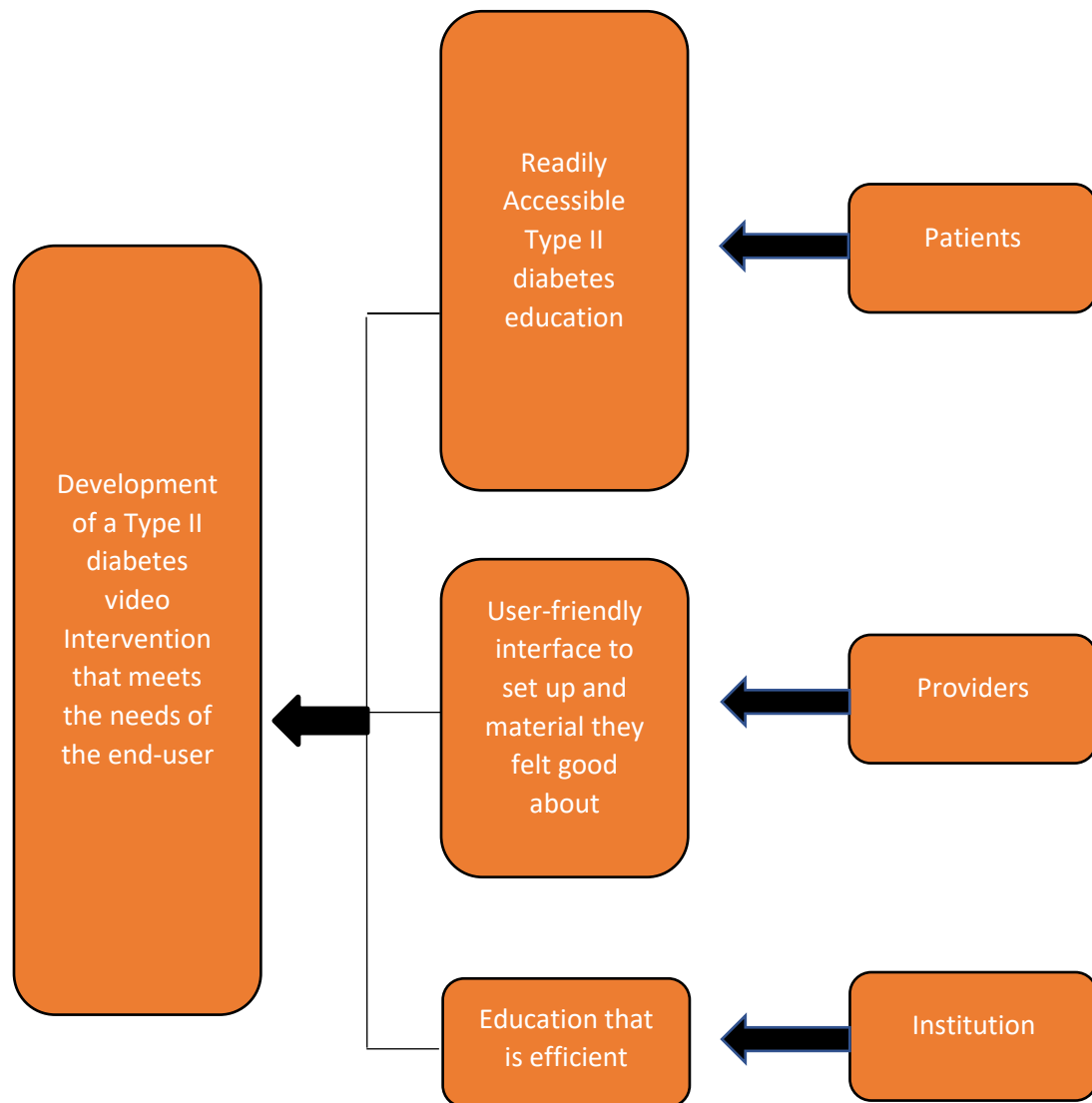
Figure 2: Stakeholder needs related to the creation of a video education module.

Design Thinking Method of Intervention Creation.

Design thinking aligns well with the concepts of the IHI Philosophy of Change and was used as the practical method for creating the intervention. The design thinking process allowed for multiple iterations of a prototype, changing as it went along. See Figure 3 for an overview of the phases as they align with educational design methods as described by McKenney & Reeves (2019). Design thinking is not linear, but instead iteratively, but is described linearly here for

simplicity sake using the following 5 distinct phases: *Phase 1: Empathize* - The empathize stage of the design thinking focuses on the end-user experience (Plattner, 2010). During this process the design team gathered information from both the institutional stakeholders and the patients with Type II diabetes. Through surveys, direct interactions and observations the quality improvement team gathered information on educational needs, current patient knowledge, and current health behaviors. *Phase 2: Define* **-** The define stage of design thinking takes the information gathered in empathize stage and synthesizes it (Plattner, 2010). During this stage the quality improvement team took the information from the empathize stage and analyzed it for common themes that were present in the information. This process took statements from the end-user and formulated a problem statement that quality improvement team utilized to develop ideas on educational needs. *Phase 3: Ideate* **-** Ideate is the process of designing the solution to the problem statement (Plattner, 2010). In this quality improvement project, the team predetermined that video education would deliver the educational intervention. However, content, video format, and implementation times were discussed during this phase. The design phase focused on broad ideas to expand the possibility of having the best product that was end-user focused. *Phase 4: Prototype* - The prototype phase of design thinking is to produce a product (Plattner, 2010). The goal of this process is not to design the final product but to design a product that an end-user can interact with that is cheap and easily corrected (Plattner, 2010). In this quality improvement project the team developed video segments that were short and provided a tangible experience for the end-user. Once a video segment was created the prototype was tested with the end-user. *Phase 5: Test -* The test phase of design thinking is eliciting feedback about the prototype (Plattner, 2010). This process allows another opportunity to have end-user feedback and essentially another opportunity to empathize with the end-user (Plattner, 2010). Design thinking methods used for quality improvement in healthcare parallel traditional methods of educational material design, which include the steps of exploration, analysis, design, construction and evaluation/reflection, thus

making this method particularly well suited for a quality improvement project aimed at improving

education through the design of educational materials (McKenney & Reeves, 2019).
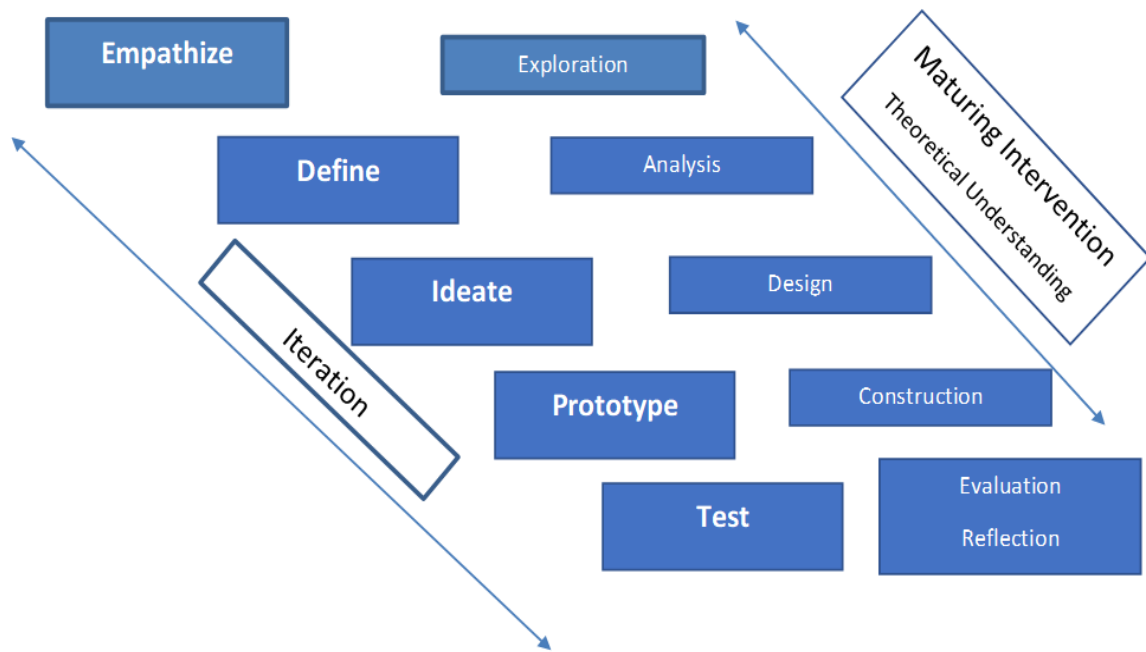
Figure 3. Design Thinking in a parallel with Educational Design. Both design processes utilize

similar wording to demonstrate similar design processes.

The process of implementing design thinking is often messy, changing to meet the needs

of the end-user, and nonlinear. For example, the design team came back to empathizing and re-

defining the problem throughout other steps. Given this, it was difficult to predict the specific

steps of the process before they unfolded.

Throughout the process, the design team evolved with the work. Team members included

Dr. Erica Lewis, an expert in the design thinking methods and Dr. Juhong Christie Liu, an expert

in instructional design. Other team members included Dr. Jane Deeds a psychologist in the

medical residency, Dr. Terry Babineau a physician faculty member in the medical residency, and

Dr. Lori Nelson-Madison program director of the medical residency.

Study of the Intervention

The intervention was developed by the end-user needs. Needs were determined by asking

the stakeholder and by testing prototypes of the educational intervention. Interviews were

recorded and were organized using empathy maps. The design thinking team validated inferences

made at each step, and inferences were validated with the end users. Two prototypes were created

using web-based video creator. The prototypes linked video clips provided by the web-based

service with narration from the principal investigator. Further explanation of prototype

development is located in the results section. Each prototype was validated and tested with

participants. Moreover, outcomes measures, described below, were used to further assess the

ability of the intervention to meet the needs of the stakeholders during the testing phase. The

focus of this project was on the educational design process, with the prototype being the primary

change to the system. Testing of prototypes was included in the development. Towards the end of

the process, some outcome measure testing occurred, and this is small in scope and intended to

pilot the intervention in the local setting with some preliminary quantitative measures. The scope

of testing was insufficient to infer the findings in a more generalizable way.

Outcome Measures

Brief Diabetic Knowledge Test (BDKT) is a 23-item questionnaire to test general

diabetic knowledge, and insulin knowledge. This quality improvement project utilized the first

14-items of the BDKT because they relate to general knowledge that is applicable to all Type-II

diabetics (Appendix 1). Fitzgerald et al. (2016) validated the split use of the BDKT. This group

certified that the first 14 items could be used as a separate survey with a Cronbach's alpha of

0.77. Participants with Type II diabetes were tested with the 14-item BDKT pre/post the

developed educational intervention. The survey was administered by the principal investigator

and was assigned a unique number to maintain anonymity. This was piloted with a small group of

participants towards study end to gather descriptive data of participant knowledge pre/post the educational intervention.

The End-User Computing Satisfaction Survey (EUCS) is a 12-item five-point Likert scale questionnaire. This survey measured the patient's experience with the video education and provided measurements in five domains: accuracy of information, content, ease-of-use, the format and timeliness (Lim, Lim, & Heinrich, 2008). The Cronbach's alpha for this survey is 0.93 (Chau et al.,2012). The EUSC has been used in prior studies with similar populations. Chau et al. (2012) utilized this survey with a similar population in Hong Kong. In this study 95% of the participants had an educational level of a high school diploma or less. This is the same population in U.S that represents most of the lower socioeconomic group and would also represent most of the patients seen at the planned setting for this project. The survey questions in this project will be slightly modified to read "the video" versus "the system". This will help make this survey applicable to this project (Appendix 2). This survey as well was administered by the principal investigator and assigned a unique participant number to maintain anonymity. This was piloted with a relatively small group of participants towards study end to gather descriptive data of participant satisfaction pre/post developed prototypes of the educational intervention.

Contextual elements

Negative impacts or unintended consequences can be experienced by any quality improvement project. One unintended consequence was potentially slowing down clinic flow and increasing overtime. During the project the intervention was introduced at the convenience of the provider rendering care. Some participants were interviewed prior to their appointments while others were interviewed following their appointments. Maintaining flexibility was key to reducing prolonged clinic schedules, however it limited the ability to predict how this type of education could be implemented during all Type II diabetes appointments.

Another potential unintended consequence was extended appointment times. Placing patients with Type II diabetes into an extended appointment time to provide video education is utilizing their personal time. To reduce this unintended consequence, patients were educated about their care and were given the opportunity to opt out of the educational experience.
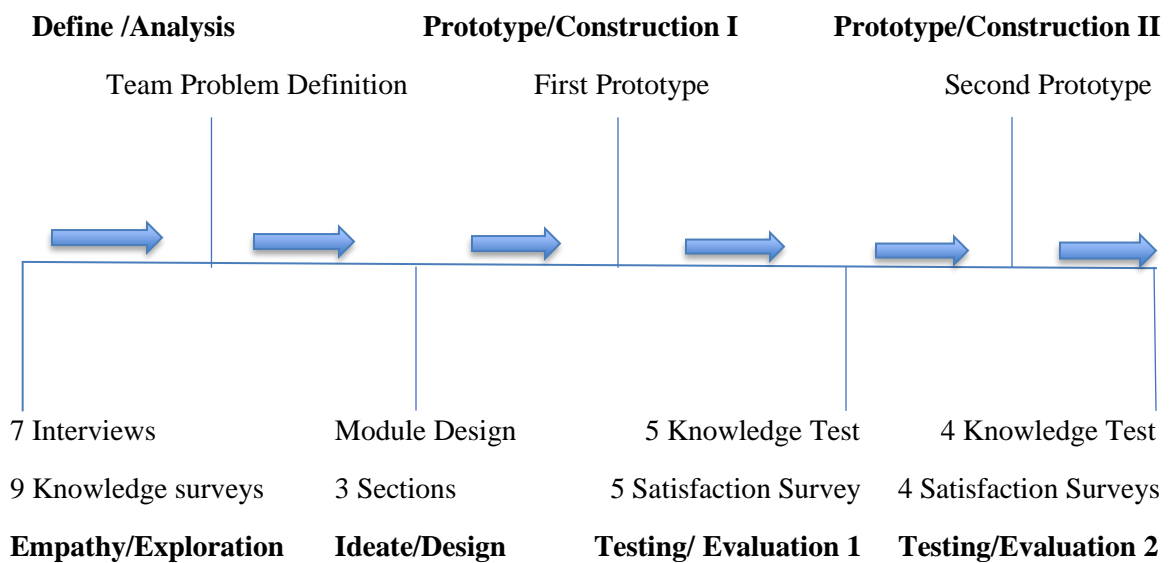
Analysis

Qualitative Analysis

Data collection occurred through interviews. These interviews utilized narrative inquiry to capture the stories of the stakeholders in this project (Clandinin, 2006). Narrative inquiry Interviews were recorded and roughly transcribed/outlined to ensure accuracy of the data collected. Capturing each stakeholder's experiences helped to produce a story that guided the creation of the video intervention for this quality improvement project (Clandinin, 2006). Proceeding in this manner helped the researchers empathize with the stake holders and helped to generate data through the iteration process of design thinking. Given the volume of interviews, exact transcription was not feasible and given the narrow scope of many of the interviews exact transcription was not necessary. Empathy maps were used to draw inferences from the interview data so that interpretation was consistent. The design team interpreted and validated inferences, the definition of the problem, and any proposed solutions which will increase the trustworthiness of each.

Pilot Quantitative Measures

Quantitative data were obtained using surveys and was organized in a spreadsheet to maintain complete data. The first outcome measure included scoring the Brief Diabetic Knowledge Test (Fitzgerald et al.,2016). The pretest scores were compared to the post-test scores. A correct answer earned 1 point and incorrect answers 0 pts. Participant scores pre/post described a small pilot group.

The second outcome measure included scoring the patient satisfaction surveys. Utilizing the End-User Computing Satisfaction Survey patients rated their experience with the video education (Lim, Lim, & Heinrich, 2008). This is a 5-point Likert scale where a score of 1 is not favorable and a score of 5 is highly favorable. A predetermined average score of 4 was used to indicate a positive reaction, a score of 3 was neutral and a score below 3 was unfavorable. Descriptive statistics was used to calculate the number and percentage of participant satisfaction ratings.

Define /Analysis	Prototype/Construction I	Prototype/Construction II
Team Problem Definition	First Prototype	Second Prototype

7 Interviews	Module Design	5 Knowledge Test	4 Knowledge Test
9 Knowledge surveys	3 Sections	5 Satisfaction Survey	4 Satisfaction Surveys
Empathy/Exploration	**Ideate/Design**	**Testing/ Evaluation 1**	**Testing/Evaluation 2**

Figure 4. The project was carried out in seven phases. Moving left to right the figure displays the phases of the project.

Phase 1: Empathy/Exploration through Interviews

First, interviews were completed one-on-one to gain empathy for the end users/stakeholders (institution, providers, patients) although there had already been some assessment of the institutional needs and thus greater emphasis was understanding provider and patient needs within the confines of what is already known about the organization. Seven initial interviews were conducted with in the groups (patients, providers & institutional representatives).

These first interviews were broad and included questions from the list below. These interviews (and interviews throughout) were recorded, roughly transcribed, and organized using empathy maps (Figure 5) and reviewed by the design team for themes.

Early Interview Questions for Provider Stakeholders included:

1) What is diabetes education like for you?

2) What deficits do you see for patients in their diabetes knowledge?

3) We would like patients to know more about their diabetes, what are your thoughts on that?

4) We are considering making a video. If we do, what suggestions do you have for that?

Early Interview Questions for Institutional stakeholders included:

1) What would successful diabetes education look like from the institutional perspective?

2) We are considering implementing diabetes education within regular clinic visits using videos. What are the challenges and opportunities from the institutional perspective?

Early Interview Questions for Patient Stakeholders included:

1. What is diabetes like for you?

2. How have you learned about your diabetes?

3. We would like patients to know more about their diabetes, what are your thoughts on that?

4. We are considering making a video. If we do, what suggestions do you have for that?

Phase 2 Define/Analysis

Data was analyzed from the interviews by a behavioral health psychologist, design thinking expert, and the principal investigator through empathy mapping (see Figure 3). Empathy mapping utilizes four quadrants to classify participants' comments and helps to identify their

needs. Statement are placed in the "say", "think", "do", and "feel" quadrants to understand

stakeholder needs. As the themes became apparent the design team defined the specific problems

inherent within the stakeholder needs. Next, solutions to the problem were discussed by the entire

design team.

Say   Think

Do   Feel
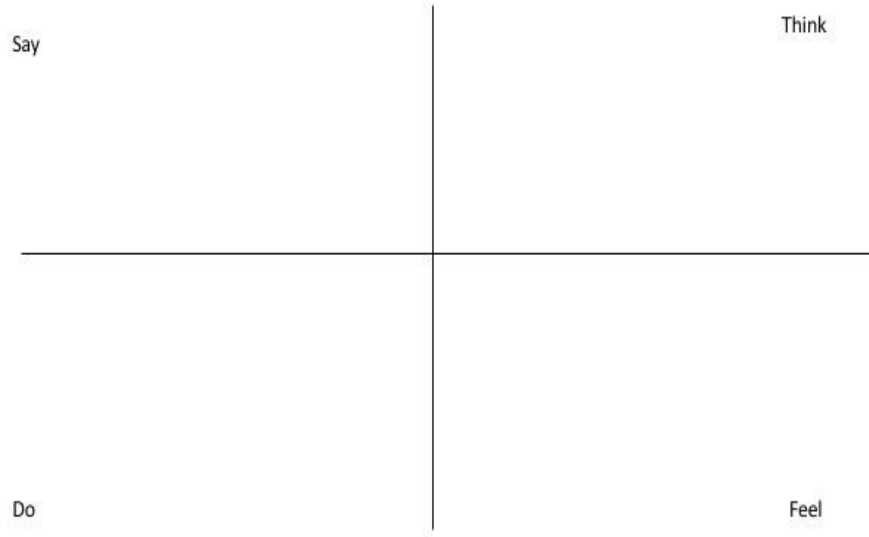
Figure 3. Empath map used during analysis/define phases.

Phase 3 Ideate/Design

The third phase of the design process was focused on the module content and video

design. In this phase video education was already chosen as method of education through the

literature review, however how to produce the video was not. The primary investigator reviewed

several different options and ultimately decided on Moovly, a subscription-based video creator

(Moovly, 2019).

Phase 4 Prototype/Construction 1

The first prototype included images, and video clips provided by the Moovly subscription, and the education was hosted/narrated by the principal investigator. The first prototype was 9 minutes 21 seconds in length and was introduced during regular scheduled office appointments.

Phase 5 Test/Evaluation

The BKDT was administered pre/post introduction of the video education, and the EUCS was administered following the video education(Fitzgerald et al.,2016; Lim et al., 2008). These surveys were utilized to capture both knowledge gain and patient's perception of video education. Patients were also given the opportunity to provide direct feedback or likes and dislikes associated with the video education experience. During the testing phases three providers were shown the first prototype and they were also given the opportunity to provide their likes and dislikes with the video education.

Phase 6 Prototype/Construction 2

Prototype II was developed utilizing the feedback received during prototype testing. Adjustment were made to expand the nutrition section to include meal planning, increased volume during hosting sections of video education, and a hope driven message. With these additions, prototype 2 was expanded to a 10 minute and 54 seconds in length.

Phase 7 Testing/Evaluation 2

Prototype II was tested with the same methods as prototype I. The BKDT was administered in the pre/post intervention format, as well the EUCS was administered following the video education (Fitzgerald et al.,2016;Lim et al., 2008). All stakeholders were interviewed in an informal manner with the listed questions below.

Later Interview Questions for Provider Stakeholders included:

1.We have created an educational intervention based on what you and patients described was needed. Will you look it over and give us some feedback?

2.What needs to change for this to be helpful for your patients?

3.What are the barriers to implementing this during your clinic visits?

Later Interview Questions for Patient Stakeholders included:

1.We asked patients in our clinic with diabetes what else they needed to know in order to take care of themselves and are creating educational materials based on that. Will you look at them?

2.What parts of this make sense to you?

3.What parts are muddy/unclear?

4.How much time might you give to watching an intervention like this?

5.What might be more useful to you?

Later Interview Questions for Institutional Stakeholders included:

1.We are pilot testing video education for patients with diabetes. Will you look at it and provide feedback?

2.Are their potential challenges you see to implementing this video education beyond a pilot?

Results

Phase 1 Empathy Gaining/Exploration

Empathy gaining/Exploration occurred through one on one interviews with both patients with Type II diabetes (n=5) and providers (n=2). Interviews ranged from 12 minutes to 20

minutes. In addition to interviews an additional group of patients with Type II diabetes (n=8) were recruited for knowledge testing utilizing the BKDT (Fitzgerald et al.,2016).

Phase 2 Define/Analysis

After the first round of interviews, problem definition occurred. The interviews were organized using the empathy maps (see Figure 6) and the team of researchers reviewed the maps and interviews for themes. Themes for each interviewee were created and then the interviews/maps were viewed for common themes. Theme illustrated latent needs and practical feedback on needs. The latent needs themes for all interviews are displayed in Table 1. The overall problem statement illustrating the latent needs from all interviews was, Patients with type II diabetes need an achievable vision of a whole, healthy, life. The knowledge testing results are displayed in Figure 7. This helped to explore gaps in knowledge and provided practical information that included a need for basic understanding of Type II diabetes, nutritional

education, and safety. The problem statement, along with the individual patient needs and the

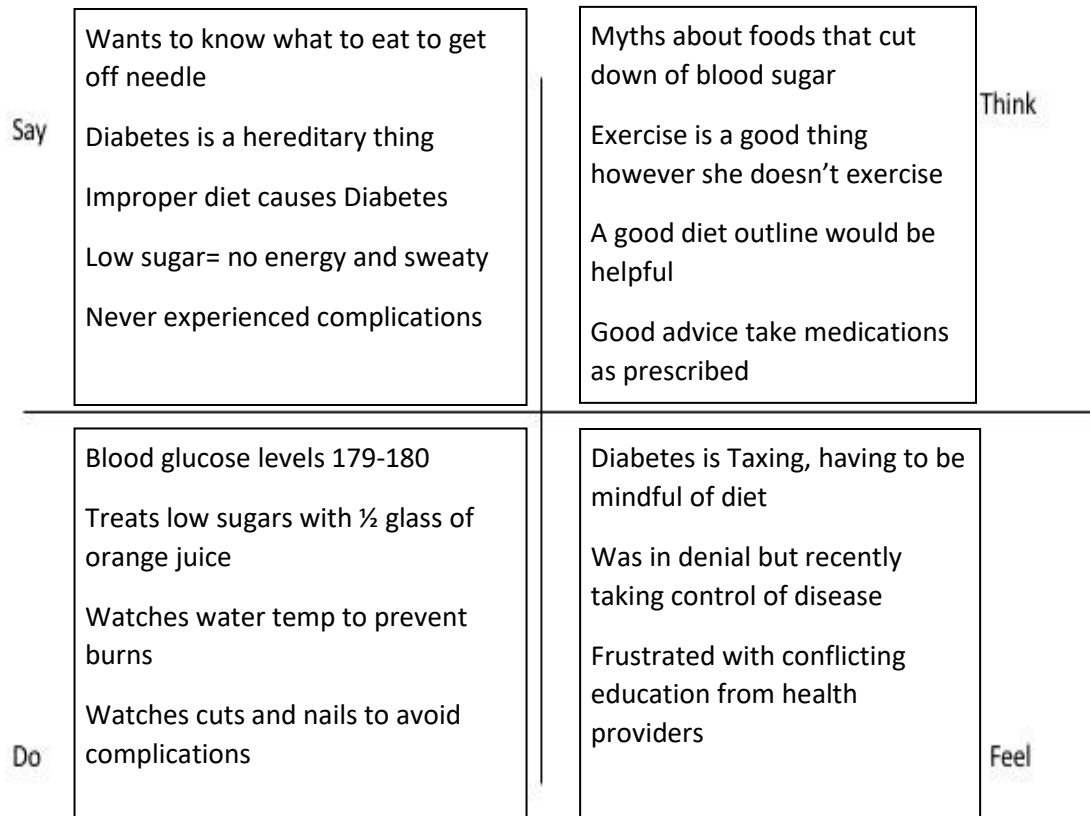practical knowledge guided creation of the first prototype.

Say

Wants to know what to eat to get off needle
Diabetes is a hereditary thing
Improper diet causes Diabetes
Low sugar= no energy and sweaty
Never experienced complications

Think

Myths about foods that cut down of blood sugar
Exercise is a good thing however she doesn't exercise
A good diet outline would be helpful
Good advice take medications as prescribed

Do

Blood glucose levels 179-180
Treats low sugars with ½ glass of orange juice
Watches water temp to prevent burns
Watches cuts and nails to avoid complications

Feel

Diabetes is Taxing, having to be mindful of diet
Was in denial but recently taking control of disease
Frustrated with conflicting education from health providers

Figure 6. Empathy map for patient 5.

Table 1

Individual Needs Statements

Patient	Age	Race	Years with type II Diabetes	Individual needs
1	70	African American	1.5	Needs to feel confident in her understanding of disease process but lacks understanding why it occurred to her. Views Type II diabetes as a burden.

2	56	Caucasian	15	Needs to maintain hope to overcome disease challenges.
3	71	African American	17	Needs basic understanding to maintain safety.
4	34	African American	4	Needs to feel empowerment to take control of disease process.
5	78	African American	10	Needs a consistent message to take over ownership of care.
Provider			**MD Experience**	**Successful care**
1			1 year	Patients should be able to teach back education and feel trust with healthcare team.
2			15 years	Redistribute power back to the patients, help patients visualize long term goals, and partner with the patients to feel empowered to let the healthcare team know when something is not right.
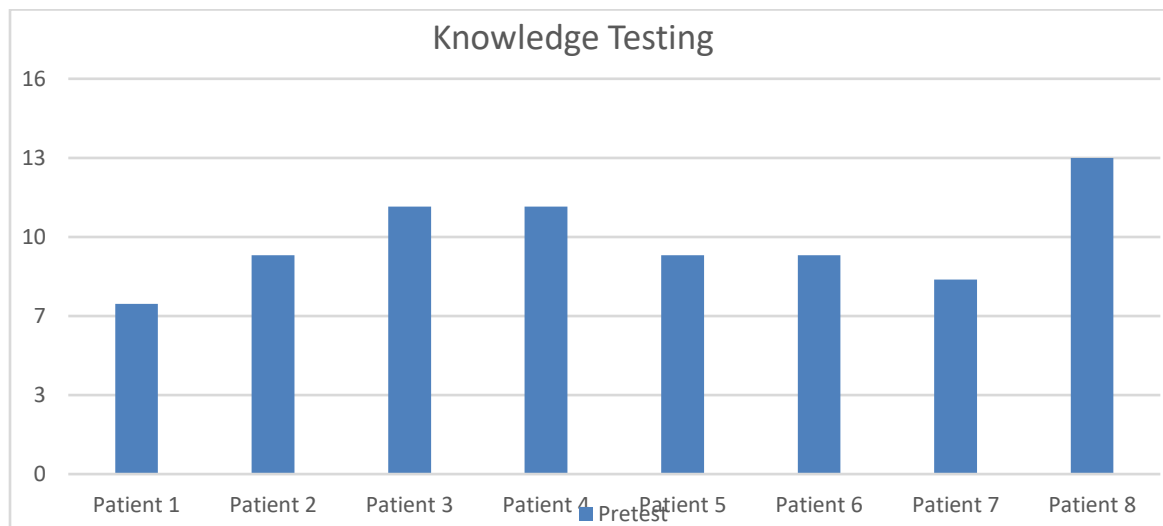
Figure 7. Preintervention knowledge testing showing varied degrees of knowledge in the patient population.

Phase 3: Ideate/Design

Creating solutions for the first prototype was developed around the individual needs

statements. Each participant had a unique need that guided the development of the modules. For

example, participant 1 had a need to fill confident in her understanding of her disease. This

statement guided the development of the basics of Type II diabetes. Likewise, participant 3

needed to have basic understanding to maintain safety. This theme was the focus of the safety

section of module 3. There was a common theme amongst all participants that there was a need to

understand basic nutrition. The design for prototype1 combined both the practical knowledge and

needs statements from the empathy gaining phase to formulate three modules.

Phase 4 Prototype/Construct I

The first prototype was an audiovisual exploration of Type II diabetes created through

Moovly (Moovly, 2019). The three modules included basics of Type II diabetes, nutrition and

safety. The prototype consisted of 53 video clips that were combined to create a video that was 9

minutes and 36 sec in length. The final format of the video was an MP4 format that could be

displayed on an Apple I pad. Prototype 1 is published at https://youtu.be/oexPFpNFcJs for

review.

Module 1 of the video education was an exploration of the basic of Type II diabetes. This

module was formulated to deliver information the physiological changes that cause Type II

diabetes. It offered a brief explanation of the causes of type II diabetes as well how participants

could play an active role in the management of their disease.

Module 2 was formulated to provide basic knowledge to address nutritional information.

In particular, the module taught participants how to use the plate method to measure proper

portion sizes for carbohydrates (25%), proteins (25%) and vegetables (50%). This module was

designed to meet of the needs stated by participants during the interviews.

Module 3 was an educational design to demonstrate actions to prevent complications.

This module provided brief information on signs/symptoms of hypoglycemia and the steps to take

to correct the potentially life-threatening condition. Last, portion of module 3 was focus on preventing life-long complications of neuropathy, diabetic retinopathy, and kidney disease.

Phase 5 Testing/Evaluation I

The prototype was tested utilizing two separate surveys, The Brief Diabetic Knowledge Survey and End-User Satisfaction Survey(Fitzgerald et al.,2016; Lim et al., 2008). Results from both surveys are displayed in Figure 8 and Table 2. The pre-knowledge scores and the post-knowledge scores had varying degrees of change. Most patients had either an increase or decrease in their scores while others remained the same. The End-user satisfaction survey was scored on a 5-point Likert scale where 1 is not favorable and 5 is highly favorable(Lim et al., 2008). The satisfaction scores from all participants rated the video education in a favorable manner with all scores remaining above 4. Patients in a debriefing interview were asked what they liked about the video and what they disliked about the video. The variety of comments included: more on vegetables, more foods to eat, how to measure meat portions, slower speech during carbohydrate section and more focus on hope while living with Type II diabetes.
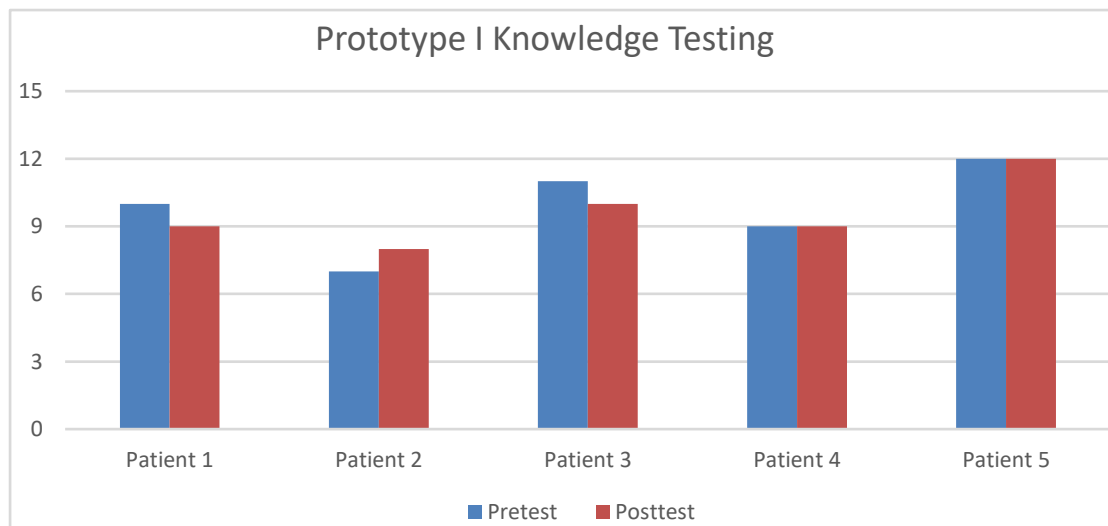

Figure 8. Prototype 1 Knowledge Testing pre/post video education.

Table 2

Mean Satisfaction scores

Question	Mean Score
1. Is the video accurate?	4.6
2. Are you satisfied with accuracy of the video?	4.8
3. Does the video provide precise information you need?	4.6
4. Does the video content meet your needs?	4.4
5. Does the video provide information that seem to be just about exactly what you need?	4.4
6. Does the video provide sufficient information?	4.6
7. Is the video user friendly?	4.6
8. Is the video easy to use?	4.8
9. Do you think the video is presented in a useful format?	5.0
10. Is the Information clear?	4.8
11. Do you get information in a timely manner?	5.0
12. Does the video provide up to date information?	5.0

Phase 6 Prototype/Construction II

Utilizing data gathered from the EUCS, BKDT and informal interviews, adjustments

were made to create Prototype II (Fitzgerald et al.,2016;Lim et al., 2008). The adjustments

included a new introduction, expanded nutrition section, and closing message focused on living a

whole healthy life with Type II diabetes. utilizing the information from prior surveys and from

the additional feedback provided by the patients during the prototype testing 1. The changes made

to the video included a new introduction, expanded nutrition section to include meal planning,

increased volume during hosting sections, and revised closing to include a hope driven message.

The video education contained 71 video clips with a total run time of 10 minutes and 48 seconds.

Video prototype I at the conclusion had an empowering theme that was associated with it. Participants' input during the first testing phase directed the change in prototype II to a hope driven theme. This was in alignment with general needs statement developed in phase 1: Patients with type II diabetes need an achievable vision of a whole, healthy life. Other input included an expanding the nutritional section. In prototype II the nutrition section was expanded to include the basics of meal planning utilizing a 9-inch plate as a guide. These final changes expanded the video by approximately 1 minute and is available for review at http://youtu.be/Q995eqfDsaQ.

Phase 7 Testing/Evaluation II

Prototype II was evaluated utilizing the same testing methods as before. With the results displayed in Figures 9 and Table 3. The Brief Diabetic Knowledge scores with second prototype were improved from prototype testing 1 (Fitzgerald et al.,2016). The patients in this group showed an increase in knowledge scores from pretest to post test, with three out of the four participants showing an improvement in knowledge scores and one participant's score remaining the same. The End-user Satisfaction Survey remained positive although some scores changed per survey item(Lim et al., 2008) . In addition, the video was shown to 3 providers, with two of the providers being from the first interviews. In a causal interview the providers were asked about their views of the education. All the providers felt the video met the needs stated during phase 1. Patients were also provided an opportunity to voice additional feedback that included: share the video more, great education, hopeful and encouraging. There was one participant that added they would like a segment dedicated to medication management.
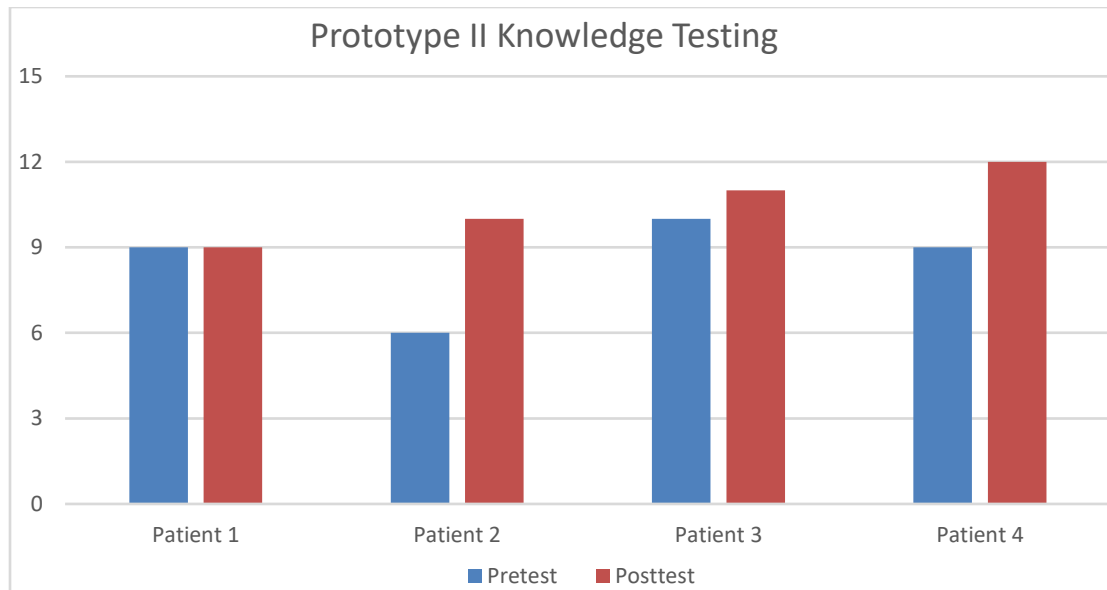
Figure 9. Prototype II pre/post video education knowledge testing. Demonstrating 3 out of 4

individuals with knowledge gain.

Table 3

Prototype II Mean Satisfaction Scores

Question	Mean Score
1. Is the video accurate?	4.75
2. Are you satisfied with accuracy of the video?	4.75
3. Does the video provide precise information you need?	4.75
4. Does the video content meet your needs?	4.75
5. Does the video provide information that seem to be just about exactly what you need?	5.0
6. Does the video provide sufficient information?	4.75
7. Is the video user friendly?	5.0
8. Is the video easy to use?	4.5
9. Do you think the video is presented in a useful format?	5.0
10. Is the Information clear?	5.0
11. Do you get information in a timely manner?	4.5

12. Does the video provide up to date information?	4.75

Discussion

The Design Thinking Method provided an appropriate format to meet a local need for patients with Type II diabetes. The results were consistent with similar projects that utilized video education as a form of patient education from the literature (Sunsoa, 2008; Kandula et al., 2009; Dyson et al., 2010, Shue et al., 2010; Majid et al., 2012; Chau et al., 2012). Utilizing the Design Thinking Methods, an intervention was prototyped that met the needs of the end-user, displayed an increase in knowledge gain in the final prototype, and patients with Type II diabetes perceived it in a positive manner.

First, the educational intervention was designed through input of all stakeholders. The initial interviews highlighted a disconnect between providers and patients with Type II diabetes. This disconnect focused on trust in the provider-patient relationship. Several patients stated they felt there was mix messages that made them feel uncertain about the care they received, and that it created confusion on what self-care behaviors to act upon. Furthermore, this distrust made living with Type II diabetes more of a burden then living a full and healthy life. The providers, on the other hand, felt that partnering with patients was a strength in care. Isolating this disconnect helped lead to the problem statement, An Achievable vision of a whole healthy life with Type II diabetes.

Next, comparing the intervention with stakeholder needs. Through the iterative process of design thinking this problem statement provided a guide for the video intervention. During the first prototype testing patients were asked about hopefulness of the video and areas to help improve it. The generalized response included: more on nutrition and meal planning, and more hope. In the second prototype there was an expansion on the nutrition section to include meal

planning utilizing the plate method and restructuring the introduction/closing frames to produce a hopeful message. Also, during this testing phase patients were given the Brief Diabetic Knowledge Test pre/post intervention. The knowledge testing was inconclusive and areas that were consistent with pre-prototype knowledge testing were addressed with the second prototype.

With any educational intervention knowledge gain is a key aim for participants. During this intervention the second prototype provided a small sample size. However, 3 out 4 patients with Type II diabetes had an increase in knowledge gain. These results are similar to the work of Sunsoa, 2008; Kandula et al., 2009; Dyson et al., 2010 in which their studies also showed that video education could assist in knowledge gain. The results from this small pilot study support the findings from the literature that video education can be a useful tool in clinical settings.

The final AIM of the project was to assess patient satisfaction with the intervention. The predetermined score of 4-5 was noted to be favorable, score of 3 neutral, and less than 3 unfavorable. Both prototypes were scored with favorable remarks with mean scores greater than 4 on all 12 survey items. Again, this small pilot study supports the work of Shue et al., 2010; Majid et al., 2012; Chau et al., 2012 who also displayed satisfaction with video education. For this small pilot it is important to note that the majority of the patients were from the geriatric population, and video education was perceived in a favorable manner.

Individuals that are seeking to design educational interventions with similar population should focus on the needs of end-users. Providing education that is produced in an audio/visual manner can enhance the learning process for geriatric patients. Future work should focus on how to introduce this type of education in to regular clinic flow and developing additional modules. Data gathered in this project suggest future work on module development should focus on different types of diabetic medications, best practices for taking medication and adverse reactions.

For providers and institutions that lack access to quality diabetic education, video education provides a format to improve availability of standardized education. This design research has laid the foundation for larger scale video education research for individuals with Type II diabetes. Utilizing this format, patients can receive quality disease education that can meet their needs, and potentially improve their health outcomes.

Limitations

There are a few limitations to this quality improvement project. First, the study is a very small pilot program designed to meet the needs of select population at one institution, and the study included the initial iterations of an educational design research. For these reasons, the findings cannot be generalized for a larger population. Second, the advanced prototype is not a final product. Future prototype development is needed to produce a final version of the education provided. Other topics to consider include: medication adherence, demonstration of appropriate exercise, and more in-depth meal preparation. Lastly, the Brief Diabetic Knowledge Survey provided a way to test basic knowledge. The prototypes were developed to meet the needs of the end-users, and not the content provided in the survey. Thus, some of the knowledge scores maybe lower because the education did not address all items on the survey.

<div align="center">

Conclusion

</div>

Trying to meet the needs of patients is a difficult task. Utilizing the Design Thinking Method is a way to provide a patient focused experience that can improve knowledge within disease care. Video technology is also perceived by patients to be a satisfactory method for patient education.   This project provided an example of how video technology could be used to meet the growing demand of disease education. Further, it provides an example of how Design Thinking as a quality improvement method can improve patient care.

Appendix 1

Brief Diabetic Knowledge Test (Fitzgerald et al.,2016)

1)   The Diabetes diet is: A) the way most American people eat B) a healthy diet for most

people C) too high in carbohydrate for most people D) too high in protein for most people

2)   Which of the following is the highest in carbohydrate? A) baked chicken B) swiss cheese

C) baked potato D) peanut butter

3)   Which of the following is highest in fat? A) low fat 2% milk B) orange juice C) Corn D)

Honey

4)   Which of the following is a "free food"? A) any unsweetened food B) any food that has

"fat free" on the label C) Any food that has a sugar free on the label D) any food that has less than

20 calories per serving

5)   A1C IS a measure of your average blood glucose level for the past A) day B) week C) 6-

12 weeks D) 6 month

6)   Which is the best method for home glucose testing? A) urine testing B) blood testing C)

both are equally good

7)   What effect does unsweetened fruit juice have on blood glucose? A) Lowers it B) raises it

C) has no effect

8)   Which should not be used to treat a low blood glucose? A) 3 hard candies B) ½ cup

orange juice C) 1 cup diet soft drink D) 1 cup skim milk

9)   For a person in good control what effect does exercise have on blood glucose? A) lowers

it B) raises it C) has no effect

10)   What effect will an infection most likely have on blood glucose? A) lowers it B) raises it

C) has no effect

11)   The best way to take care of your feet is to: A) look at and wash them each day B)

massage them with alcohol each day C) soak them for 1 hours each day D) buy shoes a size larger

than usual

12)   Eating foods lower in fat decreases your risk for: A) nerve damage B) kidney disease C)

heart disease D) eye disease

13)   Numbness and tingling maybe symptoms of: A) kidney damage B) nerve damage C)eye

disease D) liver disease

14)   Which of the following is usually not associated with diabetes: A) vision problems B)

kidney problems C) nerve problems D) lung problems

Appendix 2

End-User Computing Satisfaction Questionnaire (Lim, Lim, & Heinrich, 2008)

 5-point Likert Scale (1-almost never 2- some of the time 3- about half the time 4-most of the time 5-almost always)

1-   Is the video accurate?

2-   Are you satisfied with the accuracy of the video?

3-   Does the video provide precise information you need?

4-   Does the video content meet your needs?

5-   Does the video provide information that seem to be just about exactly what you need?

6-   Does the video provide sufficient information?

7-   Is the video user friendly?

8-   Is the video easy to use?

9-   Do you think the video is presented in a useful format?

10-   Is the information clear?

11-   Do you get information in a timely manner?

12-   Does the video provide up-to-date information?

References

Alicea-Planas, J., Pose, A. & Smith, L. (2016). Barriers to providing health education during primary care visits at community health centers: clinical staff insights. *Journal of Community Health, 41*, 2, 220-225.

American Diabetes Association. (2018). The cost of diabetes. Retrieved from: www.diabetes.org/advocacy/news-events/cost-of-diabetes.html?

Baraz, S, Shahbazian, H., Miladinia, M. & Zarea, K. (2015). Video training program and the quality of life of patients with type II diabetes. *Jundishapur J Chronic Dis Care*, *4,* 55-59.

Beck, J., Greenwood, D., Blanton, L., Bollinger, S., Butcher, M., Condon, J.,………Wang, J. (2017). 2017 national standards for diabetes self-management education and support. *The Diabetes Educator, 44*, 35-50.

Cavanaugh, K. (2011). Health literacy in diabetes care: explanation, evidence, and equipment. *Diabetes Management*, 191-199. doi: 10.2217/dmt.11.5.

CDC (2014). Age-adjusted percentage of adults aged 18 years or older with diagnosed diabetes ever attending, a diabetes self-management class, united states, 2000-2010. Retrieved from: https://www.cdc.gov/diabetes/statistics/preventive/fy_class.htm

CDC (2017). Diabetes report card. Retrieved from: www.cdc.gov/diabetes/pdfs/library/diabetesreportcard2017-508.pdf

Chau, J., Chung, L., Wong, R., Loo, K., Hoi-Shan, S., Lau,…… Lee, D. (2012). An evaluation of a web-based diabetes education program designed to enhance self-management among patients living with diabetes. *CIN: Computer, Informatics, Nursing, 30*, 672-679.

Clandinin, J. (2006). Narrative inquiry: a methodology for studying lived experience. *Research*

    Studies in Music Education. 44-54.

County Health Rankings & Roadmaps (2019). Retrieved from:

    www.countyhealthrankings.org/app/virginia/2018/measure/outcomes/60/data

Denton, Sylvia. (Personal communication, March 20, 2019) .

Dyson, P., Beatty, S., & Matthews, D. (2010). An assessment of lifestyle video education for

    people newly diagnosed with type 2 diabetes. *Journal of Human Nutrition and Dietetics,*

    23, 353-359.

Fitzgerald, J., Funnell, M., Anderson, R., Nwankwo, R., Stansfield, R. & Piatt, G. (2016).

    Validation of the revised brief diabetes knowledge test. *The Diabetes Educator, 42*, 178-

    187.

Hilton, K. & Anderson, A. (2018). IHI psychology of change frame work: to advance and sustain

    improvement. Retrieved from: http://www.ihi.org/resources/Pages/IHIWhitePapers/IHI-

    Psychology-of-Change-Framework.aspx.

Huang, M., Hung, C., Vu, E., Berry, D., Shin, S., & Hsu, Y. (2016). The effectiveness of

    multimedia education for patients with type 2 diabetes mellitus. *Journal of Advanced*

    Nursing, 73, 943-954

Institute for Healthcare Improvement. (2018). Science of improvement: testing changes.

    Retrieved from:

    www.ihi.org/resources/pages/howtoimprove/scienceofimprovementtestingchanges.aspx

Kandula, N., Nsiah-Kumi, P., Makoul, G., Sager, J., Zei, C., Glass, S., Stephens, Q., & Baker, D.

    (2009). The relationship between health literacy and knowledge improvement after a

multimedia type 2 diabetes education program. *Patient Education and Counseling, 75,*

321-327.

Kelly, T., Kelly D. (2013). Creative confidence. New York, New York: Penguin Random House

LLC.

Lim, K., Lim, J., & Heinrich, J. (2008). Validating an end-user computing satisfaction instrument:

a confirmatory factor analysis approach using international data. Journal of International

Technology and Information Management, 17, 153-165

Majid, H., Schumann, K., Doswell, A., Sutherland, J., Golden, S., Stewart, K., & Hill-Briggs, F.

(2012). Development and evaluation of the decide to move! physical activity educational

video. *The Diabetes Educator, 38*, 6, 855-859.

McKenney, S. & Reeves, T. (2019). Conducting educational design research 2nd edition. New

York, New York: Routledge.

Moovly. (2019). retrieved from https://www.moovly.com/

Ogrinc, G., Nelson, W., Adams, S. & O'Hara, A. (2013). An instrument to differentiate between

clinical research and quality improvement. IRB: *Ethics & Human Research, 35*, 1-8

Palmetto GBA (2018). Physician fee look up. Retrieved from: Palmettogba.com/j11b

Peterson, M. & Hempler, N. (2017). Developing and testing of a mobile application to support

diabetes self-management for people with newly diagnosed type 2 diabetes: a design

thinking case. *BMC Med Inform Decis Mak, 17*, 91 doi: 10.1186/s12911-017-0493-6

Plattner, H. (2010). An introduction to design thinking process guide. *The Institute of Design at

Standford*. Retrieved from: https://dschool-

old.stanford.edu/sandbox/groups/designresources/wiki/36873/attachments/74b3d/ModeG

uideBOOTCAMP2010L.pdf

Rice, S., Cranch, H., Littlemore, K., Mortimer, Platts, P., & Stephens, J. (2017). A pilot service-evaluation examining the change in hgA1C related to the prescription of internet-based education films for type 2 diabetes. *Primary Care, 2*, 305-308.

Richards, C., Glaser, E. & Lussier, M. (2017). Communication and patient participation influencing patient recall or treatment discussions. *Health Expectations, 20*, 760-770.

Shue, C., O'hara, L., Marini, D., Mckenzie, J., & Schreiner, M. (2010). Diabetes and low-health literacy: a preliminary outcome report of a mediated intervention to enhance patient-physician communication. *Communication Education, 59*, 360-373.

Sunsoa, H. (2008). South asian people with type 2 diabetes: a tool to assess learning. *Diversity in Health and Social Care, 5*, 43-53.

Sutton, B. (2016). Engineering a driving force behind the design-thinking movement. eCorner retrieved from: http://ecorner.stanford.edu/article/engineering-as-a-driving-force-behind-the-design-thinking-movement/

U.S Census Bureau (2018). Quick facts: Lynchburg city, Virginia. Retrieved from: www.census.gov/quickfacts/fact/table/lynchurgcityvirginiacounty,va/pst045218

Virginia Department of Health. (2018). Diabetes burden in Virginia. Retrieved from: http://www.vdh.virginia.gov/content/uploads/sites/25/2016/05/Diabetes-in-Virginia-2017_final_7_17.pdf

Yu, C., Parsons, J., Hall, S., Newton, D, Jovicic, A., Lottridge, D..Straus, S. (2014). User-centered design of a web-based self-management site for individuals with type 2 diabetes-providing a sense of control and community. *BMC Med Inform Decis Mak, 14*, 1-15 doi 10.1186/1472-6947-14-60