2021

Parent and Teacher Perceptions of Adolescent Use of Mobile Technology for Diabetes Care in Kenya

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This is to certify that the doctoral dissertation by

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Abstract

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MSc, George Mason University, 2015

MSc, Southeast Missouri State, 2000

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Dissertation Submitted in Partial Fulfillment

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Abstract

Mobile technology use provides an opportunity for the self-management of health among adolescents, serving as a lifestyle intervention tool to promote well-being and attenuate chronic conditions. However, little is known about how parents and teachers perceive how adolescents with chronic illness use mobile technology. This basic qualitative study aimed to explore teachers' and parents' perceptions regarding the use of mobile technology by adolescents who have diabetes in Kenya. This study's conceptual framework was the unified theory of acceptance and use of technology. Data were collected from semistructured interviews with six teachers and eight parents from two counties in Kenya. The themes that emerged from the coding analysis included general technology use, technology affordability, technology ease of use and acceptance, technology influence, and technology support. Findings indicated that parents and teachers perceive that increased mobile technology use among adolescents could help in diabetes management in Kenya. Also, with reliable and affordable internet service, there is potential for the use of mobile technology to strengthen health services and help prevent or manage diabetes among young people in Kenya. Findings may be used to identify the obstacles to diabetes management that adolescents face, thereby promoting healthier individuals.

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Dedication

I would like to dedicate this dissertation to my family. To my late father, Hezekiah Kanyugi, I still hear your positive and encouraging voice every day. You instilled in me the courage to chase my dreams in every aspect of my life, so I pursued this degree in your honor. To my mother, Esther Wanja Kanyugi, you have been the most outstanding cheerleader any son can have. The support and encouragement you have given me throughout the years will never be forgotten. To my children, Kayla, Uciel, Alex, Juana, and Blessed, I love and cherish you all. You all have been loving and supportive, and I pass the baton to you in hopes that you will pursue dreams of your own. I hope that I leave a legacy for my children and grandchildren. To my sister Lydiah Wangari, her husband Aaron Muriungi, and my niece Melissa Wanja, thank you for all the support, laughter, and encouragement throughout the years. I am still smiling at the thought of the various occasions that we compared Melissa's elementary grades and my graduate grades. To my bother Isaac Ndegwa and John Macharia, you stepped in when I needed support, and I will always be grateful to both of you. To all my other brothers and sisters, thank you all for the encouragement. To my mother-in-law Muthoni Kamau, you lent an ear when I needed to talk and stepped in to provide your guidance and encouragement right when I needed it.

Finally, to my wife, Naomi Wangari Kanyugi, you have been the most encouraging and supportive wife in the whole world. Through the late nights, you were right by my side, and I could not have done this without you. Thank you for believing in me and pushing me through the mental barriers I encountered throughout this journey.

Acknowledgments

I would like to acknowledge individuals who made this dissertation possible. First, I would like to thank the faculty, staff, and fellow students at Walden University who provided much-needed support and encouragement throughout this process. I would also like to thank those who participated in this research and provided voices to share their perspectives. My sincere appreciation is extended to my dissertation committee members, Dr. Gee, the chair, and Dr. Rasmussen, methodologist whom I greatly admire and who guided me throughout this life-changing doctorate process. Their insightful feedback pushed me to sharpen my thinking and brought my work to a higher level. Second, I would like to acknowledge Dr. Karanu of Kansas for his support throughout the dissertation process. Thank you, Jaffer Mbabu Murungi of Nairobi, for guiding me through the process of obtaining a research permit from Kenya. To my friends, thank you for your continued support and understanding even when I was not physically present on various occasions. I am grateful for my family, who supported me in the best way they could. Most importantly, I am thankful for their trust, deep respect, and appreciation for who I am and belief in my success.

Most importantly, I would like to acknowledge my wife, Naomi, who listened to my ideas and stayed long hours at night keeping me focused and for sharing my excitement during this life-changing moment. To all of you who supported me and made it possible to write my dissertation and cross the finish line to the doctorate, thank you very much, and may God bless you all.

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Chapter 1: Introduction to the Study

Mobile technology is a promising field for health self-management and can serve as a lifestyle tool to increase longevity and mitigate ongoing conditions. However, very little is known about how people with chronic illness view or use mobile technology for these purposes (Robbins et al., 2017). This study represents an attempt at addressing the gap in the potential for understanding the use of mobile diabetes technology within the sub-Saharan context. Using the unified theory of technology acceptance and use (UTAUT) model, I analyzed teachers' and parents' perceived desire to use mobile technology by diabetic adolescents. The UTAUT model was used to forecast the use of technology and to make technology-related decisions in various fields such as health care systems (Bellei et al., 2018), mobile health care (Hoque & Sorwar, 2017), and home health services (Cimperman et al., 2016). UTAUT guided the current study in exploring and understanding teacher and parent perceptions on mobile technology use by diabetic adolescents in the diabetes context. Parents and teachers have an important role to play in the holistic development of children. Therefore, it was important to explore both parents' and teachers' views as they may know certain ways to make a difference in the hearts and minds of young people.

Adolescents with diabetes require a considerable amount of information to keep track of the disease, which can sometimes become overwhelming (Cho et al., 2018). However, recent advances in mobile technology, such as smartphones, have opened up exciting new ways to keep track and stay connected. Combined with the ability to share data wirelessly, mobile technology might provide a new way of managing diabetes and

other chronic illnesses. Diabetes is a serious health condition that can have a significant impact on the lives and well-being of individuals, families, and societies worldwide (Borgnakke, 2019). Diabetes is one of the four main non-communicable diseases that caused approximately four million deaths in 2017 (Cho et al., 2018). Parents of children with diabetes are involved in day-to-day diabetic care, from preparing healthy foods to insulin injections to monitoring for low blood sugar and regulating it. Families maintain close contact with their child's health care team, who help them understand the treatment plan and provide directions on how to help a child stay healthy. In learning institutions, teachers and school nurses are key professionals supporting youths with diabetes and self-care while in school. Therefore, it is crucial to understand parent and teacher perceptions on the use of mobile technology by adolescents living with diabetes.

This chapter offers a comprehensive overview of the study. I address the elements of my study, starting with the research background. In the background section, I elaborate on the recent gap in the literature pertaining to mobile technology use for health management, specifically in its use among patients with chronic diseases. Subsequently, I describe the research problem that I framed based on current research, followed by the study's purpose, including its intent and scope of interest. The research questions that directed the study are presented next, and the theoretical framework that underpinned this study is identified. The theoretical framework is followed by the nature of the study, after which I present the assumptions, scope and delimitations, and limitations. I conclude the chapter by discussing the potential contributions of this research and the implications for

positive social change in the field of education and beyond. The summary provides a review of the significant points discussed.

Background of the Study

Despite increasing interest in integrating digital technology into health and disease control, little attention has been paid to its widespread use in communities with chronic health conditions (Robbins et al., 2017). Anstey Watkins et al. (2018) undertook a qualitative analysis on the use of mobile technology by chronic disease patients through semi-structured, in-depth interviews with 113 patients and 43 health workers from seven primary health clinics and one district hospital. Findings suggested that digital technologies such as mobile phones offer opportunities in low- and middle-income countries to improve access to information and resources relating to health care. Muralidharan et al. (2017) conducted a literature review using a web database that was searched between February 2015 and October 2016 on the use of mobile technology for the prevention and control of diabetes. Findings from the literature review suggested that mobile technology has a considerable ability to counter the outstanding burden of diabetes-related health care costs. Muralidharan et al. (2017) also observed that with added support from health care professionals, mobile technology could bring about progressed outcomes in diabetes patients.

Technological advancements in Kenya have created new models of serving rich and poor households (Ouma et al., 2017) and tend to trickle down to making life easier. Specifically, the management of diabetes through cell-based applications can be a practical approach to enhancing the adherence of the affected person to glucose targets

and health care in Kenyan households. Greenwood et al. (2017) carried out a systematic evaluation of 25 well-founded review articles and meta-analyses, focusing on the use of cell technology in diabetes self-control education and support services. Evidence from this systematic review indicated that with the massive adoption of smartphones, virtual health solutions that include evidence-based behavioral interventions can improve reach and access to diabetes self-management education and ongoing support.

These evidence-based behavior interventions pertained to my study by providing information on the utilization of mobile technology in education and support services. The extensive adoption of mobile technologies among youths, especially in developing countries, makes mobile health interventions appealing to them. Hannon et al. (2018) conducted a systematic assessment of mobile technology as utilized in diabetes control by choosing 42 articles for the review. Among them, 34 articles focused on mobile technology tools with incentive-driven technologies. The findings indicated that mobile technology improves the self-management of chronic diseases, including diabetes.

I examined the effectiveness of mobile technology as an educational tool to aid in the self-management of diabetes. Adepoju et al. (2017) reviewed four peer-reviewed articles on the use of mobile technology as an interface for enhancing point-of-care medical decision making and the quality of care in developing countries. The study determined that evidence provided on the use of cell technology as a clinical decision support system is a sign of growth in the domain, and it has the capacity for enhancing health care service delivery in low-resource settings. Similarly, Silva et al. (2015) conducted a comprehensive review and analysis of the top and novel mobile health

services and applications available in mobile markets and the health care industry. The study found that improved mobile technology, along with the internet, provides connectivity anywhere and anytime and plays an integral function in present-day health care solutions by addressing emerging problems in health services as well as by offering direct access to health services, irrespective of the time or location.

Furthermore, Gunawardena et al. (2019) conducted a qualitative study that addressed the efficacy of a modern cellular utility smart glucose manager (SGM) in Sri Lankan patients with diabetes. The study found that a cellular app primarily designed to aid in the self-control of diabetes revealed a long-term improvement in blood glucose (A1c) levels. I examined mobile technology as a tool to improve education and the physical health of adolescents. Holtz, Murray, Hershey, Dunneback, et al. (2017) conducted a qualitative study with five adolescent participants in a focus group that included seven parents of children who had a prognosis of diabetes for a period of 4 to 6 years. The study focused on the use of patient-focused research techniques to inform and enhance the design and capability of mobile technology for diabetes. Findings indicated that the patient-centered approach in the development of mobile technology could enhance communication among parents and their children. The information it provided on how technology supports communication among teachers, parents, and children on health-related problems was contextualized within my study.

Despite mobile technology contributing to advanced health care and better compliance in chronic illnesses (Lithgow et al., 2017), the use of mobile technology for health management in developing countries such as Kenya is inadequate. No in-depth

study addressing this issue was available at the time of the current study (see Latif et al., 2017). My qualitative study addressed the use of mobile technologies for diabetes management through the experiences and perceptions of teachers and parents.

Problem Statement

The issue addressed in this basic qualitative study was the insufficiency of mobile technology tools in Kenya to comprehensively address the prevalence of adolescent diabetes. Despite the current advancement in health technology, the use of mobile health in developing countries such as Kenya is rather low, and no study had been conducted to identify the reasons for the delayed pace (see Latif et al., 2017). The study of teacher and parent perceptions of mobile education for adolescents with diabetes in Kenya may be used to address health issues. Although government agencies in several countries have recorded data about diabetes mobile technology use, prevalence, and complications in a school setting, very little data were available for sub-Saharan Africa (see Ngwiri et al., 2015). Mobile technology has been efficaciously used in health care to improve chronic conditions such as diabetes (Holtz, Murray, Hershey, Dunneback, et al., 2017). However, despite the rapid spread of mobile services in Kenya and the potential of these technologies leading to improved health management outcomes, there were limited national data on children's use of diabetes mobile technology (see Opoku et al., 2017). In the absence of intervention and low information and control, diabetes can progress to complications across communities.

Diabetes self-control is imperative to overall diabetes care, and much self-management involves individual behavior change, primarily around nutritional intake

patterns and physical hobbies (Peek et al., 2014). The future appears to lie in mobile technology applications that can use embedded technology to exhibit the superior uses of a smartphone in assisting with the prevention and control of chronic illnesses (Muralidharan et al., 2017). Using mobile technology, people who have diabetes can review outcomes and develop trends that enable them to understand how day-to-day activities impact their blood sugar levels. However, further assessment of the function of mobile technology in patient-reported results and glycemic control is required (Garg et al., 2017). In developing countries, mobile technology has the potential to significantly enhance diabetes management for children and their parents by helping track the progress of the illness and offering actionable information while supporting self-management (Beratarrechea et al., 2014). In the current study, I provided an understanding and insight into how parents and teachers perceive the use of mobile technology in diabetic care.

Purpose of the Study

The purpose of this qualitative study was to explore parent and teacher perceptions of the use of mobile technology in diabetic care in two neighboring counties of Nairobi and Murang'a in Kenya. By exploring parent and teacher perceptions, the study was designed to help bridge the research gap in how mobile technology is used, its prevalence, and recommendations within Kenya. The use of mobile technology has increased dramatically in developing and developed countries, and it is widely accepted as a valuable tool for reaching out to young people (Ippoliti & L'Engle, 2017). According to Domingo and Garganté (2016), mobile learning tools are increasingly being considered in schools as a way to facilitate access to information, provide new ways of learning, and

increasing engagement in knowledge acquisition. However, Chib et al. (2015) found that the potential for mobile technology use to improve health care in low-resource environments that are typical of developing countries is yet to translate into significant health care investments. Addressing these gaps may provide additional guidance for a better understanding of how mobile technology use can help young people have better health outcomes at home and school. Eliciting teacher and parent perspectives on mobile technology use among adolescents may help to improve adolescents' long-term management of chronic illnesses and thereby reduce health risks.

Research Questions

To gain insight into the teacher and parent perceptions of mobile technology use among adolescents, I developed the following central research question (CRQ) to guide the study: What are the perceptions of parents and teachers regarding how adolescents use mobile technology for diabetic management in Kenya? In addition, I designed four subquestions (SQs) to aid in understanding the phenomenon better:

SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?

SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?

SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?

SQ4: What are the teachers' and parents' perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?

Conceptual Framework

The conceptual framework for this study was UTAUT that was formulated by Venkatesh et al. (2003). UTAUT was developed by modifying and consolidating the architectures of eight models previously used by other researchers to describe the behavior of the use of information systems. The models include (a) the theory of rational action, (b) the model of technology acceptance, (c) the model of motivation, (d) the theory of planned behavior, (e) the hybrid theory of planned behavior/technology acceptance model, (f) the model of personal computer use, (g) the theory of innovation diffusion, and (h) CGT.

I sought to obtain a comprehensive understanding, from the perspective of the teachers as well as the parents, of the use of mobile technology among adolescents living with diabetes. Due to its integrated constructs, UTAUT was used to help understand mobile technology use and acceptance issues. UTAUT has been used in previous research to identify and explore the factors that influence the acceptance and use of mobile-based technology (Islam, 2015; Seethamraju et al., 2018).

When proposing UTAUT, Venkatesh et al. (2003) argued that users' consumption preferences are likely to be influenced by their perceptions of success or performance expectancy (PE), expectations of commitment (EE), social influence (SI), and circumstance facilitation (FC). Venkatesh et al. (2003, as cited in Dwivedi et al., 2017) claimed that one could anticipate facilitating situations to predict behavioral goals. Furthermore, one of the constructs of the UTAUT, the technology acceptance model developed by Davis (1986), deals more specifically with the prediction of the

acceptability of an information system. Because UTAUT attempts to explain the degree of acceptance of information technology, researchers have adopted the theory to examine the acceptance and use of mobile services.

The UTAUT model informed my study for exploring the use of mobile technology by diabetic adolescents and their parents in Kenya. UTAUT contributed to my study by providing a framework to comprehensively explain the acceptance of information technology and articulates the actual use of such technologies (see Chao, 2019). The model's theoretical basis aided me in exploring the perceived intention of using mobile technologies. Moreover, the model contributed to the exploration of technology adoption and utilization due to its ability to incorporate diverse constructs (see Venkatesh et al., 2003). For example, UTAUT has been used to investigate the willingness of college students in Iran to use mobile technology as an assessment tool (Syed Ahmed & Kabir, 2018). In my study, UTAUT was used to explore the perceived use of mobile technologies as a tool to manage adolescents' diabetes in Kenya.

Nature of the Study

The basic qualitative approach is a form of empirical inquiry to investigate a contemporary phenomenon within its real-life context (Markus, 1989). I used qualitative content analysis as an interpretative method and used interviews as the means of data collection. Content analysis is a technique for analyzing communication patterns in a repeatable and systematic way. This research method is useful for analyzing vast volumes of data gathered from interviews or focus groups and allows for the quantification of categories (Schreier, 2012). One of the major benefits of using content analysis to

analyze social phenomena is that it is noninvasive. The current study consisted of a series of semistructured interviews with parents and teachers in rural and urban locations in Kenya. Semistructured interviews enable the exploration of lived experience as shared in an interview concerning theoretical variables of interest and have the potential to illuminate the complexities of a research topic (Galletta & Cross, 2013). The interviewer, according to Galletta and Cross, does not have to strictly adhere to a formalized list of questions during a semistructured interview. Instead of a straightforward question-and-answer format, more open-ended questions are asked that allow for a discussion with the interviewee.

The purpose of the interviews was to explore perceptions related to the use of mobile technology from teachers and parents of diabetic adolescents between the ages of 13 and 18. With the individual semistructured interviews, inductive thematic analysis was conducted to explore (a) familiarity with health-related mobile applications and (b) perceived limitations of and (c) facilitators of mobile use (Chan et al., 2017). To consider the possibility of the existence of important differences among the parents' perceptions of the use of mobile technology, participation was limited to parents of school-going diabetic adolescents. A purposeful sampling strategy was employed to select the participants, and data were collected in person in two phases. Phase 1 interviews were conducted with teachers, while Phase 2 consisted of parents. Analysis of the data collected was guided by the research framework and thematic methods used to develop a coding framework both by hand and by the use of qualitative analysis software, MAXQDA.

Definitions

To clarify the terms used in the study, I provide the operational definitions of some of the terms:

Attitude: An individual's positive or negative feelings about the output of a particular behavior (Davis, 1989; Fishbein & Ajzen, 1975; Taylor & Todd, 1995a).

Behavioral Intentions (BI): An indicator of the extent of one's desire to participate in a specific behavior (Fishbein & Ajzen, 1975).

Chronic disease: A long-term illness that cannot be prevented by vaccines or cured by medication, and does not disappear (Robbins et al., 2017).

COVID-19 pandemic: An infectious respiratory disease caused by a newly discovered coronavirus characterized by fever, coughing, and shortness of breath (Mahase, 2020).

Diabetes: A disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated glucose levels in the blood and urine (Borgnakke, 2019).

Diffusion of innovations theory (DOI): A theory that seeks to explain how, why, and at what scale new ideas and inventions are emerging (Rogers, 2003).

Effort expectancy: The perceived degree of simplicity associated with technology use (Venkatesh et al., 2003).

Facilitating conditions (FC): The extent to which a person believes that there are institutional and technological systems to sustain the use of a particular application (Venkatesh et al., 2003).

mHealth: The use of mobile phones and other wireless technology in medical care (Sleurs et al., 2019).

Mobile technology: An electronic device with internet capability that is accessible from anywhere the user is located (Khlaif, 2018).

Model of personal computer use (MPCU): A learning theory based on the idea that people learn in the context of social interactions and experiences by watching what others do (Thompson et al., 1991).

Motivational model: A model that suggests that individuals' behavior is based on extrinsic and intrinsic motivations (Davis et al., 1992).

Nonexperimental method: A research approach that lacks the manipulation of an independent variable or random assignment of participants to conditions or orders of conditions, or both (Arnold, 1997).

Performance expectancy (PE): The degree to which individuals feel that they can achieve job performance gains by using a particular system or technology resource (Venkatesh et al., 2003).

Prevalence: The proportion of a particular population found to be affected by a medical condition such as diabetes (Cho et al., 2018).

Purposeful sampling: A data collection method that focuses on specific characteristics of a population of interest to allow a researcher to address the research questions (Palinkas et al., 2015).

Self-management: Management of or by oneself; the taking of responsibility for one's behavior and well-being (Burgess, 2019).

Semi-structured interview: A meeting in which the interviewer does not strictly follow a formalized list of questions; instead, they ask more open-ended questions, allowing for a discussion with the interviewee rather than a straightforward question-and-answer format (Galletta & Cross, 2013).

Social cognitive theory (SCT): A theory that suggests when people observe others' actions and the consequences of such behavior, they recall the sequence of events and use this information to guide their subsequent behavior (Bandura, 1989).

Social influence (SI): The degree to which an individual perceives how essential the new system is from other relevant parties' perspectives (Venkatesh et al., 2003).

Technology acceptance model (TAM): A theory that deals more specifically with measuring the acceptability of the information system (Davis, 1986).

Thematic analysis method: A realistic approach to data analysis that identifies key concepts in the interview transcriptions (Patton, 2015).

Thematic saturation: Consecutive interviews that do not produce any additional novel information or until all participants are interviewed (Francis et al., 2010).

Theory of planned actions (TPB): A theory that relates one's values to actions and states that behavioral perceptions, social norms, and perceived behavioral influence shape the behavioral intentions and behaviors of the person (Ajzen, 1985).

Theory of reasoned behavior (TRA): A theory that attempts to clarify and describe the relationship between attitudes and behaviors within human actions (Tuck & Riley, 2017).

Unified theory of acceptance and use of technology (UTAUT): A theory that aims to explain user intentions to use an information system and subsequent usage behavior (Venkatesh et al., 2003).

Assumptions

I assumed that the teachers and parents interviewed would respond honestly regarding how they perceive diabetic adolescents using mobile technology. This assumption was relevant to this study because only an accurate response could inform how technology supports communication between parents and adolescents on health-related issues. Moreover, I assumed that teacher and parent perceptions of adolescents' mobile use might be used to educate adolescents about managing their diabetes. This assumption was necessary for the study because it helped me examine the effectiveness of mobile technology as an educational tool.

Another assumption was that the first set of interviews with six teachers and eight parents produced enough data for the study, and therefore follow-up interviews were not necessary because they may not lead to more information related to the study question. Both assumptions were relevant to the study because the perceptions of the participants may affect adolescents' lifestyle practices. That is, teacher and parent perceptions may provide insights on strategies, interactions, and learning activities that support, prevent, and influence diabetes management among adolescents.

Scope and Delimitations

The focus of this qualitative study was limited to the perceptions of teachers and parents on the use of mobile technology for self-health management in Kenya by

adolescents. Although diabetes and other noncommunicable diseases that share comparable risk have posed an immense threat to human health and development, I concentrated on adolescent diabetes in this study. To enhance the precision of the study findings, I included teachers who work with diabetic youths and parents of diabetic children. The scope was further narrowed to teachers and parents with knowledge of basic functionalities of smartphones, such as texting. I selected teachers and parents who most effectively demonstrated knowledge of using mobile technologies within a diabetes environment.

The purpose of the study was to explore teacher and student perceptions of mobile use by adolescents with diabetes. I did not address mobile technology perception issues beyond the context of diabetic adolescents. Moreover, the conceptual framework defined the scope of the study. UTAUT has been used in previous research to explore the factors that influence the acceptance and use of mobile-based technology (Islam, 2015; Seethamraju et al., 2018). However, the UTAUT model has not been used to explore the use of mobile technology for diabetic patients in developing countries (Hoque & Sorwar, 2017) such as Kenya. Due to the several constructs that were used to develop the UTAUT model, the intervention results obtained through the study may be applied to similar health issues that adolescents face besides diabetes. Furthermore, I used purposive sampling to capture a wide range of participant perceptions and experiences; therefore, transferability may be viable.

Limitations

The main limitations of qualitative research are that it is time-consuming and there is a possibility that specific issues will go unnoticed (Bowen, 2009). Also, researchers' interpretations are narrow, and personal knowledge and experience affect findings and conclusions relevant to the research issue. For example, data from interviews with six teachers and eight parents about their perceptions of mobile technology use took time to collect because they were collected based on individual respondents' appointment dates. There were some drawbacks to this study. First, I relied on teacher and parent perceptions rather than adolescent perceptions. The range of participants was limited to those with a basic knowledge of mobile technology functions. This range of participants implied that the sample might not have been an accurate representation of all teachers who teach diabetic youths and parents of children with diabetes.

Consequently, it was not easy to assess the credibility of the participants' responses. Participants may have exaggerated or understated information when responding to interview questions. Besides, humans are limited by their five senses—tools that people use to perceive and understand their surroundings. Furthermore, the data collection process might have been limited by the possibility of participants losing interest and willingness to truthfully answer questions, which might have affected the results. Participant reactivity and the possibility that a qualitative investigator will overidentify with one or more study participants are limitations of qualitative research (Sinclair et al., 2013). Sinclair et al. suggested that participant reactivity occurs when

people act or respond differently because they are aware that they are being watched. Overidentification of participants occurs when a sympathetic investigator studies a group of people and assigns a virtue or other trait to one or more participants over what is warranted.

Another potential limitation might have been my bias in leading the participants to answer questions in ways that might have produced my desired results. To address this bias, I designed the questions in a way that participants were allowed to freely express their perceptions. I responded to their answers with follow-up interview questions. Participants were encouraged to respond freely about their perceptions of mobile technology use and elaborate on them. I was careful not to let my personal opinion influence participants' experiences and perceptions. To reduce this bias, I strictly asked the interview questions as they were designed and ensured that the follow-up questions were as close to the original questions as possible.

Significance of the Study

This study was unique because it addressed a less researched area, that is, perceptions on the use of mobile technology (see Trawley et al., 2017) among diabetic adolescents. The future seems to lie in mobile health technology, which can use embedded technology to demonstrate a cellphone's superior aid in preventing and monitoring chronic diseases such as diabetes (Muralidharan et al., 2017). By exploring parent and teacher perceptions, the study addressed the gap in how mobile technology is used, its prevalence, and recommendations within Kenya. Knowledge gained from the study could be used to inform the advancement of practical mock-ups in the subsequent

research phase using a design-based study approach to lay out mobile-enabled patient education for the self-control of diabetes in the Kenyan setting. Understanding how mobile technology is used, its prevalence, and recommendations, as well as the possibility of using the results to design mobile-enabled patient education for self-management, may lead to improving health for adolescents and providing opportunities for positive social change.

Summary and Transition

Mobile technology use has grown in both developing and developed countries and is widely recognized as a useful tool to reach young people (Ippoliti & L'Engle, 2017). In a school setting, mobile learning tools are increasingly being considered as means of facilitating access to information, providing new ways to learn, and increasing engagement in knowledge acquisition (Domingo & Garganté, 2016). However, according to Ippoliti and L'Engle (2017), parents' perceptions of mobile technology interventions aimed at youth who reside in poor-resource settings remain insufficiently studied. The current qualitative study was conducted to bridge this gap by analyzing the teacher and parent perceptions on mobile technology use by diabetic adolescents in Kenya. Mobile technologies may be an essential therapeutic resource in developing countries. In recent years, the use of mobile technology to distribute data and health information and to provide links to programs aimed at improving health habits among hard-to-reach communities has gained increased prominence (Ippoliti & L'Engle, 2017).

The next chapter presents the literature review that sets the foundation for this study. The chapter begins with an introduction, followed by the literature search strategy

used to locate current literature. The theoretical framework—UTAUT formulated by Venkatesh et al. (2003)— is also discussed. The literature review explains the attitudes of different stakeholder groups toward the use of mobile technology in a school setting and health care. This information is followed by a discussion of the barriers to adolescents' use of mobile technologies at home and in school, which includes general barriers, resources, support, and teachers' and parents' self-efficacy.

Chapter 2: Literature Review

In this chapter, I review the existing literature relevant to understanding the perceptions of parents and teachers about adolescents suffering from diabetes using mobile technology. The integration of mobile technology in health care has led to better medical care and chronic disease enforcement (Lithgow et al., 2017). Despite current advances in health technology, however, the use of mobile technology for health management in developing countries such as Kenya is limited. Moreover, no in-depth studies have been conducted that explore this issue (Latif et al., 2017). Findings yielded by a study of parent perceptions of mobile education for adolescents who have been diagnosed with diabetes in Kenya could be used to more efficiently address the health issues that these adolescents face. This gap motivated the need for the current study, the goal of which was to enhance the understanding of how teachers, parents, and diabetic adolescents use mobile technology to address health issues related to this chronic disease. Findings could be used to develop strategies for educating parents, teachers, and adolescents regarding the use of mobile technologies to assist in minimizing health risks associated with diabetes.

Although government agencies of several countries have been monitoring the use of mobile technology to assess the prevalence of and complications arising from diabetes in a school setting, limited data exists on this issue in sub-Saharan Africa (Ngwiri et al., 2015). Globally, mobile technology has been adopted successfully to improve the health of individuals suffering from a variety of chronic conditions, including diabetes (Holtz Murray, Hershey, Richman et al., 2019). However, despite the rapid spread of mobile

services in Kenya and the potential for improving health management outcomes through the use of these technologies, there are limited national data on children's use of mobile technology aimed at diabetic patients (Opoku et al., 2017). In the absence of interventions and due to low diabetes awareness and diabetes control in Kenya, this serious medical condition could result in further health complications, thereby imposing a significant burden on the patients and the community.

In this chapter, I discuss the literature search strategy and the conceptual framework, UTAUT, which I used to conduct this study. This chapter also includes a description of the current research related to my study and how mobile technology is used in health care in general and in Kenya in particular, mobile technology in Kenya, and adolescents' use of mobile technology in diabetes management. This chapter also provides a description of the teacher and parent perceptions of mobile technology from current research and a discussion of the evidence of parental involvement in adolescent health. The chapter concludes with a summary of the literature review and how it related to the study.

Literature Search Strategy

Various research strategies were employed to locate scholarly works, books, peer-reviewed articles, and other sources pertinent to the topic under study. I accessed the following repositories from Walden University's library: Academic Journal, ProQuest Central, Health & Medical Collection, Nursing & Allied Health Database, Science Database, Health & Medical Collection, SAGE Journals, Dissertations & Theses @ Walden University, and Dissertations & Theses Global. I also used Google Scholar to

identify dissertations and conference proceedings on the topic. The following phrases were used as keywords in the search: *parents' perception of adolescents' use of mobile technology*, *mobile health (mHealth)*, *mobile technology*, *adolescent use of mobile technology*, *diabetes*, *diabetes management*, *use of mobile health by adolescents*, and *use of mobile technology in developing countries*. I reviewed the sources, especially those published in the last 5 years or if they were seminal studies. I emphasized research that focused on parental perceptions of adolescents' use of mobile technology. The literature review aimed to provide a critical evaluation of extant research on the phenomenon of interest while revealing any gaps that would situate and justify the present study. The literature search was intensive and wide-ranging, for its aim was to assess the contribution of each source, as well as identifying information deemed relevant to the current investigation.

Conceptual Framework

The conceptual framework for this study was the UTAUT, developed by Venkatesh et al. (2003). UTAUT was developed by updating and consolidating the architectures of eight models previously used by other researchers to explain the utilization behavior of information systems. This theory includes "(a) the reasoned action theory, (b) the model of technology acceptance, (c) the model of motivation, (d) the planned behavior theory, (e) the hybrid theory of planned behavior and technology acceptance models, (f) the personal computer use model, (g) the theory of innovation diffusion, and (h) the theory of social cognitive" (Kademeteme & Twinomurinzi, 2019, p. 115). Venkatesh et al.'s posterior assessment of UTAUT in a longitudinal study indicated

that it accounted for 70% of the variation in the behavioral intent (BI) of individuals to use and approximately 50% in actual use. To elucidate UTAUT's emphasis, I present a brief description of each of the eight preceding theories or models composing the final theory.

Theory of Reasoned Action

The theory of reasoned behavior (TRA) attempts to clarify and describe the relationship between attitudes and behaviors within human actions (Tuck & Riley, 2017). This theory predicts how individuals might behave based on their preexisting behaviors patterns and behavioral expectations. The individual's decision to engage in a behavior is based on the consequences they believe will emerge as a result of their actions. Developed by Fishbein and Ajzen (1975), the TRA was developed from previous research in social psychology, persuasion models, and attitude theories to better understand the relationship between attitudes, intentions, and behaviors. The findings yielded by previous studies on these relationships indicated that there is a relatively low correspondence between attitudes and behaviors, due to which some authors proposed the elimination of attitude as a factor underlying behavior (Abelson, 1972; Wicker, 1969).

Although Fishbein and Ajzen's (1975) theories indicated the existence of a relationship between attitudes and behaviors, their critics argued that attitude theories are not efficient indicators of human behavior. The TRA was subsequently revised and extended by Fishbein and Ajzen to resolve any discrepancies between planned actions theory (TPB) and the reasoned action approach. The TRA is also used in the context of communication as a theory of comprehension. The TRA focuses on theoretical constructs

dealing with human motivational factors as determinants of the probability of specific behaviors being performed (Glanz et al., 2015). The TRA is based on the assumption that aim is the best predictor of behavior and can sometimes be decided by behavioral attitudes and social normative expectations (Glanz et al., 2015).

The theory of rational action (Fishbein & Ajzen, 1975, 1980) presupposes that behavioral actions, which are the immediate antecedents of actions, emerge from confidence in the probability that the output of a particular behavior will lead to a particular outcome. These values were divided into two separate sets by Fishbein and Ajzen (1975): behavioral and regulatory. Behavioral beliefs are the causal effect of the behavioral actions of an individual, while normative beliefs reflect the arbitrary behavioral rule of an individual. Either by attitudes and/or subjective norms, knowledge or contextual beliefs influence intentions and subsequent behavior.

Theory of Planned Behavior

The TPB relates one's values to actions and is an extension of the TRA. Although both the TRA and TPB are based on the assumption that individuals make rational, informed decisions to participate in specific behaviors by analyzing the available information, TPB refers to the idea of perceived behavioral control. This behavioral control is characterized as an individual's perception of ease or difficulty in performing actions (Ajzen, 1985). TPB states that behavioral perceptions, social norms, and perceived behavioral influence shape the behavioral intentions and behaviors of the person. TPB claims that an individual's desire to take action or do something, such as using mobile technology, is influenced by their behavioral behaviors, social norms, and

perceived behavioral regulation. The behavioral attitude reflects how the person thinks and feels about the actions that could reflect a positive and functional attitude. Effective attitude shows how the individual feels about the actions (e.g., whether it is enjoyable). The instrumental attitude pertains to the extent to which the attitude is beneficial or harmful. Subjective norms pertain to the reinforcement from others that the individual can obtain for others' actions. Subjective norms could be either injective or descriptive. Although the injective norm involves motivation and support from others, descriptive norms are expressed when others support and demonstrate behavior themselves. The other indicator of behavior is perceived behavioral competence, which relates to the degree to which the individual is capable and assured of behaving and to the extent to which they can face challenges and overcome barriers (Ajzen, 1985).

The correlation of habits and social norms with behavioral intent was proposed by Ajzen (1991) to improve the predictive power of TRA by including perceived behavioral control. Existing research has been applied to the association between beliefs, attitudes, behavioral objectives, and behaviors in a variety of fields such as marketing, public relations, campaigns, health care, sports management, and sustainability. TPB can be applied to people's nonvolitional behavior, which cannot be explained by TRA. The individual's BI cannot be the sole determinant of conduct when their control of behavior is incomplete. For example, Norberg et al. (2007) argued against the association between BI and actual behavior, which indicates that, due to limitations, BI does not always lead to actual actions. TPB can explain the relationship between BI and actual behavior by incorporating perceived behavioral control.

Additionally, findings from several studies indicated that TPB can better predict health-related BI than TRA (Ajzen, 1991; Norman et al., 2005; Pratkanis et al., 1989; Taylor & Todd, 1995a). TPB has improved the predictive power of intent in various health-related areas, such as condom use, leisure, exercise, and diet. Additionally, TPB and TRA can explain individual social behaviors by considering social standards as an important variable in the context of the use of mobile technology.

Technology Acceptance Model

Based on TRA, Davis (1986) developed a technology acceptance model (TAM) that deals more specifically with measuring the acceptability of the information system. The purpose of this model is to forecast the acceptability of the process and to consider the changes required to the system to make it suitable for users. TAM suggests that two key factors determine the information system's acceptability: the perception of benefit and the perceived ease of use. As the TRA has shown, this model postulates that the use of the information system is dictated by the BI that is characterized by people's attitude toward the use of the system as well as their perception of its utility (Davis, 1986).

According to Davis (1986), the attitude of people is not the only thing affecting their use of the system. Equally significant is the potential effect of information system on their performance. Even if employees do not embrace the information system, the probability of using it is strong because they believe the system may improve their performance at work. TAM also hypothesizes a direct connection between perceived utility and perceived ease of use. Users will find the one they find easier to use more useful because of the choice between two programs that provide the same features

(Dillon & Morris, 1996). TAM provides a valid and reliable predictor that measures the acceptance or adoption of new technologies by end-users (Davis et al., 1989). The definition is widely applied when measuring technology acceptance (King & He, 2006). Davis's (1986) initial TAM forecasted the use of the system for a specific purpose based on the perceived usefulness (PU) of the end-user and perceived ease of use (PEOU). Davis suggested that across TAM's application, user-friendliness and perceived value are the most important determinants of use and are influenced by external variables.

Social, cultural, and political influences are the predominant external factors that manifest in this context. Social factors include vocabulary, expertise, and communication circumstances, while political factors refer to the effect of the use of technology in political and financial crises. Cultural factors include the set of values and philosophies of a particular community or group of individuals. For example, the traditions, values, and concepts that have been established and followed over a period of time occupy the highest place in the community. Davis (1986) proposed that the usage attitude involves the user's evaluation of the desirability of using a specific information system program, while BI is a calculation of the probability of an individual using the application. Davis (1989) applied the model to work settings and described PU as "the degree to which a person believes that using a particular system will enhance their job performance" (p. 320). Under nonwork settings, instead of enhancing job performance, the goal is to achieve personal goals. For example, the aim of the PU or the work of a health care user when selecting a physician (using web-based data) is hypothesized to locate a highly qualified medical practitioner. In these cases, web-based information is beneficial to the

degree that it helps to achieve the latter goal. Davis described PEOU as "the degree to which a person believes that the use of a particular system would be effortless" (p. 320). Therefore, PEOU's concept, unlike PU's, transcends job environments as well as goals or objectives. It is the combination of the two versions—PEOU and PU—that form the primary components of TAM.

The validity and reliability of TAM were identified in three studies (Hauser & Shugan, 1980; Larcker & Lessig, 1980; Swanson, 1987). Davis's (1989) instrument comprised six PU-related items as well as six PEOU-measuring items. For example, the study by Hauser and Shugan (1980) compared workers' expectations of utility, in addition to the ease of use of the applied technologies based on workers' self-reported use of these technologies. Some computer-based email users (with file editor software) rated their PU and PEOU and recorded the degree to which they were used. PU is characterized as the degree to which a person believes that the use of a program will enhance their efficiency. PEOU, contrarily, refers to the degree to which a person believes that the use of a device would be effortless. Several empirical analyses have shown that PU and PEOU could be regarded as two distinct dimensions (Hauser & Shugan, 1980; Larcker & Lessig, 1980; Swanson, 1987).

Motivational Model

Davis et al. (1992) applied the theory of incentive to the study of the adoption and use of information technology According to the motivation model, people's behavior is guided by both extrinsic and intrinsic motives. Extrinsic motivation is characterized as the belief that people want to do something because it will help them achieve goals other

than the task itself, such as increased job success, better pay, or promotion (Davis et al., 1992). Sources of extrinsic motivation include PU, PEOU, and social norms. Results assumptions, one of UTAUT's theories, are based on five core constructs: extrinsic motivation (adopted motivational model), relative benefit (from the theory of innovation diffusion), outcome expectations (adopted from TAM2/TAM, blended TAM, and TPB), and performance expectations (from SCT) (Venkatesh et al., 2003).

The construct of attitude, which refers to the overall affective response of an individual to using a program, is closely linked to the motivation model (Venkatesh et al., 2003). In models like TPB/DTPB, TRA, and MM, attitude frameworks are among the best predictors of behavioral intent (Davis et al., 1989; Fishbein & Ajzen, 1975; Venkatesh et al., 2003). Chau and Hu (2002), for example, found that attitudes are the second most important determiners of a doctor's intent to embrace mobile technology. Verkijika (2018) analyzed factors affecting Cameroon's adoption of UTAUT-based mobile technology and found that hedonic motivations, encouraging conditions, perceived confidence, social influence, and perceived risk have a significant impact on mobile technology use intentions.

Combined Technology Acceptance Model and Theory of Planned Behavior

Taylor and Todd (1995a) created a hybrid technology acceptance model—the theory of expected action by integrating the TPB model from the field of social psychology with TAM from the field of information technology to make TPB more relevant to technology acceptance. The corresponding combination of the TAM and TPB (C–TAM–TPB) model incorporates the TPB's predictors with TAM's expected utility in

producing a hybrid model (Taylor & Todd, 1995a). According to TAM and TPB, behavior is determined by the decision to conduct, while attitude to that behavior determines the BI itself. Significant TAM analysis is known to be a direct determinant of the user's purpose for using the product (Davis, 1989; Venkatesh et al., 2003).

However, the TAM's constructs do not comprehensively reflect the specific effects of the technical- and use-context, although these factors affect the acceptance of the product exhibited by the consumer (Safeena et al., 2013). Therefore, Davis (1989) suggested that the writers of future technology-acceptance studies may examine how other factors influence value, ease of use, and acceptance. Davis' work primarily investigated the powerful and primarily external variables that decide attitudes toward the use of technology (Hua & Wang, 2019). Davis discussed perceived usefulness and perceived ease of use of technology and suggested that, while perceived usefulness will directly influence the intention to use; the two belief factors together determine users' attitudes toward technology and should subsequently impact their behavioral intentions. Essential information on the target system can be gathered based on the relationship between PEOU, perceived utility, attitude, and BI.

It can be inferred from past research that TPB emphasizes actions (Norman et al., 2005), while TAM and C–TAM–TPB concentrate on the degree of acceptance of new technologies (Lee, 2009; Taylor & Todd, 1995b). Based on the research findings stated by Davis (1989), TAM exhibits greater predictive power than TPB to explain the success of certain information technologies. Nonetheless, as reported by Taylor and Todd (1995a), TAM is strengthened by the social and control factors incorporated into C–

TAM–TPB, thereby exhibiting a stronger explanatory power in the field of information technology. Alternatively, given that TAM is enhanced in terms of theoretical ease of use, it is more efficient than C–TAM–TPB. Taylor and Todd (1995a) have argued for the use of TAM for operational convenience even though TAM has lesser explanatory power. Consequently, the social variables and regulation variables in TAM have been omitted. Similar to TPB, TAM is equipped with different contents depending on different situations. For example, Taylor and Todd (1995a) argued that TAM fails to consider factors of culture and control that have been proven to influence actual behavior and are therefore key to TPB.

Hence, following their empirical study of students' use of a computer resource center, Taylor and Todd (1995a) introduced C–TAM–TPB, which combines TAM and TPB to include social standards and perceived behavioral regulation in technology adoption models. The empiric findings recorded by Taylor and Todd (1995b) indicate that C–TAM–TPB can explain user behavior toward the use of new technology. Based on the analyses in which users grouped according to their experience were used, C–TAM–TPB is considered a good fit for the data obtained from either experienced or inexperienced users because user behavior is a direct function of BI. BI, in effect, is a function of attitude toward use, representing positive or negative feelings toward the use of technology, while PU represents the expectation that the use of technology would improve performance. Attitude is the joint outcome of the perceived utility and perceived comfort of use, and the latter itself is a direct predictor of PU. Resultantly, numerous TAM-based technology adoption models have emerged (Taylor & Todd, 1995a).

Furthermore, there are no social or influence variables included in TAM because, as Davis (1989) argued, such factors—like utility—are weak determinants of behavior. However, Taylor and Todd (1995b) have shown that social variables and control variables are directly related to behavior. All TAM and TPB were, therefore, incorporated into the C–TAM–TPB model. Taylor and Todd believed that PEOU had a positive influence on PU, while both PU and PEOU had a positive influence on attitudes. Consequently, beliefs, social norms, and perceived behavioral control have a positive effect on user behaviors.

Model of PC Utilization

The MPCU was developed from Triandis' (1979) theory of interpersonal behavior (Thompson et al., 1991). Triandis' research efforts resulted in a theoretical framework that could be used to describe how human behavior occurs and to identify the factors that stimulate individual behavior. The MPCU is a learning theory based on the idea that people learn in the context of social interactions and experiences by watching what others do (observation). In the context of computer use, "Compeau and Higgins (1995) extended and generalized the SCT to the use and adoption of technology" (Liebenberg et al., 2018, p.162). According to Triandis (1979), action has objective implications that individuals perceive in such a way that the individual feels validated. This affirmation has two impacts on expected behavioral implications: first "it increases the perceived probability that actions will have specific consequences" and, second, "it changes the significance of those consequences" (p. 198). Other determinants such as habit, related anticipation, FC, and social factors also influence BI.

Subsequently, Thompson et al. (1991) updated and enhanced the Triandis model to accommodate information systems and used it to forecast the use of PCs (Venkatesh et al., 2003). The model's architecture makes it ideal for modeling human adoption and the use of a variety of information technologies. They agreed that individual feelings about using PCs, social norms, potential effects, desires, and CF can influence the use of PCs. Triandis, (1979) indicated that actions should be directly affected by social factors, potential consequences, outcomes, and facilitating circumstances. Thompson et al. (1991) did not include the reason for PC use in the model because the decision to use a PC should have arisen from one's already formed preferences and not from its potential use.

The central postulate of PC utilization model is that social factors impact the use of information technology and perceived effects of BI, which subsequently impact the actions (Triandis, 1979). Additionally, Triandis argued that behaviors are both direct and indirect determinants of actions. He further acknowledged that, even when intentions are high, behavior may not occur if the "geography" of the situation (i.e., FC) renders the behavior impossible. Thus, if someone intends to use a PC but does not have easy access to one, the use is less likely to occur. The model includes other variables that are not germane to this study, such as culture, social status, and genetic biological factors that may influence behavior (Thompson et al., 1991).

Complexity and health of function are applied to the MPCU to clarify the notion of potential consequences. Additionally, consumers, such as practitioners or managers who typically use PCs voluntarily in their job, are considered to have the experience of using PC. Thompson et al. (1994) continued their research into the role of experience in

the use of PCs. They indicated that practice would have a direct, indirect, and moderating impact on the use of PCs.

Diffusion of Innovations Theory

A challenging topic and one of the leading theories on acceptance recognition in UTAUT is the diffusion of innovations theory (DOI) (Aizstrauta et al., 2015). The DOI theory seeks to explain how, why and at what scale new ideas and inventions are emerging (Rogers, 2003). The theory emerged in conversation as an attempt to explain how the concept or commodity is gaining momentum over time and is distributed through a particular population or social system. The final result of this dissemination is that people promote a new idea, practice, or material as part of a social network. Rogers proposed that diffusion is the mechanism through which, over time, creativity is transmitted by participants in a social system.

For Rogers (2002), acceptance is a decision that ensures the successful use of an idea as the best available course of action, and denial is the decision to not incorporate such creativity in a social system. Acceptance implies that a person does something different from what they have done before (for example, purchasing or using a new product or adopting and practicing a new behavior). The main precondition to adoption is that the user must clearly perceive the concept, action, or substance because the product or behavior is new or innovative. This approach of adoption initiates diffusion since, according to Rogers (2003), over time, innovation is spread continuously among the members of a social system through certain networks. Creativity, communication

channels, time, and social system are the four key components of the dissemination of innovation theory, as defined by Rogers.

Social Cognitive Theory

In 1961, Bandura et al. created the SCT, which was originally referred to as the social learning theory (SLT). SCT postulates that aspects of an individual's acquisition of knowledge can be directly related to others' comprehension within the context of social interactions, behaviors, and cultural impact. Bandura (1989) developed the SCT as an extension of his theory of social thinking, suggesting that when people observe others' actions and the consequences of such actions, they recall the sequence of events and use this information to guide their subsequent behavior. SCT's unique feature is its emphasis on SI and its insistence on external and internal social strengthening.

SCT's philosophical roots lie in Holt and Brown's (1931) research, which suggested that all animal behavior is aimed at satisfying the needs of the mind, feeling, and desire. The belief that a person can't learn to mimic before they imitate is the most influential component of this theory (Holt & Brown, 1931). In 1941, Miller and Dollard published a study of Holt and Brown's work, which eventually revised Holt and Brown's theory of social learning and emulation, claiming that the following four factors contribute to learning: motives, signals, reactions, and incentives. Another reason for social learning and emulation is the reciprocal benefit that involves imitation, the mechanism for planning an act with an acceptable suggestion of where to act and when. Action is imitated based on whether a person experience response that are positive or

negative (Miller & Dollard, 1941). Miller and Dollard also argued that if one is motivated to learn a particular behavior, that behavior would be learned through its practice.

Bandura, along with his students and colleagues, conducted a series of studies based on the Bobo Doll experiment. The studies were aimed at clarifying why and when children exhibit aggressive behavior (Bandura et al., 2019). These experiments indicated the importance of modeling for the deliberate development of novel behaviors, which enabled Bandura et al. to improve on the concept of how behavior is learned by building on the work of Miller and Dollard (Bandura, 1989). Bandura believed that SLT indicates a direct correlation between perceived self-efficacy and behavioral change. Self-efficacy stems from multiple sources, namely, performance accomplishments, vicariate knowledge, emotional persuasion, and physiological states (Bandura, 1977).

In 1986, Bandura expanded his original theory and renamed it "SCT" to emphasize the important role that cognition plays in encoding and executing behavior. He concluded that human behavior is subject to financial, behavioral, and environmental influences (Bandura, 1995). In 2011, Bandura extended SCT's application to health promotion and urgent global issues, claiming that whenever it provides insight into addressing global issues through a macro-social lens, it aims to improve the equality of individual lives under the SCT umbrella. According to Bandura (2011), the key components of the SCT related to individual behavioral change include the following:

- Self-efficacy: The conviction that a person holds power over, and is capable of, acting.
- Behavioral capacity: Ability to recognize and perform a behavioral task.

- Expectations: Ability to assess the results of behavioral change.
- Expectations: Assigning importance to behavioral change outcomes.
- Self-control: Regulating and analyzing individual behavior.
- Observational learning: Observing others who perform or model the desired behavior and record the results.
- Strengthening: Encouraging opportunities and bonuses that promote behavioral change.

Bandura (1989) proposed CGT from an agent's perspective and suggested that people are self-developing, self-regulating, self-reflective, and productive, rather than being affected solely by external circumstances or internal influences. Individuals learn by watching others and the environment serves as a primary factor influencing the development of the shared triad of relationship, behavior, and cognition. Any perceived action can alter the way a person thinks (cognates). Similarly, the family environment one is born into may influence subsequent behaviors. For example, parents' perspectives or thinking (also cognates) affects the world in which they raise their children.

Unified Theory of Acceptance and Use of Technology

Following a thorough evaluation of the eight models pertinent to technology acceptance, Venkatesh et al. (2003, p. 425) "formulated a single technology acceptance and use theory (UTAUT)". Subsequently, the writers of several studies used the theory to introduce and disseminate technology both in the area of the information system (IS) and in other areas such as social psychology, management, and marketing (Dwivedi et al., 2017; Imtiaz, 2018). The impetus to describe and author UTAUT came from the

observation that a large number of constructs embodied in existing theories are comparable; thus, it was reasonable to combine them into a single theory (Venkatesh et al., 2003, p, 426). With UTAUT available, Venkatesh et al. anticipated potential investigators would no longer have to search for, collect, and organize constructs from several models to understand issues related to IS/IT adoption and dissemination.

Venkatesh et al. (2003), while proposing UTAUT, argued that users' consumption preferences are likely to be dictated by their perceptions of the success of a technology or PE, expectations of commitment (EE), SI, and circumstance facilitation (FC). The first three variables (PE, EE, and SI) are direct determiners of desire to use and actions, while the fourth (FC) is a direct determiner of consumer behavior. Nonetheless, the researchers perceive behavioral purpose as a critical development indicator. Later, the concept was revised by Venkatesh et al. (2012) by adding more dimensions such as hedonic incentives. The influence of hedonic motivation on BI is moderated by the consumer's age, gender, and background in the use of technology, while the impact of price value on BI is moderated by age and gender (Venkatesh et al., 2012). To thoroughly decipher the postulations found in UTAUT, a simple description of each of the above-mentioned structures would be worthwhile.

Performance Expectancy

PE is described as the degree to which individuals feel that they can achieve job performance gains by using a particular system or technology resource (Venkatesh et al., 2003). The anticipated product success affects the desire of the customer to implement it. PE can act as an indicator of consumer's willingness to use mobile technology. For

example, Khlaif (2018) has shown that PEs are positively linked to the intention to use mobile technologies. For example, the perceptions of teachers on the usefulness of technologies have been found to have an impact on whether and how they would apply these technologies in education. In general, most of the relevant literature in which the UTAUT model has been discussed shows that PE is the primary predictor of the use of information and communication technology (ICT) (Venkatesh et al., 2003). More recently, Arcila Calderón et al. (2017) identified a strong relationship between the PE of the individuals and their use of a particular technology.

Similarly, Khayati and Zouaoui (2013) noted that PE is equivalent to PU, defining the concept as the improvement in performance that individuals believe they can attain by using technology. PE has also been reported as an influencing factor for the adoption and use of ISs. Cheok and Wong (2015) analyzed the e-learning satisfaction indicators among secondary school teachers in Malaysia. Their research revealed that teachers' attitude, anxiety, and self-efficacy influenced their perception of the use of mobile technology including whether the system was effectively adopted or not. Additionally, factors such as accessibility, engagement, PU, and PEOU are critical to ensuring that teachers effectively use mobile technology. In the context of the use of mobile technology, researchers have already provided empirical support for a positive relationship between performance expectations and BI (Chiu & Wang, 2008). Hence, it is reasonable to consider performance expectancy as a component of the perceived use of technology.

Effort Expectancy

EE is viewed as the degree of simplicity associated with technology usage (Venkatesh et al., 2003, p. 450). Empirical evidence indicates that PEOU determines the degree of mobile technology acceptance (Davis, 1989). Consequently, EE predicts consumers' perceptions of the intention to use mobile technology. However, extant studies on the intention to adopt various mobile technologies have failed to provide evidence of a direct relationship between EE and intention to use (Morosan & DeFranco, 2016; Oliveira et al., 2016), whereas an indirect effect of EE on BI has been observed. Hence, EE may have a positive effect on PE and, consequently, on BI (Alalwan et al., 2017; Oliveira et al., 2016).

A more recent study in Taiwan by Li et al. (2018) found that EE had a significant impact on user BI in the mobile world. EE (perceived by consumers as ease of use) is the most important determinant. EE has a perceptible and powerful effect on customer BIs in the adoption of mobile technologies. Assuming that it leads to improved performance, EE can also be speculated to have a direct effect on the intention to use mobile technology. Chiu and Wang (2008) indicated that EE is positively associated with PE and BI in the context of e-learning. Consequently, the same relationships would probably exist in the context of the use of mobile technology.

Social Influence

Social Influence is defined as the "degree to which an individual perceives how essential the new system" is from the perspective of other relevant parties (Venkatesh et al., 2003, p. 451). Available evidence indicates that SI shapes the adoption and use of

technology and predicts consumers' perception of its benefits. Jaya et al. (2017), using the UTAUT model to analyze the behavior of electronic learning platform users, found that the degree of acceptance and success at mobile learning is greatly influenced by social factors and facilitation. In this context, peer pressure to use technology is one of the primary factors in SI. Fishbein and Ajzen (1975) defined SI as the extent to which individuals' perception is affected by the assessment of innovation value by others who are important to them. Other researchers have described SI as subjective norms (Chong et al., 2010; Lu et al., 2003) and identified it as a significant factor in pertinent models, such as the theory of reasoned action, the theory of planned behavior, extended TAM, and UTAUT. Fan et al. (2005) found that SI has a greater impact on mobile technology adoption than PU and PEOU.

Facilitating Conditions

FC is described as the extent to which a person believes that there are institutional and technological systems to sustain the use of a particular application (Venkatesh et al., 2003). The technical support extended for the system is an example of a supporting situation. It implies that if people have easy access to technical support using certain technologies, they are more likely to use that technology (Jaya et al., 2017). FC forecasts the presumed desire of customers to use mobile technology. Therefore, it can be argued that the availability of supportive resources, skills, and technical infrastructure may play a significant role in the use of mobile technology by diabetic youth (Hamzat & Mabawonku, 2018).

Given people's belief that the system will improve their job performance represents PE and the availability of the technical and organizational infrastructure required to use the system represents FC, both these factors play a critical role and create a direct impact on the use of any system (Hamzat & Mabawonku, 2018). It is well understood that behavior cannot occur in the absence of the required objective environmental conditions (Triandis, 1979). In other words, the relationship between attitudes, values, and other patterns of action or behavior is an individual's reaction to a particular action or environment. In the healthcare system, for example, attitudes toward health care and access to health services suggest a relationship in which the access factors affect one's assessment of health care (Cummings et al., 1980). Moreover, access to health services indicates a relationship in which accessibility is a function of the social class of the individual, while the environment can be considered as an enabler of healthy behavior, as exemplified by the geographical proximity of health care facilities (Ewart, 1991).

According to Pratkanis et al. (1989), attitude is how a person thinks or feels about someone or something. Similarly, behavior is an individual's reaction to a particular action, person, or environment. Attitudes influence feelings and actions affect practice (Ajzen, 1985). This is also applicable to the context of mobile services, as a positive relationship has been established between FC and BI in several studies (Cheong et al., 2004; Wu et al., 2007). As far as mobile learning systems are concerned, the satisfaction of learners and the decision to use the program are influenced by the perception of help

from learning content suppliers as well as the accessibility of personal devices. FC, therefore, is a key component of this research.

Attitude

Attitude is characterized as an individual's positive or negative feelings about the output of a particular behavior (Davis, 1989; Fishbein & Ajzen, 1975; Taylor & Todd, 1995a). It predicts customer expectations about usefulness of mobile technology. More precisely, behaviors influence BI's use of technology, which in effect would impact the actual use of the mobile health technology. Davis (1989) has shown that these two views are empirically credible. In the sense of web-based learning, Chiu and Wang (2008) reported a positive relationship between the importance of achievement and the purpose of continuity. Consequently, the decision of the learner to use mobile learning may be affected by the perceived achievement, which is also incorporated into the use of mobile technology.

Behavior Intentions

Behavior intentions is characterized as an indicator of the extent of one's desire to participate in a specific behavior (Fishbein & Ajzen, 1975). It predicts the consumers' perceptions of the value that can be derived from the use of mobile technology. These perceptions are recognized in the UTAUT model, which incorporates four key factors, i.e., belief, attitude, intention, and behavior. These factors act as determinants of BI and usage behavior (Hamzat & Mabawonku, 2018). In developing TAM, however, Davis (1989) proposed that two distinctive beliefs in behavior and control—PU and PEOU—would be sufficient to account for the individual's BI to use a particular technology.

Moore and Benbasat (1991) refined the set of determinants in innovation diffusion theory (IDT) for studying the acceptance of a technology and proposed as determinants the relative advantage, ease of use, image, visibility, compatibility, demonstrability of results, and willingness to use them. These variables capture three types of individual considerations (i.e., behavioral, normative, and control beliefs) that influence the decision to engage in a behavior (Fishbein & Ajzen, 1975; Kapoor et al., 2014). By combining both TAM and IDT elements, UTAUT consists of three determinants—PE, EE, and SI—that are perceived to affect BI and specifically encourage its use (Venkatesh et al., 2003).

Therefore, the UTAUT model is relevant to this study because it offers a basis for understanding and explaining the acceptance of information technology and ISs and explains the actual use of such technologies (Chao, 2019). Because of its ability to incorporate various TAMs, the model makes a substantial contribution to the exploration of technology use and acceptance (Venkatesh et al., 2003, p. 467). The UTAUT model has been used to forecast the use of devices and make technology-related decisions in a variety of fields, including interactive whiteboards (Šumak & Šorgo, 2016; Šumak et al., 2017), near-field communication technology (Khalilzadeh et al., 2017), mobile health (Hoque & Sorwar, 2017), home telehealth services (Cimperman et al., 2016), and the adoption of Enterprise Resource Planning software (Chao, 2019, p. 2). Therefore, the research used the UTAUT model as a theoretical basis to analyze the assumed intention to use new technology from the viewpoint of teachers and parents of diabetic adolescents.

Use of Mobile Technology in Managing Diabetes in Adolescents

The study adopted UTAUT to explore the use of mobile technology in the management of diabetes in adolescents as perceived by their teachers and parents. Scholars in the field have traditionally relied on TAM by Davis to understand the impact of two relevant technology features (i.e., PEOU and PU) on people's willingness to adopt specific technology (Marangunić & Granić, 2015). TAM is used to demonstrate that PU and PEOU are key drivers of technology acceptance (Davis, 1989). Although several modifications have been made to the original TAM model over the last decade, UTAUT stands out as the most prominent one. In this current study, the UTAUT model was used to understand parents' perceptions of the use of mobile technology by adolescents in diabetes management.

The UTAUT model in this current study consisted of the following variables: (a) PE, which is characterized as an individual's level of confidence in the value of technology, depending on the extent to which the use of technology is expected to help them benefit from diabetes awareness; (2) EE, which pertains to the effort required to use the mobile technology; (3) SI, which is defined as the perceived pressure from others to use the technology; and (4) FC, which is defined as the resources required (such as the availability of mobile devices and internet connectivity) for technology use. These four determinants are assumed to directly affect BI and user behavior (Venkatesh et al., 2003).

With the foregoing, the utility of the modified versions of the UTAUT model in explaining mobile technology use as perceived by the parents of diabetic adolescents in a developing country was explored. The objective of this current study was to assess the

impact of the UTAUT factors on the BI of adolescents to embrace mobile technology as a tool in diabetes management. The UTAUT model uses BI as a predictor of behavior toward the use of technology. Venkatesh et al. (2003) submitted that favorable conditions would be required to promote BI prediction only if EE is not included in the UTAUT model. Since UTAUT is typically used in research and practice to explain the degree of information technology acceptance, it is also adopted in studies focusing on the acceptance and usage of mobile services (Dwivedi et al., 2017). To understand the process of accepting mobile services, several authors called for appropriate modifications and extensions to the original UTAUT structure when applied in a social context (Dwivedi et al., 2017; Venkatesh et al., 2012). As Carlsson et al. (2006) have stated, TAM and UTAUT have been developed to define and clarify the organizational adoption of information technologies. However, the adoption of mobile technology is more individual, more customized, and focuses on the services that are made available through technology.

It should be noted that the UTAUT model was based on the extremely influential TAM. Venkatesh et al. (2003) improved, incorporated, and validated the designs of eight previous technique acceptance methodologies into a single model, making UTAUT a reliable basis for addressing a wide range of technology diffusion issues (Keong et al., 2012; Oh & Yoon, 2014; Wu et al., 2007). Venkatesh et al. (2003, p. 451) used TRA, TAM, MM, TPB, and the TAM and TPB models combined, the MPCU, the IDT, and the SCT in building UTAUT. Venkatesh et al. (2003) evaluated and combined all of these constructs to form a set of new and refined factors that affect the BI and the IS

consumers' actions. The most important aspects of the UTAUT model are the relationship between the purpose of use and the two separate constructs PE and EE, which are also present in the traditional TAM model (Jaya et al., 2017).

As already mentioned, the UTAUT model was therefore implemented in this study to investigate the expectations of parents and teachers with the use of mobile technology by diabetic adolescents in Kenya. The UTAT model was used to guide this study to explore the use of mobile technology in adolescent diabetes management as perceived by parents and teachers. Authors of several existing studies on technology adoption relied on Davis' TAM to gain a better understanding of the impact of two relevant technological features, namely, PEOU and PU, on people's willingness to adopt specific technologies (Marangunić & Granić, 2015). Davis (1989) referred to PEOU as the extent to which people think that the use of a particular technology would be effortless. While Davis defined PU as the "degree to which a person believes that using a particular system would improve their job performance" (p. 320), the objective of the study was to use the UTAUT model to understand the parents' perceptions of adolescents' use mobile technology to manage diabetes.

UTAUT in Research

Since its first implementation in 2003, UTAUT has commonly been used as an integrative model to assess the acceptance of IT (Fuad & Hsu, 2018). Various researchers with varied research intentions and focus subjects conducted UTAUT studies using a variety of research methodologies in several settings (Williams et al., 2015). This extensive body of work has led to the incorporation of numerous new constructs into the

original theory. This has resulted in the combination of UTAUT with other theoretical models and, occasionally, the re-specification of the underlying relationship between the UTAUT variables (Williams et al., 2015).

In the scholarly database Scopus, 8,939 citations related to UTAUT are recorded as of January 16th, 2018 (Fuad & Hsu, 2018). While UTAUT has been cited in several fields for more than a decade, only a limited number of scholarly works are directly related to its convergence with established theories or the extension of the original conceptual UTAUT framework (Fuad & Hsu, 2018). However, UTAUT has been traditionally recognized as a functionalist–institutionalist theory that focuses on structural stability and, in conjunction with other interpretive theories, was useful in this study to better understand the complex social and symbolic realities of the use and adoption of mobile health technologies (Fuad & Hsu, 2018). Although UTAUT has been developed and tested not only through the models existing in conjunction with it but also through the introduction of new variables and the exploration of alternative relationships among its constituent components in different contexts and environments, broad and consistent opportunities are still available for researchers to engage, develop, and contribute further to this field. Therefore, the UTAUT framework is ideal for exploring the perception of mobile technology use among diabetic adolescents.

Mobile Technology

Mobile technology is changing our way of life and learning (Thakre & Thakre, 2015) and has the potential to improve access to health information and resources in low-resource environments. For example, the use of mobile technology in deprived and

remote rural areas of South Africa has created resources and skills to improve access to and provision of health services (Anstey Watkins et al., 2018). Mobile technologies are a logical solution for addressing the health concerns of poor and remote rural communities that have limited access to health care. Furthermore, with an increase in mobile connectivity as expressed through online social networking sites, people can share access to products and services with others (Tussyadiah & Pesonen, 2018).

Mobile technology applications are considered a viable and low-cost means of delivering health interventions to both general and at-risk populations. However, rigorous research to test their effectiveness and acceptability in developing countries such as Kenya is lacking (Zhao et al., 2016). Chib et al. (2015), in a study on the use of mobile health care in developing countries, stated the potential for using mobile technology to improve health care in low-resource settings in developing countries is yet to translate into substantial mobile health policy investments. However, available evidence indicates that mobile technology use can improve access to primary health care, particularly in rural areas that have limited access to health information (Musyimi et al., 2018). The low level of mHealth on policy agendas could be due to the lack of evidence of a scalable, sustainable impact on health metrics (Chib et al., 2015).

Mobile technology use has undeniably increased exponentially since the advent of smartphones and accelerated the explosive proliferation of companion applications (Chan et al., 2017). For instance, Chan et al. (2017) found smartphone penetration to be high among the younger demographic in the United States, with 73% of adolescents aged 13–17 years having access to a smartphone and 58% indicating that they had downloaded

apps. In Kenya, the accessibility of and willingness to use mHealth for medical intervention has been growing at a similar pace (57.3%), possibly due to the perceived benefits of such services (Kirui, 2018). As part of their systematic literature review, Hamine et al. (2015) found that the acceptability of mHealth methods for chronic disease management is generally high among both patients and providers. Additionally, mHealth encourages more frequent contact with patients and improves the delivery of health-related information at times when these messages may have the most significant impact (Anglada-Martinez et al., 2015). Nonetheless, smartphone-based mHealth approaches are being increasingly implemented in clinical settings to improve patient education, communication, monitoring, and chronic disease management (Chan et al., 2017).

It is evident that in this age of digital media, teenagers are addicted to technology and digital devices (Wartella et al., 2016). Owing to the rapid growth in access to digital information, teens can easily obtain the health information they require, even though most of them still rely considerably on people than technology. Teens are worried about health-related issues including exercise, sexual activity, drugs, hygiene, mental health, and stress. Since most young people have their digital devices at hand at all times, public health campaigns and education programs should be designed to reflect how adolescents currently access digital health information about the health issues that affect them most (Wartella et al., 2016).

Digital technologies, such as mobile technologies, provide solutions to improve access to health information and services in low- and middle-income countries. A recent study by Opoku et al. (2017) on the use of mHealth for chronic medical conditions in

sub-Saharan Africa suggested that mHealth would effectively address the lack of capacity to treat diseases by providing access to health care to more people. Similarly, Thakre and Thakre (2015) argued that the frequent and increasing use of mobile devices as reference and information management tools in clinical practice and medical training by faculty, students, younger professionals and trainees and residents is particularly beneficial. M-learning (i.e., mobile learning) is characterized as learning across multiple contexts through social and content interactions using personal electronic devices.

Smartphones are "digital devices that make it possible to change the practice of finding and providing care, leading to increased efficiency" (Haenssgen & Ariana, 2017b, p. 288). For example, patients and health workers can use smartphones to find health information that they can use to enhance the quality of health care and its outcomes. Doctors should improve treatment procedures to the advantage of patients. For the many participants who participated in the Anstey Watkins et al. (2018) report, mobile technology provided an opportunity to use the parallel program, which subsequently led to an increased likelihood of obtaining or providing effective health care. As a part of this research, interviews were conducted to explore participants' prevalent use of digital mobile health-related technology among patients and health workers at their first point of access to services in rural South Africa.

Over half of the interviewed patients reported using their mobile phones to manage their chronic illness more effectively (Anstey Watkins et al., 2018). Most of the younger patients interviewed discussed how they were becoming increasingly informed and aware of their condition by using their mobile devices to actively seek relevant

information. For example, patients used the phone and internet services to search for more information on diabetes, the appropriate diets to follow when suffering from it, and to learn the steps for preventing diabetes and staying healthy. Several younger patients spoke about sharing information with others who did not have access to the internet. In a story-based method study, Hampshire et al. (2015) investigated the effect of mobile phones on the lives of young people in Ghana, Malawi, and South Africa. Approximately 500 interviews with young people (8–25 years of age) were conducted in each country. The writers have found that mobile phones can be utilized as an important educational tool aiding young people's health. Limited access to mobile technology, lack of digital resources, insecurity, and insufficiency of health services—all of which are faced by young people in developing countries—undermine the efforts to improve their health (Hampshire et al., 2015).

Since social factors also influence the usability of mobile technologies for access to health care, these factors can shape communication patterns between health care providers and patients (Haenssgen & Ariana, 2017a). Identifying the factors that influence most the use of technology by children has been posited as an effective means of identifying the characteristics of a technological service that make it attractive for adoption (Grekin et al., 2018). Mobile technologies offer innovative ways for developing countries to support clinic-based health initiatives. These opportunities include, but are not limited to, medical alerts, sending appointment reminders, distributing laboratory reports, and reminding parents about vaccinations and giving medication (Smaldone et al., 2015).

Community acceptance of mobile technology, however, can vary depending on the demographic and cultural characteristics. Mobile technology and social media deliver the advantages of access efficiency, personalization, real-time connectivity, and cost-effective dissemination of information (Smaldone et al., 2015). Variations in the use of communication technologies and social media and attitudes among parent-youth pairs indicate that the knowledge of these factors within target groups is key to the successful application of health-promoting behaviors and health services applications (Smaldone et al., 2015).

While mobile technologies hold immense potential to support health and provide health services in developing countries, their effectiveness depends on the acceptability and availability of the modalities to be used, interest in accessing health information, and privacy comfort (Karageorgos et al., 2019). The research by Karageorgos et al. sought to explore teachers' and parents' perspectives on the existing use of mobile and social media platforms for health communication purposes by adolescents. This helped gain insight into their expectations from mobile technology. As part of this study, viewpoints were exchanged between teachers and parents on the use of a wide range of mobile and social media technologies in Kenya. Furthermore, the perceived use of mobile technology was discussed to recognize teachers', parents', and adolescents' favorite modes of health communication.

Unlike earlier generations whose members started using technology when they were older, millennials were born during the age marked by rapid technological advances and, therefore, they are among the early adopters of new technologies (Lauricella et al.,

2014). Additionally, Lauricella et al. (2014) concluded that adolescents have a more difficult time separating themselves from technology because, if they are not well-connected, they might suffer peer disapproval. Digital technology, including the internet, mobile phones, and gaming, is increasingly influencing teenage lives. Seeking parents' perspectives on the use of mobile technology-based interventions by adolescents could enhance acceptance of available help and long-term engagement and minimize patient fatigue. Technology has changed the way teens interact and access information and, as regards health risk, teens remain a vulnerable population. In the age of digital technology, they are constantly connecting online through social media platforms and mobile apps. Therefore, it is not surprising that they often resort to digital media to seek answers to their health-related queries.

Mobile technology is attracting increasing interest in both developed and developing countries and is widely recognized as an important way to reach young people (Ippoliti & L'Engle, 2017). Additionally, it is becoming a common method of linking teenagers to health information and resources and increasing their awareness of specific health problems and/or rapid behavioral changes. However, according to Ippoliti and L'Engle (2017), parents' perceptions of mobile technology interventions aimed at youth who reside in poor-resource settings remain insufficiently studied. Mobile technologies may be an important therapeutic resource in developing countries. In recent years, the use of mobile technology to convey health information and provide links to programs aimed at improving health habits among hard-to-reach communities has gained increased prominence (Ippoliti & L'Engle, 2017). However, efforts to promote this

technology may be undermined by restricted access to technology, lack of digital resources, confusion, and poor health care.

Improved mobile technology, along with reliable access to internet services, is required to deliver modern health care approaches that can mitigate the lack of immediate availability of healthcare services by providing direct access to health services, irrespective of time and location (Silva et al., 2015). Gunawardena et al. (2019) recently observed that a mobile app specifically designed to support diabetes self-management has been exhibiting a long-term increase in A1c rates in diabetes patients residing in Sri Lanka, a developing country. These researchers (2019) studied the efficacy of the newly designed mobile application the SGM in diabetes patients in Sri Lanka. As a part of this analysis, 67 patients were randomized to an SGM (n = 27) and a control group (n = 25) with access to android smartphones. The research provided evidence that smartphone apps can be more effective than traditional practices in controlling diabetes (Gunawardena et al., 2019). The authors noted that further studies are required to determine the SGM's long-term effect on diabetes care and its potential for application in a more diverse global patient population.

Mobile technology has the potential to improve diabetes care and self-management among adolescents in developing countries. However, little is known about the feasibility of such applications and how patients, parents, and teachers actually engage with them (Kitsiou et al., 2017). In their meta-analysis of 25 relevant studies, Greenwood et al. (2017) recorded that the current technical effect on people living with diabetes is gradually being used to make diabetes self-management education and support

realizable. Most of the papers included in this analysis addressed the use of mobile phones and encrypted communications, focusing on self-care habits such as healthy eating, exercise, and metabolic control. The authors of 18 articles reported a significant decrease in blood glucose (A1c) as an indicator of outcome. Four key elements have been established as necessary for enhanced A1c control: (1) access, (2) patient-generated healthcare information, (3) understanding, and (4) feedback. The authors concluded that with the widespread adoption of mobile technology, behavioral interventions will improve access and adherence to diabetes self-management education and ongoing support of the diabetes condition.

Additionally, Kitsiou et al. (2017) and Greenwood et al. (2017) concluded that the use of smart devices in diabetes management could lead to significant changes in clinical outcomes and patient participation, and potential cost savings for the health care system. Chib et al. (2015) found that the potential of the use of mobile technology in improving health care in low-resource environments, such as in developing countries, is yet to translate into significant investments in mHealth. In preparation for their study, Chib et al. (2015) analyzed 53 mobile health studies from developing economies. The authors also examined 63 articles as part of a study on the use of mobile phones in healthcare, focusing on patients or healthcare workers in low- and middle-income countries. The review identified a gap in recognizing mobile approaches in health care. For example, while the mobile health sector in developing countries is slowly gaining traction, it has not gained the credibility and confidence of practitioners and policymakers (Chib et al., 2015).

ICT is a key driver of information in an environment where the immediate implications of educational practice cannot be identified. ICT promotes the growth of socio-economic networks by facilitating the creation and maintenance of online peer groups (Tussyadiah & Pesonen, 2018). Also, ICT improves communication across online social networking sites and allows people to share access to products and services. In Kenya, the rapid spread of mobile services has increased the potential utility of these technologies, leading to improved health management outcomes (Nyambura Ndung'u & Waema, 2011). These services can be extended to schools, which is highly relevant since teachers and parents can help reduce potential cases of diabetes. Teachers and parents are among the most important influencers in the lives of adolescents. Seeking teachers' and parents' perceptions of mobile technology use among the youth could enhance adolescents' long-term management of chronic illnesses and, thereby, minimize health risks.

Mobile learning tools in a school setting are increasingly seen by teachers as a way to facilitate access to information, provide new ways of learning and increase engagement in acquiring knowledge (Domingo & Garganté, 2016). In their study, Domingo and Garganté (2016) analyzed the survey data gathered from 102 teachers working in 12 primary schools in Spain. The participants answered questions about their perceptions of the impact of mobile technology in a learning environment. The obtained results suggested that facilitating access to information and increasing engagement with learning are the two predominant impacts of mobile technology use in the classroom. Study findings also indicated that the choice of mobile apps is related to the teachers'

perceptions of how mobile technology impacts learning. Therefore, teachers might be of help in guiding adolescents to make the appropriate choice of mobile technology apps that could aid in making good health-related choices.

While health systems have strengthened diabetes prevention and control services in most developing countries, many problems still need to be addressed (Agrawal et al., 2016). Due to inadequate human resources and low functioning health systems, developing countries need creative and inventive solutions to battle against diabetes (Latif et al., 2017). In this respect, immense advances in telecommunications technology, in particular mobile technology, can be made to improve diabetes treatment. Particularly, smartphones may serve as a tool to gather information on tracking, service delivery, evidence-based care, and delivery systems for diabetes in primary health care settings and spreading health messages as a part of diabetes education. Latif et al. (2017) found that non-communicable diseases (NCDs) are the leading global causes of morbidity and mortality and have a disproportionate impact on citizens of developing countries. Thus, mobile technologies can be used in the management of NCDs through the provision of mobile technology resources for successful prevention and treatment for both physicians and patients (Latif et al., 2017).

Smaldone et al. (2015) compared the perspectives of underserved parents and their teenage children on the perceived use of a wide range of mobile technologies and their expectations of its use for health communication purposes. As a part of this research, a group of 130 parents and adolescents from American urban Latino community were surveyed to study their use of mobile and social media technologies and preferences

for the use of these technologies in health communications. Although the majority of young participants in the survey indicated access to and regular use of the internet, fewer than half reported using the internet to search for health-related information (Smaldone et al., 2015). The differences in the use of communication technologies and social media and the differences in the attitudes of parents and teenagers indicate that recognizing these variables within target groups is essential for providing substantial support both to those suffering from different health problems and to those providing health care (Smaldone et al., 2015). Although mobile technologies may provide new opportunities to support clinically based health programs for underserved youth, community-based technologies can vary depending on demographic and cultural characteristics.

Greenwood et al. (2017) conducted a systematic review of research on the use of mobile technology in diabetes self-management education and support services. The evidence gathered suggested that with the widespread adoption of mobile technology, digital health approaches that integrate proof-based behavioral interventions will enhance the scope and access to diabetes self-management education and ongoing support. Greenwood et al. results revealed that by using mobile devices, individuals with diabetes could reduce the short-term and long-term effects of the disease by learning and practicing self-management skills. Adepoju et al. (2017) argued that the use of mobile technology could serve as an interface between the patient and the health-service provider for improving point-of-care clinical decision-making and quality of care in Africa. Their evidence of the use of mobile technology as a clinical decision-making support system in sub-Saharan Africa is both an indicator of development in the technology sector and an

indication of its potential to improve the delivery of health services in low-resource settings.

In another study on the use of mobile technology in diabetes management, Hannon et al. (2018) found that technology has improved the self-management of chronic diseases such as diabetes since blood glucose self-monitoring technologies have facilitated remote parental monitoring of blood glucose in real-time. As part of this study, the authors compared three strategies for enhancing the short-term self-monitoring of blood sugar and self-care of diabetes. (1) enhanced blood glucose meter, which shares data on blood glucose among patients, with their parents and caregivers through text messaging, (2) family-centered target settings, and (3) a combination of (1) and (2). Although 128 participants were enrolled in the study, only 97 adolescent-parent couples attended the clinic at 3-month intervals during the 6-month intervention. The results obtained by analyzing their data were, however, inconclusive. Therefore, the authors concluded that further study is required to apply the family-centered goal-setting strategy for the implementation of mobile health information-enhanced diabetes technology.

Mobile technologies have changed the way teenagers interact with and access information (Rotondi et al., 2017). Rotondi et al. (2017) performed an empirical analysis based on repeated cross-section data from the Multipurpose Household Survey: Aspects of Daily Life. As a part of this large sample study, which included the households of resident population in Italy, face-to-face interviews were conducted every year with different samples of approximately 50,000 individuals (about 24,000 households). The authors observed that mobile technology can simultaneously fulfill the need to make

phone calls, click photos, pay bills, listen to music, watch videos, browse the internet, communicate through social media platforms, and more generally entertain. All of these mobile features have significantly improved and made life easier. Nevertheless, the fact that these tasks can be conducted anywhere has made mobile devices more invasive than any other type of technology.

Such innovations allow young people to engage, albeit in novel ways, in age-old activities such as texting, flirting, and dating, while simultaneously providing anonymous sources for health information. Nevertheless, young people remain vulnerable to health risks because they experience rapid cognitive, behavioral, emotional, and social changes. Hamine et al. (2015) published a literature review of 107 papers, of which 34.6% were conducted in the United States, 10.3% in the United Kingdom, 10.3% in South Korea, and 44.8% from the rest of the world. The authors found that there is a potential for mHealth devices to improve commitment to chronic disease management. Research published suggests that the flexibility and portability of mobile devices combined with an advanced capacity for two-way communication and for collecting and analyzing data for real-time response offer enormous potential for patients and health-service providers (Hamine et al., 2015). The review also found that the accessibility, efficacy, and acceptability of mobile health resources for chronic disease management are generally high among both patients and providers. However, the authors concluded that the evidence supporting its current usefulness is inconsistent and proposed that further work should be concentrated on understanding how mHealth tools can address unique barriers to adherence.

As Hamine et al. (2015) suggested "Mobile technologies are increasingly being used in health care and public health practice (mHealth) for patient communication, monitoring, and education, and to facilitate adherence to chronic diseases management" (p. 2). St George et al. (2016) found that recognizing barriers to and promoting the use of smartphones for diabetes treatment in ethnic minority adolescents can increase their participation in, and ultimately the adoption of, technology. These authors also investigated exposure to and participation in technology-based diabetes services among predominantly Hispanic adolescents and their parents. During the scheduled visit, a group of 50 adolescents with diabetes (52% female; 74% Hispanic) and 49 parents (54% with household income < $49,000) completed a brief self-report survey. The results obtained by analyzing the survey responses indicated that access to the internet (98%) and mobile phones (86%) is high among adolescents (St George et al., 2016). Nevertheless, the results indicated that girls are more likely to display high interest in technology-based diabetes applications than boys. Although most parents reported a high interest in diabetes-specific apps, there was a greater variation in the extent of interest among adolescents.

Technology Readiness

Despite the global increase in mobile technology adoption, parents remain uncertain about how to efficiently handle the integration of multiple mobile devices into the everyday lives of their children. Sanders et al. (2016) observed that while the use of mobile technology (for reasons other than communication) increases among adolescents, technology-specific parental expectations and parenting habits are significant

determinants of how much time adolescents spend using mobile technology. In their study, Sanders et al. (2016) recruited a group of 615 parents of children aged 3-17 years via Amazon's online platform Mechanical Turk as part of a larger study on parenting evaluation. Results from the study suggested that positive parental perceptions of media devices may be important for the environment of media use in the household, consistent with a family systems context. It is essential to evaluate whether mobile technology use in the home can extend beyond technology-related parenting practices. For example, parental beliefs and attitudes about technology can affect the screen time allowed for children not only through the dyadic exchange around parenting and youth screen time related to technology but also through other mechanisms not examined in this study. More positively, there has been discussion around the opportunities that mobile technologies present to young people (Barr, 2019), indicating that mobile technology has shaped the learning and literacy of hundreds of children around the world. Consequently, parents have a responsibility to provide children with advice and insights into how to use mobile technology productively.

Therefore, it is logical to conclude that parental concerns about screen time for children, the increase of media use in society, and the potentially negative impacts of these media devices put parents in the uncomfortable position of trying to appropriately control the exposure of their children to these technological devices. When ICT devices become more prevalent in family life, the resolution of these conflicting concerns by the parents will probably influence how parents opt to control their children's access to media. Moreover, the technology readiness of parents is an indicator of the involvement

of adolescents in the decision of the parents to purchase technology products (Dikcius et al., 2017).

Technology can undoubtedly play an essential role in the improvement of diabetes self-management skills among adolescents (Knox et al., 2019). As a part of the move toward patient-centered clinical care, education should be tailored to meet the needs of both patients and their families. In Kenya, inequitable access to health care and health information has rendered several young people vulnerable to health risks (Hampshire et al., 2015). Mobile technology in Kenya provides a unique opportunity for adolescents to close this gap, given the high penetration of mobile technologies and the prevalence of these apps among adolescents (Omamo et al., 2018). Thus, mobile technology is a powerful, simple, and cost-effective strategy for health promotion.

Mobile Technology Use in Kenya

Given the dramatic increase in the use of mobile phones in low- and middle-income countries, mHealth has immense potential to directly link healthcare services to enrolled individuals and boost their dedication to treatment. In this endeavor, global rural and remote settings can present significant challenges and opportunities (Kazi et al., 2017). Challenges may include low levels of education and literacy among some communities. On the other hand, opportunities include improved health in remote, underserved communities where access to health care is made available by mobile technology, which otherwise would have been extremely limited. According to the previous assessment by Kenya's Communications Authority (CAK, 2015a), 83% of the Kenyan population owns a cell phone. The socio-economic disparities in mobile phone

ownership, availability, and internet access, however, hinder the use of mobile technology for health-related purposes (Kibere, 2016). Access to mobile technology is, thus, not evenly distributed in Kenya and some communities have lower levels of technology literacy, exposure to mobile technologies, and reliable network connectivity than others (Kazi et al., 2017).

According to CAK's aforementioned annual report (2015a), Kenya has approximately 29.6 million internet users and this number is steadily growing. A large number of Kenyans (mostly from urban areas) also access the internet via their mobile phones, and there are 19.9 million subscriptions to mobile data (CAK, 2015a). Although reports indicate growth in handset ownership and demonstrate that most rural Kenyans own a mobile phone (CAK, 2015b), these reports reveal little about the types of functionalities of devices—factors that significantly influence access to mobile internet (Masika et al., 2015).

As mobile technology use and adoption continues to increase in Kenya, innovations in mobile technology, such as the money transfer service M-Pesa, are expected to emerge as well (Kibere, 2016). Recently, mobile technology has been implemented in Kenya to support health-related issues, such as family planning and tuberculosis treatment adherence. This indicates that mobile technology tools have the potential to be of immense value to Kenyan communities for disease surveillance and health monitoring (Mannik et al., 2018). Kirui (2018) argued that mobile technologies, such as mHealth have been advocated as an innovative tool for improving both access to and quality of health care for the underserved and remote locations.

However, evidence on patients' willingness to adopt mobile technology for chronic disease treatment adherence remains limited. Although there exists a willingness to receive mobile technology-based health services in Kenya, a large number of the mobile available phones do not support delivering many of the health care interventions currently provided (Ngaruiya et al., 2019). However, mobile phones may have a better reach in disseminating information and education to patients. Nonetheless, Mannik et al. (2018) posited that mobile technology has the potential to support adolescent health management through the distribution of learning materials and reminders, particularly in rural locations in Kenya where access to health facilities requires long commutes. Although gaps exist in research, there is increasing evidence to support the efficacy of mobile health initiatives in Kenya, especially in improving compliance with diagnosis and appointments, as well as creating support networks for teenagers and their parents (Mannik et al., 2018).

Mobile Technology Use in Health Care

An increase in the accessibility to mHealth has created and encouraged willingness to use it for medical intervention, possibly due to its perceived benefits (Kirui, 2018). Hamine et al. (2015) found in their systematic review that the acceptability of mHealth methods for adherence to chronic illness care was generally high among both patients and providers. Mobile phone connectivity has dramatically increased worldwide, providing substantial incentives for innovative and cost-effective mHealth interventions. Despite the growing interest in mHealth, there is limited evidence of patients' ability to use the technology. Furthermore, access to mHealth technologies may not be equal to the

whole population because some low-income families may be unable to pay for mobile devices and connectivity to mhealth (Cummings et al., 2019). The above-mentioned absence of information about patients' readiness to use technology motivated this study.

Smartphones can be costly and beyond many Kenyans' purchasing power (Ippoliti & L'Engle, 2017). Therefore, most people prefer cheap, widely available, low-end phones. A study by Silva et al. (2015) indicated that advanced mobile technology and better access to mobile internet services that provide direct access to information on emerging healthcare problems regardless of time and place are critical to modern healthcare solutions. These results were obtained through a comprehensive review and examination of the groundbreaking mobile health services and systems provided by healthcare industries and made available on the internet. The authors concluded that mobile health services play a decisive role in transforming traditional healthcare services and structures that are still focused on face-to-face patient-physician contact. Mobile health applications have a significant impact on all health care providers, such as hospitals, care centers, and emergency services. Anstey Watkins et al. (2018) conducted semi-structured, in-depth interviews with 113 patients and 43 health workers from seven primary healthcare clinics and one district hospital in rural South Africa while investigating the use of mobile technology among patients with chronic diseases. Their findings indicated that in low- and middle-income countries, digital technologies such as mobile devices effectively increase access to information and services in health care.

The growing proliferation of mobile phones in society, particularly in the developing world, where approximately 90% of the population owned mobile phones in

2013 (Karageorgos et al., 2019) is a key factor supporting the development of mHealth interventions as a means for improving the health care system and health outcomes. As demonstrated by several organizations participating in initiatives aimed at improving healthcare in developing countries through mHealth programs and networks, mHealth has evoked considerable interest in both research and practice. For example, Eilu (2018) found that mHealth has immense potential to provide better, easily accessible healthcare at a reduced cost. Nonetheless, there is very little empirical evidence regarding mHealth's efficacy, sustainability, and best practices in sub-Saharan Africa, and many mHealth projects are still being piloted (Eilu, 2018). According to a report published in 2009 by the United Nations Foundation and the Vodafone Foundation, 51 mHealth initiatives aimed at promoting health education and awareness, remote data collection, remote monitoring, communication and awareness among healthcare workers, tracking disease and epidemic outbreaks, and supporting diagnosis and treatment operated in 26 developing countries and most of the activities stemmed from India, Rwanda, South Africa, Peru, and Uganda (Karageorgos et al., 2019).

Although extant research has demonstrated that mobile technology has provided adolescents with anonymous avenues for seeking health information, adolescents remain vulnerable to chronic diseases such as diabetes, especially in developing countries. For example, Holtz Murray, Hershey, Dunneback, et al. (2017) found that mHealth has been successfully used to improve the health of people suffering from a variety of chronic conditions including diabetes. Holtz Murray, Hershey, Richman, et al. (2019) reported that a smartphone application holds the potential to be an innovative tool for involving

adolescents and their parents in meaningful contact over Type 1 diabetes management. Similarly, Smaldone et al. (2015) found that mobile communications systems offer creative ways to support clinic-based health programs. The degree of acceptance of technology in societies, however, depends on their demographic and cultural characteristics.

Based on the analyses conducted so far, mHealth innovations tend to have the potential to enhance the delivery of health information and services in developing countries but various barriers and obstacles should be addressed to achieve wider adoption of these services. In general, the implementation of mHealth strategies can be highly complex, considering the target group and location (Karageorgos et al., 2019). Hence, it is important to recognize the cultural, socio-economic, and educational characteristics of the different vulnerable groups when implementing mHealth strategies. In the case of public education and behavioral change communication, the success of mobile health may considerably vary according to the condition of the patient, e.g., obesity, diabetes, and HIV, whereas some habits, e.g., avoidance of physical exercise may be more challenging to change and may require more rigorous interventions.

Issues regarding the prevention of infection should be addressed when handling communicable diseases such as HIV and TB (Karageorgos et al., 2019). Another issue with these initiatives is that people living in poverty may not be able to access the internet or afford internet services on the mobile phone. Unreliable electricity supply is another problem in Kenya, and continuous electricity supply is available mostly in semi-urban and urban areas only (Ngaruiya et al., 2019). Since power consumption by smartphones is

high, many users of mobile health technology may struggle to ensure that their phones are regularly charged. Due to such disparities, the use of mobile technologies for disseminating health information may exacerbate gaps in knowledge among various population strata.

Several advances have been made to facilitate the use of mHealth to enhance the healthcare system. Several scholars have highlighted the importance of SMSs in promoting a healthy lifestyle and facilitating the adoption of health services (Karageorgos et al., 2019). Advances in sensor innovations, design and support systems, and data gathering promise to replace traditional methods with novel mHealth tools that could further benefit clinical practice. It has been indicated that both underprivileged communities and health care workers in developing countries will benefit from such technologies due to increased opportunities to improve their efficiency of the healthcare services (Karageorgos et al., 2019). This is especially important for adolescents as they progress through life in which they will develop important health behaviors that they will carry through into their adult years (Gonsalves et al., 2018).

Mobile Technology Use in Health Care in Kenya

The high prevalence of mobile technologies has altered the lifestyles and daily activities of parents and adolescents and created a new human culture (Yan, 2018). Adolescents grow up independently in two internet communities—the global web community (Goggin, 2012) and the local youth community (Vanden Abeele, 2016). The global mobile society provides adolescents with a new foundation on which to construct a new culture (Vygotsky, 1978). Through witnessing and engaging in daily routines and

everyday activities within the global mobile culture, adolescents may evolve cognitively, socially, and emotionally (Rogoff, 2003) and experience and adopt a different cultural framework from the international youth culture (Vygotsky, 1978). Teenagers of today are growing up as a part of a digital generation (Lauricella et al., 2014). This enables them to be in constant communication with peers and create new standards of behavior and communication. Adolescents use mobile devices not only to communicate with family members but also to stay close to their peers and to receive support (Yan, 2018). However, parents and teachers should develop a way to help adolescents maximize the benefits and minimize the drawbacks of mobile technology.

While it is commonly understood that cell technology can help address health issues in developing countries by presenting pertinent information, it is less known how precisely (and if) the human-computer interface of a smartphone (i.e., its software and hardware design) facilitate such communication (Wyche & Olson, 2018). Increased ownership of mobile phones and internet connectivity across Africa continues to encourage ICT-based initiatives, especially mobile devices, to address long-standing socio-economic problems in the "developing world" (Wyche & Olson, 2018). According to Ngaruiya et al. (2019), Kenya has a strong basis for introducing mHealth programs. This can partially be attributed to Kenyans knowing how to use mobile technologies for purposes other than merely making and receiving calls. Tens of millions of Kenyans use mobile banking services, such as M-PESA to conduct financial transactions in the social sector. In a way, this extensive social sector use of M-PESA is already indirectly helping to improve mHealth results in Kenya (Ngaruiya et al., 2019). Another such outcome is

suitable responses to external impulses, where mobile devices are used to disseminate key information and beneficial practices among communities.

Adolescents' Use of Mobile Technology in Diabetes Self-Management

Young people face unique challenges in accessing information and support regarding health self-management (Lithgow et al., 2017). In Kenya, the high penetration and availability of mobile phones provide a new channel for reaching young people. However, little evidence is available regarding the role of digital interventions in efforts to improve health outcomes (Gonsalves et al., 2018). The incorporation of technology in health care has, however, led to improved medical care and better enforcement, particularly for chronic diseases such as diabetes (Lithgow et al., 2017). Despite these technological advances, regulation and awareness have always been a problem in caring for adolescents with diabetes.

Self-management of diabetes is a key determinant of safe and cost-effective diabetes treatment that significantly reduces both hospital admissions and complications (Kebede & Pischke, 2019). Diabetes self-management is a highly demanding activity that requires ongoing education and support to encourage patients to improve health literacy and maintain the necessary self-care behaviors (Powers et al., 2015; Shin & Lee, 2018). Empirical evidence indicates that diabetes applications (apps) assist patients in improving their knowledge of the disease including their understanding of complications and self-management skills (Husted et al., 2018; Muralidharan et al., 2017).

Mobile devices also help diabetic patients track their physical activity, diet, and blood glucose (Ryan et al., 2017). A mobile device can help to personalize diabetes self-

management strategies and tailor recommendations. Therefore, diabetic patients can more efficiently monitor their progress for achieving personal glycemic and behavioral goals through mobile technologies (Kaufman & Khurana, 2016). Furthermore, the International Diabetes Federation recently suggested that well-suited diabetes apps could be critical for promoting diabetes self-management practices and preventing complications (Rose et al., 2019).

The rapid developments in the effort to interconnect electronic devices over the internet, as well as in big data analytics, machine learning, artificial intelligence, and other fields of mobile computing (Neborachko et al., 2018), are revolutionizing the future of personalized diabetes medicine. Mobile technologies such as diabetes apps provide opportunities for several health care stakeholders, including providers, payers, consumers, and developers. Authors of several intervention studies have examined the role of mobile technology in enhancing self-care behaviors with diabetes, such as glucose monitoring, diet, foot care, and clinical activity (Zhou et al., 2016). Data on whether mobile technology enhances the self-care conduct of diabetes in real-world settings have returned positive results (Ye et al., 2018). However, there exists a paucity of knowledge on the quality of the diabetes apps available in common stores. Consequently, it is unclear which mobile technologies are the most widely used and tested for diabetes (Wahbeh et al., 2021).

Teachers' Perception of Mobile Technology Use

Mobile technology has become popular with a wide range of users today, including students at various levels of education. While extensive studies have been

conducted on the role of mobile technology in classrooms, little is known about teachers' experiences of the impacts of mobile technology on students' learning and its connection to the use of mobile apps in classrooms (Domingo & Garganté, 2016). This is an evident gap in the literature as the aspirations of teachers have a major impact on their teaching practices. Extended work in this area has indicated that the two primary factors of mobile technology in the classroom are encouraging access to information and growing student interest in learning (Domingo & Garganté, 2016; Yusri et al., 2015). According to the findings published by Domingo and Garganté (2016), the choice of apps usually depends on the teachers' expectations of how learning should be influenced by mobile technology. Mobile learning should be used as a viable means for delivering knowledge to young people with the rapid development of mobile technology and the growing availability of wireless mobile devices in everyday life. The development of technology and communication tools demands collaboration between the technology and education sectors.

According to Domingo and Garganté (2016), PEOU's interactive applications can effectively forecast their utility from the point of view of learners, which is a key factor in their desire to be guided through the learning process. Teachers' perspectives on the use of mobile technology to improve learning reflect their perceptions of how this technology influences learning processes (Domingo & Garganté, 2016). Jaklič et al. (2018) have shown that expectations of reliability directly benefit and mediate the effect of perceptions of performance on intentions of use. While SI exhibits interface consequences by improving the perceived importance of accessibility in influencing the

intentional use of technology, Jaklič et al. (2018) have shown that SI is integral to determine the awareness of future users of mobile learning tools since this will affect their motivation and willingness to use the system. For example, teachers in Indonesia who held a positive perception of mobile learning platforms were eager to engage in mobile learning (Jaya et al., 2017).

Similarly, Yusri et al. (2015) found that a small percentage of teachers participating in their research on program complexity and financial issues as obstacles to mobile learning, though their experience of using mobile technology was only adequate, they were willing to learn more about mobile technology. It is important to distinguish between teachers' knowledge of the use of technology in schools, which generally refers to realistic ideas, and their understandings and beliefs, which relate to opinions, assumptions, and ideologies of the effect of technology on learning (Jaya et al., 2017). In summary, understanding teachers' preferences for mobile technology provides a means for encouraging more effective use of this technology in classroom environments (Domingo & Garganté, 2016).

Parental Involvement in Adolescent Health

As parents significantly impact adolescents' ability to self-manage diabetes, a more comprehensive understanding of the challenges adolescents and parents face in the everyday self-management of diabetes is necessary for the development of the health services extended to this patient population (Castensøe-Seidenfaden et al., 2017). Parent-child conflicts may be reduced by using mobile technology that directly reports diabetes monitoring data to health care providers and creates a communication link to discuss

therapeutic options. Behaviors that are typical of adolescents, such as seeking greater independence from parental norms and challenging them in favor of the norms imposed by peers, can be at odds with the demands of effective diabetes self-management. Thus, perceived trust and openness of communication between parents and teens can reduce discordance (Blackwell et al., 2016).

Given that 92% of teenagers in the world use online platforms every day and 24% use them almost constantly, and as technology becomes more deeply embedded in adolescent lives, opportunities emerge to integrate technology into strategies to change adolescents' health behavior (Radovic et al., 2017). Hilliard et al. (2018) confirmed that strong mHealth engagement has helped parents increase their awareness and efforts to support their adolescents' participation in healthy diabetes-related behaviors. The authors argued that parental focus on identifying and enhancing adolescents' appropriate actions has the potential to enhance support and collaboration in parent-adolescent relationships aimed at better management of diabetes.

Given the importance of parental oversight, modifying patient interaction with family members could be a crucial component in improving adolescents' ability to manage diabetes. Reasonable and clear technology standard regulations will allow parents and children to manage the use of mobile technology better. Empirical evidence suggests that teaching parents to identify and improve positive behaviors among adolescents regularly may also increase behaviors correlated with positive outcomes for diabetes (Hilliard et al., 2018; Tolan, 2018).

Difference of perceptions between parents and their teenage children have negative implications for both adolescent behavior and parent-teen relationships. For example, children express frustration with parents imposing limits on their screen time, particularly when they feel that their parents are suspecting their actual use of devices (Blackwell et al., 2016). Similarly, Zhao et al. (2018) indicated that PU, PEOU, perceived weakness, and perceived severity have significant impacts on individual attitudes, while PEOU, subjective norms—confidence, perceived risk, and AT—have a significant impact on BI. Research on children and technology indicates that this relationship is sometimes optimistic, educative, and beneficial but can also be negative, restrictive, and threatening (Kardefelt-Winther, 2017). For example, teenagers' social relationships are enhanced by digital technology since they use it to strengthen their existing relationships and remain in contact with friends. Moreover, those with less social capital at the beginning can use mobile technology to create positive relationships. Alternatively, digital technology may interfere with adolescents' structured activities such as homework.

Despite rising mobile technology adoption rates, parents are often unsure how to better manage the introduction of numerous mobile devices into their children's daily lives (Sanders et al., 2016). Parental worries over their children's increased screen time, along with a rise in media use and the potential negative impacts of these media devices, put parents in a difficult position to try and control their children's screen time. As these innovations become more prevalent in family life, the resolution of these conflicting values by parents is likely to influence how they choose to control their children's access to media (Sanders et al., 2016). The analysis from the current study analyzed teachers'

and parents' impressions of mobile technology use by adolescents with diabetes to determine how well they can use technology to manage the disease.

Parents' Perception of Mobile Technology Use

Given the continuous changes in the technology surrounding children and the growing technology exposure at home, Genc (2014) noted that parents are increasingly cautious of the amount of daily screen time they allow their children. The sample for this study included 85 parents from three preschools in Turkey, to capture their opinions about the use of mobile technology. Results from subsequent thematic analyses revealed that preschoolers mostly used smartphones for playing, creating some worry for their parents. As a result of a study involving the parents of young children, based on parental expectations and experiences, Plowman and Stevenson (2012) indicated that experiences with technology would benefit the four main areas of learning—organizational abilities, experience and understanding of the world, learning arrangements, and understanding of the role of technology in daily life. Hilliard et al. (2018) observed that supporting parental involvement in adolescent diabetes self-management promotes optimal diabetes outcomes. However, in only a few interventions for parents of children have authors made explicit use of strength-based approaches to help strengthen desired management behaviors and promote positive family interactions related to diabetes care (Hilliard et al., 2018). The strength-based approach helps parents understand and strengthen what their adolescents are doing well by increasing parental awareness and promoting positive family interactions in the sense of daily use of mobile technology.

Vittrup et al. (2016) found that most parents exhibit positive media and technology attitudes and felt that it was an important component of the lives of their children, both now and in the future. Of the 101 parents who participated in this study, the majority (83%) were Caucasian, 8% were Hispanic, 3% were American Indian, 3% were Black, and 2% were Asian. Moreover, 93% of the sample had completed at least some college-level education, with 55% of the participating parents possessing a bachelor's degree, and 25% possessing a master's or doctoral degree. The mean amount of household income was US$ 75,000, with 30% of the sample earning more than US$ 100,000 annually. Additionally, 95% of respondents were married or living with a partner, and children ranged from 1 to 7 per household. Results of the survey showed heavy media consumption among both parents and children, with significant numbers of children having private access including the youngest.

Overall, parents have exhibited positive attitudes toward the media to the extent that they believe media exposure is integral to the development of their children. This finding suggests that parents should communicate with their children and encourage them to demonstrate and explain what they know about technology, how they use different tools, and how technology affects them. Such communication would allow them to better assess the suitability of different media platforms and to serve as mediators or buffers against possible negative influences on their children. Vittrup et al. (2016) suggested that it is important to examine whether the positive attitudes of parents toward media and technology influence other aspects of family life. In particular, researchers were asked to

investigate the extent to which technological resources improve or inhibit communication and the quality of life within the family (Vittrup et al., 2016).

Parents' expectations of their performance with media devices are not only directly linked to their technology-related communication strategies but can also impact how they communicate with their children on these technologies and, thus, how their children view the devices (Sanders et al., 2016). As is consistent with the existence of an emotionally well-connected family, parental expectations of media devices tend to be essential to the household environment of media use. From the perspective of family systems, individual-level variables such as parental opinions about and attitudes toward technology can affect the screen time of children not only through the dyadic exchange around it but through other mechanisms. Therefore, Sanders et al. (2016) proposed that future studies integrate both parental actions and parental experiences relating to the use of their child's media to more comprehensively understand the role of media in the family and its effect on the child.

Sanders et al. (2016) further argued that the process of changing the family technology environment commences by educating parents about technology and providing them with effective parenting strategies for the use of technology with their children. Mobile health interventions, for example, can be effective in improving youth health outcomes, especially when parents are the active recipients of the intervention (Fedele et al., 2017). This finding is consistent with the evidence yielded by face-to-face health promotion and prevention interventions indicating that multi-systemic strategies are more effective in improving youth health than those solely targeting the individual

(Cushing et al., 2014). mHealth approaches seem to be viable health behavior change interventions for youth. Consequently, given the ubiquity of mobile technologies, mHealth interventions are promising tools for improving public health (Fedele et al., 2017).

The viability of adolescent use of mobile technology depends on teachers' and parents' perceptions and acceptance of this technology (Sanders et al., 2016). In developing countries, greater effort should be made to identify the barriers toward acceptance of health technologies as well as to develop strategies to overcome these barriers by increasing awareness and education among groups of stakeholders about diabetic youth. Most parents are enthusiastic about using mobile technologies that have been proven to assist their children with behavioral regulation and exhibit particular enthusiasm for those aimed at promoting physical activity. Strategies such as self-monitoring and goal setting for physical activity are among the most highly preferred by parents (Cushing et al., 2018). Although most parents who took part in the study (Cushing et al., 2018) expressed a high interest in diabetes-specific apps, some were less enthusiastic about leveraging IS to motivate their children's activity. However, adolescents' interest in the use of health-related apps showed more significant variability. Recognizing obstacles and facilitators to the use of smartphone apps for adolescent diabetes care will increase their interest in and the eventual acceptance of this technology (St George et al., 2016).

Adoption of UTAUT in the Study

The literature indicated that the perceptions of teachers and parents could have a positive impact on how adolescents use mobile technology to manage their health. Parents want their children to be healthy, but many parents struggle to help with their children's health needs. Therefore, mobile technology could provide strategies for teenage self-management of their health.

In this study, the basic UTAUT constructs were adopted to explore parent and teacher perceptions of the use of mobile technology in adolescent diabetic care. Results from existing UTAUT studies indicated that the selected constructs lead to BI to embrace and use technology and its applications (Hamzat & Mabawonku, 2018). There are two reasons for the UTAUT approach being particularly useful. First, the UTAUT model integrates a range of hypothetical and empirical relevant variables from different models by defining consumer adoption of mobile technology (Venkatesh et al., 2003). Second, it is a flexible strategy for conceptualizing acceptance of mobile technology since it enables additional factors to be incorporated into the conceptual framework of technical acceptance (Hino, 2015).

UTAUT model was formulated by Venkatesh et al. (2003) after an extensive review of eight conspicuous models used in user acceptance of technology. The authors proposed that four variables—performance expectation, effort expectation, circumstances facilitation, and social influence—have an indirect relationship through BI to use. The theory also provides four moderators to advance the relationship between constructs, namely, age, gender, expertise, and willingness to use (Venkatesh et al., 2003).

Therefore, use and deployment problems have been continuously addressed as new technologies continue to evolve and find their place in both society and organizations (Dwivedi et al., 2017). Venkatesh et al. (2003) noted that some of the existing theories, although under different names, contain similar variables.

Given that the UTAUT synthesized by Venkatesh et al. (2003) has established a thorough evaluation and integration of variables from eight theories/models (usually within the organizational context), it can be adopted to explore the acceptance of technology by users (Williams et al., 2015). Due to the persistent efforts to understand issues related to the implementation and dissemination of mobile technology, various theories have been developed, adopted, or adapted in the IS literature to characterize the reception and use of technology in a variety of contexts (Morosan & DeFranco, 2016; Williams et al., 2015). The UTAUT was formulated and accepted with the specific objective of providing a single theoretical choice to promote the adoption and distribution of technology through research on IT/IS.

Consequently, due to increased access to smartphones, mobile technology has the potential to influence attitudes toward health via public health initiatives and health education, particularly among the underserved and minority populations (Anderson-Lewis et al., 2018). Cushing (2017) further argued that mobile technology extends the reach and effectiveness of clinical care and expands the types of interventions that can be provided to adolescents. Understanding the benefits and challenges of using mobile technology from parents' perspective can help locate cost-effective ways for providing health information to adolescents in developing countries. Mobile technologies hold the

potential to enhance the management of chronic diseases, while simultaneously improving communication between the patient and the health service provider, as well as assessing the inclination and perceptions of smartphone use among patients and caregivers (Hamine et al., 2015).

Adolescents, according to Moawad and Ebrahem (2016), are among the most active users of technology and are typically early adopters of new technologies, including the internet, mobile technologies, social media, and other platforms and devices. They were born during the age of technology—digital natives, unlike previous generations whose members learned how to use various ICT tools when they were older—digital immigrants. Growth in the use of mobile technology has become increasingly important for adolescents who now use it more often to search for health-related information (Moawad & Ebrahem, 2016). Along with the growth in the number of users of mobile devices, the devices have gradually become more versatile and capable of handling a much more comprehensive range of functionalities. Mobile technologies are, therefore, increasingly considered as a viable means for improving communication between healthcare practitioners and patients. Enhanced communication could alleviate the burden of disease on patients, their families, and even entire communities by reducing the expenditure on hospital stay and mitigating long-term complications associated with a variety of chronic conditions.

Self-management of diabetes is central to overall diabetes treatment, in which individual behavioral change plays a crucial role, especially in terms of dietary patterns and physical activity (Peek et al., 2014). Therefore, integrating mobile technology

applications into approaches aimed at the prevention and treatment of chronic diseases such as diabetes would be beneficial (Muralidharan et al., 2017). This approach to the delivery of health care allows people with diabetes to review outcomes, identify trends, and understand how everyday activities affect their blood sugar levels. Mobile technology can significantly improve the control of diabetes for young people and their parents in developing countries by helping monitor the disease and by providing actionable information while promoting self-management (Beratarrechea et al., 2014).

Mobile technologies are indeed becoming an essential part of the health-seeking repertoires of young people in Ghana, Malawi, and South Africa (Hampshire et al., 2015). Such mobile devices have the potential to serve as a significant therapeutic tool and are already being creatively used by adolescents for information analysis and access to health care assistance. Nevertheless, adolescents' efforts can be jeopardized by restricted access to technology, lack of digital resources, instability, and inadequate delivery of health services, all of which are most intensely felt by residents of developing countries. Understanding and overcoming these constraints is crucial if the potential of mobile technology is to be harnessed to support the health of adolescents, particularly in sub-Saharan Africa (Hampshire et al., 2015).

Summary and Conclusions

This chapter provided a comprehensive review of the research and scholarly literature on mobile technology use and acceptance and with the development of the conceptual framework, UTAUT, which guided this study. UTAUT focuses on the use and degree of acceptance of information technology. The theory comprehensively

explains the acceptance of information technology and articulates the actual use of such technologies (Chao, 2019). The UTAUT provided a framework that guided the qualitative study through interviews and several viewpoints that contributed to enriching the research. The literature revealed that adolescents are frequent users of technology. Hence, involving adolescents in self-management of diabetes by using technology might be invaluable in improving long-term outcomes. Moreover, mobile networks are becoming increasingly common in sub-Saharan Africa, which is expected to be the world's fastest-growing region as regards mobile technology use (Eilu, 2018). Hence, understanding the expectations of teachers and parents about the use of mobile technology was important if stakeholders are to leverage the potential of these technologies to support the health of young people, especially in developing countries. With the developments in mobile technology, the number of mobile phone users has increased significantly (Holtz, Vasold et al., 2019), which has caused a boom in the use of mobile health services. Research has shown the influence of mobile technology has made health care delivery more accessible, a□ordable, and e□ective (Idrish et al., 2018). However, teachers' and parents' perceptions of how adolescents use mobile technology for their health management have not been widely explored.

The next chapter provides an overview and a description of the methodology used for this study. The chapter also provides a review of the research design and rationale, the central concepts and chosen traditions, the researcher's role, selection of participants, instrumentation, procedures for the recruitment, participation, and collection of data. A review of the data analysis strategy and a summary of the facts about trustworthiness and

ethical procedures are also presented. The chapter concludes with a summary of the research design.

Chapter 3: Research Method

The purpose of this qualitative study was to explore parents' and teachers' perceptions of the use of mobile technology for diabetes management in Kenya. The study was based on the UTAUT model. The UTAUT theoretical framework includes the following constructs: "(a) performance expectancy (PE), (b) effort expectancy (EE), (c) social influence (SI), and (d) facilitating conditions (FC)" (Venkatesh et al., 2003, p. 447). Although the first three are primary predictors of customer behavior (PE, EE, and SI), the fourth (FC) is a major indicator of user behavior. The framework helped explain how teachers and parents perceive teenagers' use of mobile technology as a learning tool for managing health and well-being. I also described teachers' and parents' attitudes toward the usefulness and ease of use of mobile technologies. In terms of research design and rationale, I employed a purposeful sampling strategy to select the participants. This strategy was intended to achieve a homogeneous sample of participants' perceptions of the use of mobile technology. I used this type of sampling because the research study questions were specific to the characteristics of the use of mobile technology.

In this chapter, I discuss the research method that was used to conduct this study. This chapter also provides a review of the research design and rationale, researcher role, participant selection, instrumentation, recruiting, attendance, and data collection procedures. This chapter also contains a description of the data analysis plan and a discussion of the evidence of trustworthiness and ethical procedures. The chapter ends with a summary of the research design.

Research Design and Rationale

I used a qualitative nonexperimental method to explore teacher and parent perceptions of technology use among adolescents with diabetes. The study design included the UTAUT model, which researchers have used to analyze factors that affect the acceptance, adoption, and use of mobile-based technologies (Islam, 2015; Seethamraju et al., 2018). The results of previous studies were essential to my research because they indicated that four constructs in the UTAUT model—EE, FC, PE, and SI—influenced behavioral intent to use mobile technology solutions in a meaningful and beneficial way. Seethamraju et al. (2018) validated the predictive capabilities of the UTAUT model in the implementation of health service mobile technologies in developing countries. I conducted interviews with teachers and parents of adolescents with diabetes in a Kenyan setting. The interview questions were designed to explore the perceptions of teachers and parents regarding the use of mobile technology in aiding adolescents to make the right health decisions.

Research Questions

The following central research question was devised after adopting the conceptual framework and conducting an extensive literature review: What are the perceptions of parents and teachers regarding how adolescents use mobile technology for diabetic management in Kenya? Related research questions included the following:

SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?

SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?

SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?

SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?

Central Concepts and Chosen Traditions

The central objective of this qualitative research study was to explore teacher and parent perceptions of mobile technology use by diabetic adolescents. A case study with qualitative methods was appropriate for the study because nonnumeric data collected on teacher and parent perceptions guided the research in answering complex questions such as how and why efforts to implement best practices may succeed (see Hamilton & Finley, 2019). A case study provides a detailed overview of the bounded structure and enables the reader to examine the case so that they can learn from it (Burkholder et al., 2020). Additionally, a case study offers a structured way to look at facts, gather data, analyze information, and report the results. In this study, a case study provided a chance to obtain an in-depth understanding of parent and teacher perceptions of how adolescents use mobile technology for health management. A more precise understanding of why mobile technology use is perceived in a certain way may be gained. The results may be used in a future study about mobile technology use in teen's health management.

In this study, I investigated the meanings that the participants attributed to adolescents' behavior, actions, and interactions when the youths use mobile technology

in diabetes management. I also sought to interpret the data collected to aid in understanding the use of mobile technology according to teacher and parent perceptions. The goal of applying a qualitative analysis is to produce observations that are of value to the study and the broader scientific community (Hamilton & Finley, 2019). Teachers and parents who participated in this study were queried about their knowledge of mobile technology, including what type of mobile technology they or their adolescent children use and their perceptions of mobile technology use as it relates to the health care of adolescents. Researchers found that increased use of mobile technologies may create adverse health effects, particularly for adolescents (Crompton & Burke, 2018; Law et al., 2018). Some of the research demonstrated that mobile health technology could increase health education and prevention of diabetes in disparate health communities (Anderson-Lewis et al., 2018). In a similar study to explore the health behavior of college students at Midwestern University, Warnick et al. (2019) argued that understanding the beliefs and opinions of the target population is instrumental in developing effective health interventions. Therefore, exploring teacher and parent perceptions of mobile technology use among diabetic adolescents is important in understanding how the youths can effectively use the technology to manage their health.

Role of the Researcher

My role as the researcher was to access the thoughts and feelings of the study participants regarding adolescents' use of mobile technology in relation to diabetes management. I acted as the primary investigator, and I was the data collection and analysis tool. I selected the research design, chose the participants, identified the data

sources, developed the tools for data collection, and developed recruitment, participation, and data collection procedures. Additionally, I was responsible for all data analysis and for applying strategies that improved the trustworthiness of this qualitative research. I had no personal or professional interaction with the participants. Therefore, I did not have any direct or indirect contact with the participants prior to the study, except when soliciting their participation. There was no potential conflict of interest because I possessed no knowledge of or experience with the participants. In the process of the study, I sought to reduce bias by taking notes of any conflicts that may have hindered my ability to provide unbiased data.

In the analysis stage, I minimized the potential for researcher bias such as unconscious bias caused by apophenia. Apophenia occurs, usually outside conscious awareness, when meaning is perceived in unrelated cases (Buetow, 2019). Buetow (2019) stressed that qualitative researchers make subjective judgments in defining and attributing meaning to patterns on the nature of social action from samples whose small size reduces the ability to optimize variability among participants. I addressed these biases by introducing strategies to improve the credibility of this study, including triangulation, participant controls, and reflexivity. To further reduce bias, I adopted precoding in the analysis stage by creating new anticipated codes, thereby making connections to new ideas.

Methodology

In this section, I explain the methodology used for this study. Documentation is also presented on the participant selection process, instrumentation, recruitment and

participation procedures, and interview guide. I also describe the process of data collection and the data analysis strategy.

Qualitative content analysis was used as an interpretation method in a case study that emphasized interviews as a means of data collection. In this study, I investigated teacher and parent perceptions within their environmental context (Ridder, 2020). In qualitative research, the case is selected for theoretical reasons or because it is of interest (Eisenhardt & Graebner, 2007). The case study approach is an empirical inquiry that examines a current trend in a real-life context such as the use of mobile health technology (Head & Li, 2009). As part of my data collection strategy, I triangulated data that resulted in a detailed case description while I sought to clarify the meaning and diversity of perceptions.

The study consisted of a series of interviews in rural and urban environments with parents and teachers. The purpose of the interviews was to gather information from teachers and parents of diabetic adolescents between the ages of 13 and 18 in relation to their use of mobile technology. With the individual semistructured interviews, an inductive thematic analysis was conducted to explore (a) interactions with health-related mobile apps, (b) perceived obstacles to mobile use, and (c) facilitators of mobile use (Chan et al., 2017). To consider the possibility of there being important differences among parent perceptions of the use of mobile technology, participants were limited to parents of diabetic adolescents attending school.

Participant Selection Logic

A purposeful sampling strategy was employed to select the participants. Qualitative research uses purposeful sampling for the discovery and collection of information-rich cases pertaining to the topic of interest (Palinkas et al., 2015). The primary purpose of purposeful sampling, according to Palinkas et al. (2015), is to focus on specific characteristics of a population that are of interest to more efficiently allow a researcher to address the research questions. In the current study, participants possessed basic knowledge of mobile technology. The following criteria were used to assess basic knowledge: familiarity with the basic terms used in mobile technology, such as calling, texting, applications, connectivity, and social networking, and knowledge of using mobile devices to handle essential communication functions such as voice service and short message service (SMS or text messaging). Moreover, the participants were working with or were the parent of a diabetic adolescent. The selected participants provided data that enabled me to answer the research questions and enhance awareness of the use of mobile technology. One significant advantage of this type of sampling was that it was easier to make generalizations about the study sample compared to a random sample in which not all participants necessarily had the characteristic required for the study.

The target population were six teachers who taught diabetic adolescents and eight parents of a child with diabetes. Once I obtained the approval to conduct the research from the Institutional Review Board (IRB number 07-22-20-0047065) at Walden University, I commenced the recruitment process. Prescreening was undertaken through phone calls in which the participants were asked questions to determine whether they

possessed a basic knowledge of technology. Participants were also asked whether they interact with diabetic adolescents either at home or at school. After the prescreening phone calls an invitation letter (see Appendix A) was emailed if the participant had an email account. If the participant did not have an email account, the invitation was sent as a text message. The participants belonged to the urban and rural populations in Nairobi and central Kenya. Including participants from these areas made it easier to get the participants to the interview centers for the data collection purpose—one of which was held in Nairobi and the other in central Kenya. Following the screening, participants were provided with information explaining the study process, their role, confidentiality, and time requirements. Appropriate consent forms and verbatim IRB regulations were texted (SMS or WhatsApp) or emailed if the participant had an email account. For participants who did not possess text capabilities or email services, the consent forms were handed to them to sign on the day of the interview before the start of data collection. The signed forms were collected on the interview day before the commencement of the interview.

Participants were recruited through a phone call from a list of parents and teachers provided by a research partner. The research partner was a nonprofit medical organization that aims to educate the public about diabetes. The organization engages in the development of community and school programs that create public awareness and help with the prevention, diagnosis, and management of diabetes in Kenya. The organization works with teachers and parents to promote positive health behaviors that reduce or prevent diabetes.

The list provided by the research partner included parents whose adolescent children are diabetic and teachers who teach diabetic adolescents in their schools. From the list, I contacted potential participants via phone to inform them of the purpose of the interview and to ask whether they would be willing to participate. Participants selected needed to meet specific inclusion criteria. Teachers included in the sample (a) were working in a classroom with at least one diabetic child, (b) had basic knowledge of technology, and (c) owned a mobile technology device. Parents needed to have (a) at least one child with diabetes, (b) basic knowledge of technology, and (c) a mobile technology device.

Instrumentation

As the primary investigator, I was responsible for choosing the research design, participants, and instruments for collecting data. I was also responsible for collecting, analyzing, interpreting, and reporting data. I used one type of data: perceptions of teachers and parents of adolescents on the use of mobile technologies. I collected in-depth perceptions of the targeted populations. Nine interview questions were developed to pose to the participants. The designed questions were submitted to the IRB for approval before being used in the interviews. In partnership with the research partner, I identified the participants through a prescreening process. I prepared for the interview day by designing the necessary documents such as the participation invitation letter and research consent form. Each interview session lasted approximately 25 minutes.

Procedures for Recruitment

Once I obtained research approval from the National Council of Science, Technology, and Innovation in Kenya and approval from the IRB at Walden University, I started participant recruitment. I initially met with the research partner, who helped me identify a pool of teachers and parents who met the inclusion criteria. The participants for this study included eight parents and six teachers of adolescents with diabetes in a Kenyan school. I selected teachers and parents who demonstrated knowledge of mobile technology use within a diabetes environment. Participants were invited to take part in the study by using a recruiting script (see Appendix B) through a telephone call. Follow-up telephone calls were made to confirm the participants' acceptance of the invitation. During the confirmation call, I provided the proposed agenda, including a list of questions for discussion and the time and location of the interview. One day prior to the interview, I called the participants to remind them of the meeting. I then set the agenda for the interview session, which included a warm welcome, a review of the meeting's goal, a summary of the ground rules, introductions, questions, and answers. The agenda was read to the participants as a part of the introduction on the day of the interview.

Participation and Interview Guide

All the participants answered similar questions during the interview. Rather than coding and analyzing individual responses, the responses were coded and analyzed collectively. According to Patton (2002), the "purpose of interviewing is to allow us to enter into the other person's perspective" to make explicit their feelings, thoughts, intentions, and stories (p. 341). To capture both teachers' and parents' perceptions on

adolescent use of mobile technology, I designed an in-depth interview. The design of the questions was purposeful, meaningful, and aligned with the study questions. The questions were open-ended and, as such, the collected data was useful in revealing the values, perspectives, and experiences of the population under study. Instead of choosing from a list of predetermined answers, the interview encouraged respondents to provide unique answers. This strategy offered the respondents the opportunity to express themselves freely on the use of mobile technology. The interview included exploratory questions that might expose new possibilities, problems, or quotations. Based on these criteria, I developed nine open-ended interview questions (Table 1 and Table 2) consistent with research questions about the awareness and perceptions of teachers and parents about the use of mobile technology. The tables below show the alignment of the parent and teacher interview questions with research questions for the study.

Table 1.

Alignment of Parent Interview Questions with Study Questions

Parent Interview Questions	CRQ	SQ1	SQ2	SQ3	SQ4
1. What type of mobile technology does your adolescent child use?	X	X	X	X	X
2. What are your perceptions of how useful these mobile technologies are or are not to your adolescent child? Please explain why or why not.	X	X	X		
3. How do you perceive the ease with which your adolescent child uses these mobile technologies? Please explain.	X		X	X	
4. How do you perceive the influence these technologies have on your adolescent child?	X	X		X	
5. What factors do you perceive influence your adolescent child's acceptance of mobile technology?	X	X	X	X	
6. What factors, positive or negative, do you perceive influence your adolescent child's use of mobile technology? Please explain.	X	X	X	X	X
7. What is your perception of health management using mobile health technologies?	X	X			
8. What is your perception of mobile health technologies in adolescents making healthy lifestyle changes?	X	X	X		X
9. What are your recommendations on how mobile technology might help your adolescent child to manage diabetes?	X				X

Table 2 demonstrates how the teacher interview questions fit with the research questions for this study.

Table 2.

Alignment of Research Questions with Teacher Interview Questions

Teacher Interview Questions	CRQ	SQ1	SQ2	SQ3	SQ4
1. What type of mobile technologies, if any, do your students use?	X	X	X	X	X
2. What are your perceptions of how useful these mobile technologies are or are not to your adolescent child? Please explain why or why not.	X	X	X		
3. How do you perceive the ease at which the students use these mobile technologies? Please explain.	X		X	X	
4. How do you perceive the influence these technologies have on students?	X	X		X	
5. What factors do you perceive influence student's acceptance of mobile technology?	X	X	X	X	
6. What factors, positive or negative, do you perceive influence students' use of mobile technology? Please explain.	X	X	X	X	X
7. What is your perception of health management using mobile health technologies?	X	X			
8. What is your perception of mobile health technologies in students making healthy lifestyle changes?	X	X	X		X
9. What are your recommendations on how mobile technology might help students to manage diabetes?	X				X

Data Collection

Data was collected in person in two phases during the study. First, the teachers were individually interviewed. Thereafter, the parents of diabetic children were interviewed. Follow-up interviews were conducted with participants to seek clarification and probe additional themes that emerged from the first round of interviews. The interviews were similar to and aligned with the research questions. The individual interviews were conducted in two schools—one in an urban setting and the other in a rural setting. Apart from making notes, the entire interview sessions were recorded using a digital audio recording device, the Sony ICD-ux560. All sessions included an exit strategy, which included an open-ended question such as "What other areas of mobile technology use do you have a concern with?" A follow-up question such as "What are some additional concerns, comments, or questions you may have that you have not talked about yet?" The exit strategy ensured that those who were timid and less willing to share information were provided the option to add further information.

The teachers and parents were initially asked about their perceptions of and interactions with mobile technology regarding health management and the justification for using the technology. I also used several questions to identify factors that influence adolescents' use of mobile technology and beliefs that may drive participants' decision to use mobile technologies to make improvements to lifestyles. Following this, I asked about other motivating factors and barriers to using mobile technology for educational purposes and health management. Finally, participants were asked whether they thought mobile technology can help diabetic adolescents make smarter health decisions. The

duration of the individual interview session ranged from 20 to 30 minutes. The data was analyzed as was being collected, and interviews continued until thematic saturation was reached. Saturation is the stage beyond which consecutive interviews do not produce any additional novel information (Francis et al., 2010) or until all participants are interviewed.

Bowen (2008) observed that saturation was a difficult concept to describe in qualitative research. However, saturation refers to that stage in qualitative research where enough data are available to ensure that the problems of the sample can be resolved. Nevertheless, as with all areas of qualitative research, data depth is often more important than its volume (Burmeister & Aitken, 2012). Moreover, a small number of rich interviews or documents may have the sense of hundreds of shorter interviews (Fusch & Ness, 2015). A retrospective review of a qualitative project by Guest et al. (2006) found that 12 interviews may be sufficient for saturation in qualitative research and that most of the themes emerge after only six interviews.

Data Analysis Plan

My study used a thematic analysis method to develop a coding framework. A thematic structure and realistic approach to analysis identify key concepts in the transcriptions of the interview (Patton, 2015). A framework methodology is a flexible approach to qualitative analysis in which specific trends and principles are defined *a priori*. This facilitates the identification of emerging topics inductively (Dixon-Woods, 2011). The thematic analysis offers flexibility for framing the theory, research questions, and research design. The analysis can be used to explore questions about participants' life

experiences, perspectives, behavior, and practices that influence and shape particular phenomena (Braun et al., 2019).

According to Braun et al. (2019), there are three predominant types of thematic analysis: coding reliability approaches, codebook approaches, and reflexive approaches. In this study, I used the thematic analysis approach, where codes evolve throughout the coding process (Braun et al., 2019). The themes were created by clustering similar codes together to capture shared meaning organized around a central concept or idea (Braun et al., 2014). Since coding is an explicit and iterative process, the analysis was altered and modified as required by the data and as ideas emerged. To ensure maintaining the codes' integrity, I read and reviewed the data repeatedly and double-checked the codes for consistency and validation. The codes were used to form the codebook from which themes emerge. Themes and sub-themes patterns that emerged from the coded data were identified. Finally, the concepts were organized into groups and themes were explained with a few quotes from the original text to help the reader understand their significance.

All the respondents' answers were analyzed according to the research framework. Data from the teacher's and the parent's interviews were analyzed separately and findings were compared. The collected data were coded and analyzed to maximize its reliability and accurately prepare a comprehensive analysis implementation. To guarantee the reliability of the detailed outcomes and keeping in mind the end goal, an evaluation and analysis plan was constructed to ensure the alignment of the data with the research questions. The qualitative data was digitally transcribed to safeguard the reliability of the data and ensure complete accuracy.

Data analysis in qualitative research can be said to consist of the following five stages: collection, disassembly, reassembly, interpretation, and conclusion (Castleberry & Nolen, 2018). According to Castleberry and Nolen (2018), the raw data are transcribed or simplified at the compilation stage. This is followed by dissociation, which includes separating the data and forming meaningful groupings. The codes or categories are subsequently put into mutual context in the reassembling stage to create themes. The description and explanation of these themes contribute to interpretation, and the conclusions explain the answers to the research questions or the study's intent (Castleberry & Nolen, 2018).

The data analysis commenced with a process of coding to identify portions of the data that were potentially useful for further analysis, for example, reviewing key events, daily routines, and implications of people's actions in the coding process. The purpose of the data coding was to bring out the essential meaning of the data that participants provided and to ensure that none of the crucial points in the data were lost during data coding (Saldaña, 2016). A manageable coding scheme based on the collected data was developed. The analyzed data included the identified pieces of information related to teachers' and parents' perceptions of adolescents' mobile technology use.

Following data collection, coding was done to (a) create categories, (b) assign a phrase to each coding category, and (c) determine the general theme. The resulting narrative was summarized and organized. After completing the analysis, an attempt was made to interpret and understand the results to identify and describe the most interesting and significant results. Individual codes were sub-categorized based on the similarities in

content and meaning. The sub-categories were scrutinized and placed in broader categories (Morse, 2008). Data were analyzed, and the final categories were reviewed. Trustworthiness strategies included the implementation of a coding system, peer debriefing, and the creation of a critical analysis decision-making audit trail (Abboud et al., 2017; Lincoln & Guba, 1985; Morse, 2015).

Analysis of the collected data was guided by the research framework and using thematic methods to develop a coding framework. The coding of the data aided in identifying portions of the data that were potentially useful for further analysis. Coding brought out the meaning of the data as themes emerged. The findings were evaluated in relation to the purpose and intention of the study and presented in the context of the conceptual framework and the literature review. Concerning the issues of trustworthiness, triangulation strategies, appropriate participation in data collection, reflexivity, audit trail, and dense, thick definitions were used to enhance the integrity, transferability, precision, and conformability of this qualitative research. Ethical considerations included compliance with federal regulations and Walden University policies so that this study would not cause harm, have legal consent, maintain confidentiality and anonymity of participants, and ensure that the benefits of the research outweighed the risks to the participants.

Issues of Trustworthiness

This section examines issues of trustworthiness that prove the quality of a study. Credibility was described, discussed, and contextualized. This was followed by confirmation of transferability, dependability, and finally, defining conformability. This

section concludes with the ethical procedures that were followed to ensure and maintain the safety, privacy, and confidentiality of the participants in this study.

Credibility

To ensure the credibility of the process, the theory/perspective triangulation was applied using various theoretical viewpoints to analyze and interpret the data (Madan & Madan, 2019). Triangulation is a tool used by qualitative scholars to test and establish validity in their studies by evaluating multiple perspectives on a research question. This study involved purposeful analysis of data using its theoretical framework and the UTAUT, which comprises eight constructs. The UTAUT is a powerful tool that provides multiple theoretical positions that ensure the integration of different lenses in viewing the data. Data triangulation may result in a broader understanding of the teacher and parent perceptions of adolescents' use of mobile technology for self-management of health. Participants were offered a chance to review and confirm that the data accurately reflected their perceptions and experiences.

For credibility, an effort was made to locate matching patterns in the collected data, explore possible explanations for the results, and identify a convergence of data to determine consistency (Yin, 2016). The data was analyzed using codes that aligned with the research questions, theoretical framework, and types of perceptions. I also sought the convergence of patterns and common themes among the different data sources to establish triangulation (Miles et al., 2018). As the facilitator and mediator of the interview sessions, all the possible effort was made to provide the participants a comfortable environment in which they could be at ease as they shared their experiences.

Member checking was used following each interview to confirm the accuracy of the written transcription.

Transferability

The transferability issue was handled by specifying how the findings of this study could be applied to other similar situations, such as health issues other than diabetes that adolescents face. Rich descriptions of contextual information were provided to facilitate a smooth transfer (Shenton, 2004). The contextual information included details about the geographical locations of the participants in the study and the connectivity and their experiences, if any, with mobile health applications. The purposive sampling for selecting the participants supported the transferability of the research findings to future studies.

Dependability

Dependability was established by documenting all the processes in the study in detail. This understanding of the processes would allow future researchers to replicate the study in the same context using the same methodology and for achieving similar results with the same number of participants (Shenton, 2004). Documentation included information on the research design, research questions, interview questions, interview guides, tools, and a reflective review. An external researcher, the methodologist, performed an investigative audit of the research study to establish dependability. The evaluation by investigation involved having the external researcher analyze the data collection, data analysis procedures, and the findings of the research. This evaluation validated the accuracy of the results and investigated whether the collected data supported the findings.

Conformability

Conformity is sometimes regarded as a fundamental human characteristic that extends to individuals in several group settings (Beran, 2015). When in school, adolescents conform to a teacher's expectations on the use of mobile technology, and at home, they follow the rules set by their parents regarding the use of mobile technology. In this study, confirmability was established by documenting procedures through an audit trail, which could enable any researcher to track the progress of the research step-by-step through the decisions made and the procedures mentioned (Shenton, 2004). This documentation illustrated the systematic research process undertaken to collect the data that led to the development of the recommendations, the triangulation of the in-depth individual interview data, and the disclosure of my biases. All of the participants answered similar questions during the interview. The coding and analysis were collectively conducted rather than from individual responses.

Ethical Procedures

To preserve the confidentiality of the participants, pseudonyms were used throughout the documentation. Codes were used to ensure that no information that could lead to the identification of the participants was included in any of the documentation in the final report. Complete transparency regarding how the obtained data would be used was ensured so that the participants possessed all the relevant information about their participation in the research before the commencement of the study. Informed consent forms were texted, emailed, or handed to the participants on the day of the interview before the data collection processes commenced. The participants were free to withdraw

from the study for any reason and at any time. The notice of withdrawal from the study could be communicated through a phone call, text message, or email. Data collected were stored on a safe drive and will be permanently deleted after five years to protect participants' privacy. This dissertation shows the IRB approval number for Walden University.

Summary

The chapter provides an overview of the basic qualitative study methodology that was used to explore the teacher and parent perceptions for use of mobile technology. Also, presented in the chapter is an overview of the research design and rationale, the role of the researcher, the method of selecting the participants, instrumentation, recruitment procedures, participation, and data collection procedures. A review of the data analysis strategy and a summary of the trustworthiness facts and ethical procedures are also provided.

The next chapter presents a brief introduction with details of the settings, demographics, data collection, data analysis, evidence of trustworthiness, and dependability. The latter part of the chapter contains a detailed presentation of the findings from the study. It ends with a summary. Analysis of the collected data was guided by the research framework and used thematic methods to develop a coding framework. The results were analyzed in conjunction with the research questions and interpreted in light of the conceptual framework and the literature review.

Chapter 4: Results

The purpose of this basic qualitative research study was to explore parent and teacher perceptions of the use of mobile technology in diabetic care in Kenyan. The study aimed to gain insights into one central research questions: What are parents' and teachers' perceptions of how adolescents in Kenya use mobile technology for diabetic management? Four secondary questions were also used to guide the study:

SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?

SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?

SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?

SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?

The study's goal was to enhance the understanding of how teachers, parents, and diabetic adolescents use mobile technology to address health issues related to this chronic disease. The purpose of the study was aligned with the central research question. To derive meaning from parents' and teachers' perceptions of mobile technology use, I used the UTAUT conceptual framework formulated by Venkatesh et al. (2003). To guarantee the reliability of the outcomes and keep in mind the end goal, I constructed an evaluation and analysis plan for the collected data to ensure alignment with the research questions. This chapter details the research process used to collect data pertinent to the study's

purpose and objective. Chapter 4 also includes the study setting, demographics, data collection procedures, data analysis, evidence of trustworthiness, and results. The chapter concludes with a summary.

Research Setting

The setting of the study was rural and urban locations in Kenya. The two locations were convenient because of their proximity to each other, reducing transport costs for me and the participants. The interviews were conducted in a school conference room within the counties of Nairobi and Murang'a in Kenya. Although interviews were conducted in two schools within the two counties, three participants opted to use alternative locations for the interviews, which were convenient for them. The alternative locations were assessed for privacy and other ethical considerations. I started each interview by introducing myself and explaining the nature and purpose of the study. Before the interview, the participants were asked to read and consent to the interview by signing and dating the consent form.

Demographics

I conducted interviews among teachers and parents of adolescents with diabetes in a Kenyan setting. The interview questions were designed to explore teacher and parent perceptions of mobile technology use in aiding adolescents to make the right health decisions. A total of 20 possible participants (13 parents and seven teachers) were contacted through telephone calls. The recruitment process resulted in a purposeful sample of six teachers who teach adolescents with diabetes and eight parents of a diabetic child. Eight participants, five parents and three teachers, were recruited from Nairobi

County, while six participants, three parents and three teachers, come from Murang' a County. In Nairobi five women and three men were interviewed, while three women and three men were interviewed in Murang'a. Nairobi had a higher participation because its population is larger than that of Murang'a County. After the recruitment, interviews were scheduled for the day and time that worked well for the participants.

Data Collection

Once I obtained the approval to conduct the research from the IRB at Walden University on September 19, 2020, I commenced the recruitment process. Due to the COVID-19 pandemic, I first contacted the government and health officials and communicated my intent to conduct interviews in Nairobi and Murang'a counties. I was provided with Kenyan revised COVID-19 guidelines in place at the time regarding social distancing, gathering restrictions, use of masks, and other mitigating practices as published by the Kenyan government. I then contacted the research partner to get phone numbers or emails for potential participants. I then invited participants to participate in the study through a telephone call.

During the initial call, participants were informed of the interview's time range and location so they could make an informed decision about whether to participate. I asked the potential participants questions to determine whether they met my inclusion criteria. The inclusion criteria included teachers who worked in a classroom with at least one diabetic child, had a basic knowledge of technology, and owned a mobile technology device. Parents contacted had at least one child with diabetes, had a basic knowledge of

technology, and owned a mobile technology device. The participants were also asked whether they interacted with diabetic adolescents either at home or at school.

When the recruitment process was over, I had contacted 13 parents and seven teachers, of whom 14 participants (six teachers and eight parents) agreed to participate. I emailed the invitation letter (see Appendix A) for those participants with emails and texted the letters to the other participants. A follow-up call was made after a week to confirm the participants' acceptance of the invitation and to agree on a convenient date for each participant's interview. During the confirmation call, I provided the participants with a list of interview questions for discussion. One day before the interview, I called the participants to remind them of the meeting. Participants were asked to review the consent form before participating in the interview. I emailed or texted the consent form to participants for review immediately after participation confirmation. On the day of the interview, I presented a printed form for participants to review and sign to indicate their consent.

Interviews were conducted within a week with at least two interviewees per day. I collected the data in person through interviews in which the participants answered open-ended questions. For participants who agreed to participate in the study, none withdrew from the study. I followed the COVID-19 guidelines throughout the data collection process. For instance, I provided masks and hand sanitizers to all participants before and after the interview. During the interview, the participants were cooperative and shared their experiences in detail and with precise responses. I took notes, and all interviews were recorded. I used a hard copy of my interview questions to take notes and journal.

As an audit trail, I maintained a reflexive journal during the data collection process. The reflexive journal allowed me to ensure the dependability and confirmability of the study. Data collection took place over a period of 2 weeks, after which I started data transcription. Some analyses were done as data were being collected, and interviews were continued until thematic saturation was reached, described as consecutive interviews that do not produce any additional novel information (Francis et al., 2010) or until all participants are interviewed. Bowen (2008) observed that saturation is a difficult concept to describe in qualitative research. However, saturation refers to the stage of qualitative research in which enough data are available to ensure that the sample's problems can be resolved. Nevertheless, as with all qualitative research, data depth is often more important than numbers (Burmeister & Aitken, 2012). Moreover, a small number of rich interviews or documents may have the sense of hundreds of shorter interviews (Fusch & Ness, 2015). Guest et al. (2006) found that 12 interviews may be sufficient for qualitative data saturation. Most of the themes emerge after only six interviews.

It took 3 weeks to transcribe the interview data. For each transcript, I went back and checked the wording while playing back the audio recording for each interview. I used this procedure to check the accuracy of the transcripts and to gain insight into each participant. After transcribing the data, I emailed or texted each participant a copy of the interview transcript to review and confirm the transcript's accuracy. Once transcripts were checked for accuracy, I started data analysis. All audio recordings and transcripts were moved to a password-protected computer.

I used qualitative content analysis as an interpretation method. The method consisted of a series of interviews with parents and teachers in rural and urban locations. A purposeful sampling strategy was employed to select the participants, and data were collected in person in two phases. Phase 1 interviews were conducted with teachers, while Phase 2 was conducted with parents. The research framework guided the analysis of the data collected, and thematic methods were used to develop a coding framework by hand and by qualitative analysis software, MAXQDA.

There were some variations in data collection from the process outlined in Chapter 3. I was to conduct interviews in a school conference room. However, due to COVID-19 fears and other personal commitments, five participants opted to use a different location. I assessed the alternate locations and found them to be conducive for the interview. The rooms were quiet and there were no other individuals in the room. The average length of the interviews was 25 minutes instead of 45 to 60 minutes. Also, unlike my previous plan to interview the teachers first and then the parents, the interviews were conducted depending on the participants' availability.

Data Analysis

The methods used to analyze the data, the analysis results, validity, trustworthiness, and ethical procedures are described in this section. I used a qualitative nonexperimental method to explore teacher and parent perceptions of technology use among adolescents with diabetes. The UTAUT model, which researchers have used to analyze factors that affect the adoption, acceptance, and use of mobile technologies, was part of the study's scope (see Islam, 2015; Seethamraju et al., 2018). These studies'

results were essential to my research because they indicated that four constructs in the UTAUT model—EE, FC, PE, and SI—influenced behavioral intent to use mobile technology solutions in a meaningful and beneficial way. Seethamraju et al. (2018) validated the predictive capabilities of the UTAUT model in the implementation of health service mobile technologies in developing countries.

In this section, I describe the analysis of the data for the current study, both by hand and by using the MAXQDA data analysis program, Version 2020. I specified the codes and then subjected them to the MAXQDA software's lexical search to identify patterns. Data analysis started with data transcriptions. The data analysis included organizing the data into groups: teacher participants, parent participants, participants from the urban area, and participants from the rural area. I manually transcribed the data, then used several steps to search for the transcriptions. The first phase involved creating a list of all expressions related to the views of the participants. In the lexical search module, the phrases or terms listed served as keywords. The second step was to import the participants' transcribed documents into MAXQDA and organize and divide participants into two levels: teachers and parents. The third stage involved entering the constructed expressions or terms into the lexical search module and executing the search. The search results included coded segments, line numbers linked to the original documents where the coded segments were found, and the search objects. To assess the significant categories or themes, the fourth stage involved reduction and elimination.

To find meaningful segments that would lead to the understanding of parents' and educators' perceptions of mobile technology use by adolescents, I read and reread the

coded segments. I validated the codes or segments by checking them against the original transcribed documents. I eliminated the codes or parts of the transcript that were not clearly indicated or were redundant. Clustering was the final step in which I exported the coded data to a Microsoft Excel file to simplify, condense, and group the codes into categories and core themes for each participant's perspective.

The category process involved grouping or clustering the refined codes into categories. A category is a unit of information consisting of instances, happenings, and events that form concepts or constructs (Bryant et al., 2019). Through in-depth analysis, I determined 15 categories by clustering the codes based on commonalities. According to Creswell and Guetterman (2019), a theme is created by summarizing each category to find the underlying patterns and meanings. To determine trends, I examined the categories for similarities and differences and grouped them into five emerging topics that I formulated into summative explanations. I formulated these statements and correlated with each theme the explanatory and summarized statements.

I preferred to use a mixture of hands-on (manual) and coding software. Because the data set was more extensive, using an automated tool after manual transcription and coding was a much faster and efficient approach. I assigned codes to the participants' transcribed data, after which I merged similar code principles to form categories (see Table 3). The process helped me get a broader sense of the transcribed data. I started with preset codes, but as I read and analyzed the data during the coding process, new codes emerged. Over time, I refined the code frame by adding, collapsing, expanding, and revising the coding categories. For example, some codes were vague and needed to be

broken down into subcodes to better organize the data. The ability to identify new codes is one of the key benefits of a manual approach (Adu, 2019).

Table 3.

Summary of Codes and Categories

Categories	Insights
Mobile technology devices used	• Types of mobile devices used by children with diabetes vary. • Devices are expensive and sometimes not usable because of internet connectivity and reliability.
Perception of technology use	• Teachers and parents perceive technology use positively. • Technology helps children in learning, communication, and monitoring their health issues. • Learning, Social media, communication, games, & entertainment are some of the key drivers of the children's technology environment.
Ease and acceptance of technology use	• Unlike their parents, young people find it easy to use mobile technology. • Technology which is user-friendly is good for a learning environment both in school and managing health. • Peer pressure makes technology more acceptable.
Technology influence	• Technology has positive and negative influences on children and according to the perceptions of teachers and parents, the positive influence outweighs the negatives. • Positive influence includes aiding in Learning/education, promoting lifestyle changes, promoting healthy eating, and enhancing patient and healthcare personnel interaction. • Negative influence includes promotion of peer pressure, negative social media, and age-inappropriate sites and entertainment that cause damage to the character and behavior of a child.
Technology and health management	• Help monitor food intake, monitor health issues, and provide workout ideas, • Support health issue monitoring and enhance patient/physician interaction.
Technology use recommendations and support	• Technology should be readily available and at a low cost so that majority of Kenyans can afford it, • Technology should be user-friendly and internet connectivity should be reliable, equitable, and at low cost, • Technology improvement is needed to enhance learning, • Technology guidance and monitoring both at school and at home is essential for a child's success in learning and appropriately using the technology.

To code the participants' interview data, I assigned labels to words or phrases that represent important and recurring themes in each response. For example, I used easy to remember and recognizable labels, such as "use", "acceptance", "influence", "technology", "affordable", and "ease". I completed the coding process of the transcribed data by identifying different themes and the relationships among them.

When coding my qualitative data in MS Word, comments were used to code the transcribed document and it was ensured that the comment labels were consistent. A single-layer tag was used. Then category sets were created and organized into various themes that span the data of the interview. For example, the data from the parent and teacher interviews were transcribed and categorized by the two counties of Kenya in which those participants live and then coded to explore the themes that arose from the entire collection of interviews. During the coding process, it was noticed that manual word coding resulted in more comprehensive coding, the creation of detailed code descriptions and enabled tracking of comments and emerging data ideas. Support for more comprehensive coding was consistent with Ose's (2016) study, which found that word manual coding ensures that all content, not just words or terms extracted from the text, are coded. According to Ose, for coding extensive data, the entire extraction and consolidation process needs to be re-run each time a code change or an update is made in the source documents. Using the word method produced a flexible Word document of interview data separated into relevant chapters and subchapters.

To extract as many data connections as possible, an interactive data analysis process was used. Further, throughout the process of data analysis, the research question

was constantly kept in view. The data from the interview transcripts of the participants was coded and categorized. To address the research question, participants' responses were examined by defining initial codes that were further analyzed to determine overarching themes (see Table 3). The coding process involved assigning labels to words or phrases that represented important and recurring themes in each response. The labels were words and short phrases that were easy to remember, skim, and organize. While coding the qualitative interview data, a thematic analysis approach was used to look for common themes and concepts. Thematic analysis extracts themes from a text by analyzing the word and sentence structure (Braun et al., 2019).

Participants from two counties in Kenya, Nairobi and Murang'a, were selected to participate in the study. Six participants were teachers teaching adolescents with diabetes, while the remaining eight participants were parents with at least one child with diabetes. The interviews were face-to-face. These triangulation interviews were preferred because they included the researcher's reflexivity to assess parents' and teachers' experiences and perceptions of how diabetic adolescents use mobile technology for health purposes. Data analysis led to five themes (see Table 4) outlining teacher and parent perceptions regarding mobile technology use by diabetic adolescents.

Table 4.

Themes and Categories for Perceptions of Technology use Among Children with Diabetes

Themes	Categories
Technology use: - Communication/Learning	Education: In the era of COVID-19, technology is good for children and it helps in • Learning/schoolwork, • Communication, • Entertainment • Monitoring food intake, • Supporting and monitoring health issues, • Providing workout ideas to children. Types of mobile devices used by children vary and include: • Cellphone/smartphones, • Health monitoring devices such as Dexcom for monitoring diabetes. Parental guidance is needed for children to take full advantage of technology and hence enhance their quality of life.
Technology availability: - Cost/Connectivity	Cost: • Smartphones are not readily available to all children especially from poor families. • Smartphones are expensive in Kenya. • Charging ports are expensive. Connectivity: - • Internet connection, known as bundles in Kenya, is not cheap. • Internet connection is not reliable. • Some regions do not have internet connectivity.
Technology ease of use: - Acceptance	Acceptance of mobile technology use: Technology Acceptance • Accepted by the parents and teachers, • User-friendly: Unlike their parents, children do not find it difficult to use existing technology, • Peer pressure that influences and encourages children to want to follow their peers, • Education/Learning at school and gathering information on the internet.
Technology influence	Influence: Technology has positive and negative influences on children. According to the perceptions of teachers and parents, the positive influence outweighs the negatives.

Themes	Categories
	Positive • Aiding in learning/education • Promoting lifestyle change, • Promoting acceptable behavior, • Promoting healthy eating, • Aiding in monitoring and enhancing patient/physician interaction, • helping in monitoring food intake, health issues, and provides workout ideas. Negative • Promoting peer pressure, • Negative social media, • Age-inappropriate sites, movies, and entertainment. Learning, social media, communication, games, and entertainment are some of the key drivers of the children's technology environment
Technology support	Support: Recommendations for • Low cost • Availability • Reliable • Connectivity • User-friendly • Technology use guidance/monitoring both at school and at home • Control/filters

The categories of perception of the use of technology included keywords and phrases that were identified from the transcribed data of interviews. The text was then systematically searched to find all instances of the use of keywords or phrases. Every time a word was found, the word and its immediate context were copied. Finally, the categories were sorted into piles of similar meaning to identify the themes. To complete my categories, a compare and contrast technique was used. The process of comparison was based on the premise that themes reflect how texts are either identical or distinct from each other (Ryan & Bernard, 2003). The data analysis described in this section

resulted from the interviews of teacher and parent perceptions of mobile technology use. The themes that emerged from the analysis are described below.

Theme 1: Technology Use

The first theme identified was technology use. The theme related to SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya? SQ1 sought to explore the importance of mobile technology as a useful tool for diabetes management. The participants felt that children are engaged in mobile technology use because of the need to communicate, gain knowledge, and manage their health conditions. While four teacher participants perceived mobile technology use as a tool to aid in knowledge acquisition, six parent participants indicated that mobile technology use would boost communication between children, parents, and health providers. However, all participants agreed that mobile technology use could help adolescents manage their health conditions more effectively by allowing quick and effective communication with teachers, parents, and healthcare providers. Adolescents can monitor their health at home or school using mobile technology in a way that would not be possible without it. Therefore, mobile technology use has a significant impact on the lives of adolescents living with diabetes. Adolescents with diabetes collect and maintain an array of information, such as the levels of blood sugar, diet, exercise, and medication, related to their health condition.

One teacher mentioned that "mobile technology use enables interaction between the teacher and children in the learning process outside the classroom environment" (P11). In addition, the use of mobile technology is beneficial as it gives children with

diabetes the ability to instantly know when blood sugar levels rise or fall. Likewise, all parent participants agreed with the teachers that children find mobile technology useful and easy to use. One of the parents stated that "my child uses a mobile phone for schoolwork and communication. Therefore, she has no problem using the mobile phone" (P1). The parent added, "With her diabetes condition, a smartphone helps find information that guides her to manage and get through her illness." Another parent responded, "it is easy for my daughter to monitor her blood sugar levels using the available technology" (P8). All participants indicated that through mobile technology, children communicate and work on their school assignments. For example, one parent responded, "due to COVID-19, Kenyan schools are out, and my child uses mobile technology for his classwork and assignments" (P3). Moreover, the introduction of ICT as a subject in Kenyan schools encouraged and influenced learners to use mobile technology. Ultimately, teacher participants agreed that students need to use technology to research their schoolwork and diabetes treatment services in Kenya.

All teacher participants believed that mobile technology, especially smartphones, is convenient to use in Kenya, where computers are not widely used. The learners use mobile technology to help them manage their nutrition and ensure that the required drugs in the prescribed dosage are used. Three of the teacher participants' transcripts showed that the information regarding nutrition received through mobile technology could be useful in improving food habits and diet-related behaviors of adolescents. All parent participants indicated that mobile technology use could promote healthy eating and discourage unhealthy diets. According to one of the parents' responses, if a child can look

up the nutrition content of a snack or identify a sugary snack through apps, it might be useful for their health. If a meal has many calories or sugar, a child might think twice before seizing the opportunity to consume it.

A teacher participant stated, "I spend time with students with diabetes at school, and I have seen how they struggle to keep up with their blood sugar levels because of poor diet and reliable internet connection." (P11). Another teacher stated that,

> Teachers use mobile technology to gather information about the usage of the prescribed drug for the student and suitable locations for various health services that the students need—where one might take the learners if the health services are required (P2).

According to five of the six teacher participants, health management becomes more manageable with mobile technology because from wherever the user may be located the required information is accessible.

Three teachers' responses indicated that the use of mobile technology is influenced mainly by the need to communicate by calling and texting. One of the teachers stated, "I believe communication influences the use of mobile technology because in Kenya it is the most commonly used method of communication" (P6). However, another teacher indicated that the "current COVID-19 pandemic has brought much uncertainty in the way people live and communicate where almost everything is being done online, including schooling" (P14). All teachers and three parents believed that mobile technology helps communication with the children's guardians or parents and health professionals, such as doctors who treat the students.

Theme 2: Technology Availability

The second identified theme was the availability of technology, which was related to SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology? The theme related to SQ4: What are teachers' and parents' perceptions of mobile technology use as a means to manage the health care in diabetes for adolescents? The two questions were designed to understand the factors that influence technology use and whether the adolescents understand how to use the technology. Data revealed that the participants perceived benefits and convenience of use motivate children to use mobile technology. Six teachers and five parents in this study said that providing reliable internet access and affordable smartphone devices could significantly enhance mobile technology use among adolescents. One of the teachers pointed out that,

> If a regional-specific software is developed that is user-friendly and easily accessible, it may help provide information on diabetes. Preferably technology that brings together all stakeholders, such as patients, healthcare professionals, parents, and teachers. Also, technology needs to be available and affordable to all students with the condition (P5).

The review of the interview transcripts revealed that most participants would like to see a localized technology to provide information about traditional Kenyan food for the benefit of the children who typically eat this food.

All the parent participants agreed with the teachers that a user-friendly and cost-effective technology available to all children living with diabetes could facilitate a better lifestyle change among adolescents. As one of the parents stated, "I think, as a parent of a

child living with diabetes, I really go through a lot because even if the technology is available, it comes with a cost" (P12). In order for adolescents with diabetes to take advantage of mobile technology, it should be affordable. Not all adolescents with diabetes can currently afford smartphones or internet access, called bundles in Kenya. Technology should be accessible to all Kenyans, while internet access should be reliable in all areas of the country to ensure that reliable information can be received at any time. As three of the participants pointed out, the unavailability of reliable internet service is a significant obstacle in providing education. In Kenya, particularly in the rural areas, this can be extremely challenging given the distance between communities and the nearest town where they can connect to the internet.

Theme 3: Technology Ease of Use and Acceptance

The third theme, technology ease of use and acceptance and was related to SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies? Participants' transcribed data revealed that availability that leads to acceptance makes mobile technology suitable for users. While all teacher participants stated that children can easily use the technology because they use it also in school, only three parents believed that their children found it easy to use technology because they use it at home and school to do their schoolwork. Five parents said that children find it easy to use technology because they use various social media platforms such as Facebook and Instagram. All teachers agreed that children under their care use mobile technology with ease because they are already exposed to technology through computer classes. As one teacher indicated, it is effortless for adolescents to use mobile technology because they

are already exposed to technology through computer lessons, which have been introduced in almost all the schools in Kenya.

However, the ease of use of technology does not solve the problems on the ground. A review of the participants' interview transcripts revealed that health facilities are minimal in Kenya. In some areas, they are far from a school or home, and, therefore, mobile technology use could be helpful. All parents believed that a technology network connecting and communicating with healthcare workers or doctors when children's sugar levels fall too low or rise very high is important in Kenya. One parent participant gave an example of a mobile app for farmers developed by university students in Kenya. The app alerts farmers when the soil humidity levels change. As the parent pointed out, "a similar a technology to alert users about sugar levels will be beneficial for Type-1 diabetic children in case of emergency particularly in the areas where reaching the treatment centers require long commutes" (P9). The parent participant added, "currently, my child communicates with me wherever I am, and then I have to struggle to connect to the doctor and get her to the treatment center." With reliable technology, the child and the parent's worry would be eased because the alerts or signals that it sends when it is time to attend to the child. That means, parents, wherever they may be, would get the blood sugar level numbers through the internet. Besides, with minimal effort, mobile technology provides the means for gathering and evaluating health information related to diabetes.

The easy-to-use technology enables parents when not at home to communicate with children to, for example, ask their children to check their sugar level and, if necessary, inject insulin. Parents and adolescents, irrespective of their geographic

location, can know their blood sugar level through the internet. One of the parents said, "With technology, parents do not have to worry about their children's sugar levels when they are at school or visiting friends or relatives because the children can check it themselves" (P10). Another teacher said, "children with diabetes can research their health condition regularly" (P13). For example, students research companies that offer less expensive ways of dealing with diabetes, causes of diabetes, upcoming treatment, the effectiveness of drugs, and health management and prevention. Both teacher and parent participants agreed that the use of mobile technology could benefit children if used properly.

Theme 4: Technology Influence

The fourth theme identified was technology influence. The theme was related to SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology? SQ2 sought to understand what motivates adolescents to use mobile technology. The study revealed that all teachers and seven parent participants were of the opinion that external factors, such as peer pressure and the need to communicate, influence technology use. Only one parent had the opinion that internal factors, such as the socio-economic status of the parents, influence children to use mobile technology. Participants believed that whatever factors motivate children to use technology, the factors could be positive or negative. According to thirteen out of the fourteen participants, technology influence could be beneficial or detrimental to young children. However, one of the parents had a strong negative experience with her daughter's use of technology. For example, this parent said, "as a parent, I am not at ease with how my

child uses technology because I cannot be there all the time watching her when she is surfing the internet" (P4). At the same time, another parent agreed that,

> Mobile technologies, in general, have both positive and negative impacts on kids. Overall, in the context of health and behavior, there are several benefits. In any case, technology makes managing illnesses a lot easier. On the contrary, it can be a major distraction in the child's life in terms of social media, especially if it is not appropriately used (P3).

One of the parent participants said, "age-inappropriate sites, movies and entertainment, learning, social media, communication, games, and entertainment are some of the key drivers of the children's technology environment" (P12). Inappropriate sites are a challenge for parents as they try to control the information their children see/get from the smartphone.

Four teacher participants stated that technological advances influence young people to use mobile technology as they try to fit into modern times. On the other hand, six parent participants expressed that perceived confidence and peer pressure encourage children to want to use mobile technology. All teacher participants' interview transcripts revealed that engaging in social media sometimes benefits children by enhancing communication, social connection, and even technical skills. However, parent participants said that adolescents are at some risk as they experiment with social media because of their inadequate capacity for self-regulation and peer pressure vulnerability.

Theme 5: Technology Support

The fifth theme was technology support and was related to SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology? and SQ4: What are teachers' and parents' perceptions of mobile technology use as a means for managing the health care of adolescents with diabetes? A review of participants' interview data showed that mobile technology might not reach the people without support who need it desperately. As one of the teacher participants said, technology in Kenya is not affordable. Only a few towns in the country have reliable internet access. A parent participant agreed that "even with the available technology in Kenya, it comes with cost putting strain on our budget for proper healthcare of our children with diabetes" (P4). The participants' transcripts revealed that many children with diabetes need support to take full advantage of mobile technology.

However, the use of technology in Kenya is hindered by unreliability of internet connectivity, internet cost, and the affordable cost of smartphones. One of the parents stated, "if internet connectivity in Kenya could be improved and be more reliable, technology might help many children with diabetes to access the right information" (P8). Children, mostly from low-income families, cannot afford the devices and internet connection. Participants' transcripts revealed that very few parents and children own smartphones though the use of cellphone has increased in Kenya. Four teachers and seven parents stated that smartphones and internet services, known as bundles, are costly for ordinary Kenyans. All parent and teacher participants believed technology should be made affordable in Kenya because not all students with diabetes can afford smartphones.

Moreover, the cost of bundles, accessibility, and internet connectivity/network deprive ordinary people of the use of technology.

The transcribed interview data revealed that all participants believed that the Kenyan government should help children with diabetes to get proper treatment when they need it. One of the parents said, "if internet connectivity in Kenya can be improved and be more reliable, technology can help many children with diabetes access the right information and get treatment quickly" (P10). The government should also make sure that smartphones are available and affordable to most Kenyans with diabetes, especially poor people.

All fourteen participants agreed that if the technology would be made readily available in Kenya, it could be useful to students when making healthy lifestyle changes. Moreover, the availability of content on the internet that is easy to use and relevant to their education and health needs is crucial. Using mobile technology, learners can gather information about nutrition management that can guide them to choose proper diet that can improve their health. The participants felt that the ability to use mobile technology is a step in the right direction. The use of mobile technology is beneficial as it gives parents, teachers, and children the ability to instantly know when the child's blood sugar level is high or low. They do not have to worry about their child's sugar levels getting too low or too high because, with mobile technology, they can check the child's blood sugar at any time. However, mobile technologies, in general, have both positive and negative impacts on kids. Overall, in the context of health and behavior, there are several benefits. They make the management of illnesses a lot easier. On the contrary, it can be a significant

distraction in the child's life because of social media, especially if social media is not used properly.

Discrepant Cases

The data analysis revealed certain inconsistencies and discrepant cases. Regarding mobile technology use among adolescents with diabetes, parents and teachers who participated in the current study felt that there was a significant potential for mobile technology to strengthen health services and help prevent or manage diabetes among young people in Kenya. The current study indicates that mobile technology could help everyone regardless of their social and economic status. According to the participants, mobile technology plays a significant role in adolescents' lifestyle changes and BI. Seven parents and all of the teachers had a strong positive impression of adolescents' use of mobile technology. However, despite almost unanimous view on mobile technology use among adolescents by parent participants in the current study, one parent said she was very uncomfortable and did not approve of her child using mobile technology. The parent said, "Because I cannot be there all the time watching her when she is searching on the internet, she spends many hours when I am at work chatting on social media and searching inappropriate materials on the internet" (P7). The parent respondent felt that social media platforms distort reality and give kids an unrealistic view of other people's lives, which destroys families. Further, the parent thought adolescents spend too much time on social media at the expense of schoolwork and family time.

About the ease of use of mobile technology, all the parents agreed that adolescents use technology with ease. While many of the teachers said that students use

technology with ease because they are exposed to computer classes at school, one of the teacher participants in this study said that young people find it difficult to use mobile technology because of lack of exposure and limited internet access. The teacher said, "I believe technology should be made accessible to all students, and connectivity/network made reliable in Kenya to ensure that students use technology with ease. Students are not well exposed or connected to technology" (P6). According to the teacher, limited, unreliable and expensive internet access in Kenya is a major deterrent to the use of mobile technology.

The teacher's views were consistent with TAM, which suggests that perceived convenience of use determines the technology acceptability. According to Verkijika (2018), favorable conditions such as availability and exposure to technology significantly impact mobile technology use intentions. Moreover, TAM proposes a direct link between perceived utility and PEOU, implying that user-friendliness and perceived value are the most significant determinants of actual technology use and are influenced by external factors such as exposure to technology and internet access. In the current study, a teacher said that access and exposure to reliable technology could add a perceived value to technology use. Also, Davis (1989) claimed that PU and ease of use were two factors that influence how people feel about technology. As a result, the variables affect technology users' BI and, as a result, influence technology use.

Data analysis showed that there was almost a clear consensus among teachers and parents on how peer pressure and age influence children's technology use. However, one teacher participant did not view peer pressure as the main factor influencing young

people's use of mobile technology. The participant expressed that the internet, social media, and gaming are influencing children to use technology. The participant added a new dimension by introducing the COVID-19 pandemic as a factor that influenced youth to use mobile technology because they have to do their schoolwork using mobile technology. The participant stated, "Due to the COVID-19 pandemic, schools are closed. Therefore, students are encouraged to use technology for their classwork and assignments." (P2). According to the respondent, the current COVID-19 pandemic brought much uncertainty in the lives of the people in Kenya and the way they communicate. Almost everything is being done online, including schooling. As the country struggles to contain the COVID-19 pandemic and social distancing recommendations remain in place, adolescents are not attending school in person, which means that they are often stuck inside their homes. Consequently, using the internet as a primary means of human connection is breaking barriers that previously separated people, allowing for unparalleled equality in social interactions and opportunities.

Summary of Results

This study applied the UTAUT model to examine parents' and teachers' perceptions of the use of mobile technology by diabetic adolescents. The study sought to address the research question: "What are the perceptions of parents and teachers regarding how adolescents use mobile technology for diabetes management in Kenya?" It gave rise to four subquestions to aid in understanding the phenomenon better. The additional research questions were as follows,

SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?

SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?

SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?

SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?

With these questions, this study took an in-depth look into how, in the perception of their parents and teachers, adolescents utilize mobile technology.

The participants' responses were examined to address the research questions by identifying initial codes. These were further analyzed to determine overarching themes. The data collection and analysis results provided valuable information to address the study questions about mobile technology use by adolescents. The participants' responses were descriptive of their impressions and perceptions of the use of mobile technology. The analysis of the transcribed data resulted in five themes, 1) mobile technology use, 2) mobile technology affordability, 3) mobile technology ease of use and acceptance, 4) mobile technology influence, and 5) mobile technology support.

The purpose of the first sub-question (SQ1) was to determine whether participants consider mobile technology as a valuable tool for their children's education. According to the study's findings, thirteen of the fourteen participants believe mobile technology is a useful tool for adolescents' learning, communication, and health management.

Participants shared a variety of experiences from their homes and schools to demonstrate how access to technology has influenced their personal learning and good health practices. For example, teacher participants stated that students are increasingly using ICT and mobile technology as learning tools. On the other hand, parent participants noted that mobile technology enables children to upload food logs, medications and independently monitor and analyze blood sugar levels. One of the teacher participants said, "With the right technology and devices, students can easily access assignments, communicate with peers, and reach out to their teachers if they have a question." All parents except one felt that through mobile technology their children learn how to manage their health. However, one parent disagreed with the rest of the participants by stating that mobile technology has a negative impact on her child because of its negative influence of social media.

I designed the second sub-question (SQ2) to help in understanding why adolescents use mobile technology. According to the study's findings, all participants believed that mobile technology use is primarily influenced by the need to communicate by calling and texting. In Kenya, mobile phones are among the most widely used modes of communication. Another factor that influences the use of mobile technology is learning and research on the internet and through apps. The teachers expressed that the introduction of ICT as a subject in Kenyan schools has motivated students, particularly in the area of technology use. One of the parents indicated that technological advances are inspiring children to be computer literate to be able to fit in with modern times. Other factors influencing students' acceptance of mobile technology are its ease of use and peer

pressure. Most parent participants said that their children ask for a smartphone because their peers are using them. Other factors that influence the use of mobile technology include the affordability of smartphones and internet services. The more money one has, the more time one is able to spend on the internet.

The third sub-question, (SQ3), was needed to assess whether adolescents understand how to use mobile technology. While five out of the six teacher participants stated that children are comfortable with technology because they use it at school, parents said that children are comfortable using the technology because of social media platforms such as Facebook and Instagram. The parents felt that the children's age and the need to communicate with family and friends make it easy for them to use mobile technology. All teachers agreed that children in their care use mobile technology with ease because they are already exposed to technology through computer classes. According to one teacher, learners find it easy to use mobile technology because they are already exposed to technology through computer lessons that are taught in almost all Kenyan schools.

The purpose of developing the fourth research sub-question (SQ4) was to determine whether adolescents fully utilize mobile technology to improve their health. The participants' transcripts revealed that many children with diabetes require assistance to fully utilize mobile technology for the said purpose. According to one of the parents, "If internet connectivity in Kenya could be improved and made more reliable, technology could help many children with diabetes access the right information." Children, particularly those from low-income families, cannot afford the devices and internet connection. Despite increased cellphone use in Kenya, participants' transcripts revealed

that very few parents and children own smartphones. According to four teachers and seven parents, smartphones and internet services, known as bundles, are prohibitively expensive for ordinary Kenyans. All parent and teacher participants agreed that technology should be made more affordable in Kenya because not all students with diabetes can afford smartphones. Furthermore, the high cost of bundles (internet), accessibility, and internet connectivity/network deprives ordinary people of the ability to use technology.

The study's findings showed an overall positive view of adolescents' mobile technology use as observed by parents and teachers. All the participants had a positive outlook and attitude about mobile technology use by teenagers with diabetes. The participants thought that mobile technology contributes a great deal to adolescents' lifestyle changes and BI. Participants also felt that adolescents with diabetes have embraced mobile technology and found the technology practical and easy to use. The findings were collected taking the contextual framework into account, just as the research questions were based on the framework provided by UTAUT model.

Participants were quick to affirm their approval of mobile technology use because they viewed it as a learning tool. Parent participants stated that mobile technology helps their diabetic teenage children track their blood sugar levels. If the child's condition makes it necessary, the child can be taken to the clinic for treatment. According to parent participants, sugar levels are supposed to be checked periodically even from a remote location. Therefore, mobile technology is an essential device for adolescents to have and use. Parents and their adolescents use mobile technology to search for information

regarding Type 1 diabetes and how they can control it and stabilize blood sugar in case the level rises. However, technology is not always helpful to adolescents because some of them are not putting it to appropriate use. For example, they use technology to download music, comedies, and movies, some of which are not appropriate for their age, and that hinders positive learning.

Teacher participants felt that the use of mobile technology is beneficial because educators could interact with guardians or parents about the child's behavior or performance. Therefore, the study revealed that mobile technology facilitates communication between parents and teachers which helps create relationships between them outside the walls of educational institutions. To study diabetes and other health problems, learners use mobile devices to collect data on how to care for themselves. Mobile technology also facilitates easy and fast communication with healthcare professionals, such as physicians and other healthcare workers who may respond to students' needs. For students, mobile technologies are useful because they use technology to get more information on what they are taught in class. Teachers agreed with the parents that mobile technology exposes students to inappropriate content such as age-inappropriate material on social media that is not suitable for a learning environment. For instance, when children are exposed to negative social media, they tend to neglect their schoolwork.

Both teacher and parent participants indicated primarily positive effects of mobile technology use among adolescents. In contrast, more parents than teachers reported a mostly negative impact of social media. According to all participants, technology use in

adolescents can increase creativity, family communication, social group connection, and improve well-being. However, there are numerous potential risks, such as sending inappropriate content through the internet, excessive use, and compromised privacy. Also, all the participants viewed internet access, the cost and accessibility of devices, and the internet as a major impediment in the use of mobile technologies, especially in rural Kenya. Access to a stable internet network in Kenya is also a major negative factor leading to adolescents' reduced use of mobile technology. All participants also perceived that access to mobile technology could encourage lifestyle change and, thereby, facilitate health improvement.

According to one of the parent participants, mobile technology apps and gadgets can give children vital information about their health. Since children need good food to fuel their bodies, healthy eating is necessary for a healthy lifestyle. On the contrary, a sedentary lifestyle and unhealthy eating habits can hurt children's lives. Respondents also indicated that mobile technology access was an important addition to the health toolkit, promoting adolescent health and learning. Participants described how access to technology has contributed to the enhancement of adolescent personal awareness and the advancement of healthy lifestyle practices. In addition, mobile phones are proving to be effective tools for engaging and mobilizing their children to engage in the economic, social, and political spheres at an early age.

As set out in individual contextual situations, these experiences provided insights into the overall positive perceptions expressed by all participants of the use of mobile technology by adolescents. One source of positive perceptions was that mobile

technology was seen as an important learning and communication tool for teachers, parents, and adolescents. Also, adolescents use mobile technology for researching for their schoolwork, gathering information about health management, and information on managing their health conditions. So, technology can help children learn if used appropriately. Seven parents emphasized that their children's ability to use technology is a step in the right direction. The use of mobile technology is beneficial as it gives children the ability to know instantly when blood sugar levels go high or low. For example, parents do not have to worry about a child's sugar levels getting too low or too high because, with mobile technology, they can read the blood sugar level at any time.

Also, parents believed that through mobile technology, their adolescent children are learning. For example, due to the COVID-19 pandemic, schools are closed thus students use the technology for their classwork and assignments. When confronted with a complex problem in their schoolwork, they use smartphones to Google for answers or information that helps them learn. On the other hand, as a parent or a teacher, one cannot be available all the time to check the internet searches children conduct on their phone, and sometimes they might go to undesirable sites. Technology in Kenya is not at a level where a parent or a teacher can filter the internet material or block phone contents. Internet in Kenya is bought chiefly in bundles that are controlled within individual smartphones. When it comes to monitoring the information children receive over smartphones, the lack of internet filters is a concern and a challenge for parents and teachers. However, using mobile technology, learners can get information about nutrition management that leads to lifestyle changes. They can get information that can guide them

in deciding on a proper diet or the type of food they can eat to prevent illnesses or improve their health.

Parents and teachers can gather information about the usage of prescribed drugs for the student. They can also gather information on suitable locations for various health services that the students need. The content available on the internet must be easy to use and relevant to users in Kenya. Therefore, if the information on the website is well designed and organized so that it is locally understandable, it can be helpful to adolescents when making healthy lifestyle changes. Participants also agreed that, with mobile technology, health management is easier because information can be gathered from wherever and whenever a person gets ill. Consequently, adolescents go online to seek information about a condition on a particular site because his/her peer has mentioned it. The information they get from the internet is sometimes misleading or inaccurate, depending on whether or not they search through several internet sites to confirm the accuracy of the information. Mobile technology also exposes one to a wide variety of information regarding health and how to manage it. However, mobile health technology is yet to penetrate most Kenyan counties. Moreover, according to two parents, the response of medical service in Kenya is more reactive than proactive to a condition or illness. In Kenya, most people seek cure and not preventive measures. A review of the interview transcripts of the participants revealed that mobile technology, particularly smartphones, is convenient and widely used as a communication tool in Kenya. Accordingly, the use of mobile technology enables the various areas of education and social life in Kenya to be explored.

Participants expressed the need for more advanced technology in Kenya to ensure efficient treatment of Type I diabetes. Technology makes it easy to communicate with the child's healthcare workers or doctor when the sugar levels dips too low or rises too high. Currently, the children communicate with their parents or teachers wherever they may be, who then struggle to connect to the doctor and get the children to the clinic for treatment. As mentioned earlier in this chapter, one of the parent participants provided an example of such technology by describing intelligent farming in Kenya. A similar app for Type 1 diabetic children would help connect the parents, the doctors, and the child in case of emergency. With such a technology, the child's and the parent's worry would be eased because the technology would alert or signal that it is time to attend to the children's health.

Another parent participant suggested that the Kenyan government needs to consolidate all the information related to diabetes on mobile technology for easy access. Due to the high cost, most Kenyans rely on the government for their healthcare. Therefore, bringing the information together makes it accessible when needed rather than spending time and money on moving from one town to another, looking for information and treatment. The participants also felt that the government should intervene to make the internet affordable and available throughout the country. According to participants, just a few towns in Kenya have reliable internet access, and the internet is costly for poor Kenyans. By increasing the spread and reducing the cost of using the internet, children could receive faster help and treatment. Overall, this study revealed early exposure, adoption, and use of mobile technology use among young children in urban and rural

communities in Kenya. However, to prevent inappropriate use of technology, teachers and parents need an update of the guidelines to enable them to monitor the use of mobile technology by young children under their care.

The study found no notable differences in how teachers and parents perceive mobile technology use among children with diabetes. Unlike teacher participants, parents were most concerned about the lack of mobile technology that could help them easily access their child's healthcare provider. On the other hand, teacher participants were concerned about using mobile technology to educate children on health management and how to prevent diabetes. Parents indicated that they would like to use mobile technology to contact healthcare professionals to address their diabetic child's needs. Over two-thirds of parent participants had a positive perception of mobile technology use among their children with diabetes. In this study of teachers' and parents' perception of mobile technology use among children with diabetes, there was a high prevalence of participants' concerns about inadequacy of technology to provide easy access to children's healthcare providers. Moreover, these concerns were strongly associated with participants' willingness to adopt mobile technology to monitor and communicate their children's blood sugar level results. However, both teacher and parent participants perceived unstable internet connectivity and providing affordable mobile technology as the challenge's parents, teachers, and children with diabetes faced in accessing and using technology.

Evidence of Trustworthiness

Trustworthiness is established by applying research integrity elements that helped establish and define the study's quality (Amin et al., 2020). Using the guidance issued by the IRB of Walden University, the research recommendations stipulated in the literature as evidence of trustworthiness were followed. According to Amin et al. (2020), trustworthiness is an ingredient apparent in a solid and sound qualitative study. Moreover, documenting the evidence of trustworthiness and authenticity provides the reader with greater confidence in the study and improves the integrality of the results (Amin et al., 2020).

Credibility

The data was collected using a secure digital recording unit and then the recorded data was manually transcribed and checked for accuracy through multiple reviews. It was checked for potential inconsistencies by reading the transcripts to ensure that contexts and meanings were not overlooked. It was ensured that all participants met the selection criteria. The interview procedures and interview questions were reviewed before the interviews to confirm that they were easily comprehended. Biases were prevented by accurately transcribing recorded interviews, gathering participants' feedback, and using an appropriate analysis method. A sample of five data transcription were sent to the participants, and they agreed that their views had been accurately represented. Yin (2016) referred to credibility in qualitative research as the degree to which the findings meet the events or participants' perceptions. To ensure triangulation, teachers and parents were interviewed. Multiple perspective interviews can shed light on complex interactional

processes from various participant perspectives (Vogl et al., 2019). In this study, to assist in triangulation, multiple viewpoints were captured by gathering data from parents because they deal with children in their homes and community environment, and from teachers because they spend a lot of time with children in schools. During analysis, data from the individual interviews were triangulated at a relationship level in which the accounts of related individuals were correlated and incorporated. That is, the data analyzed from the individual teacher's and parent's transcripts blended well with each other, and the results of the data from the two counties complemented each other.

Transferability

Although this study was not designed or intended for generalization, the aim was to gather extensive and rich representations of transferability perceptions of mobile technology use from participants. Furthermore, I presented a detailed explanation of the data collection process for a reader to be able to decide whether the established environment was comparable to another scenario. This was done purposely to increase the possible transferability of findings by presenting baseline knowledge to support future studies. To allow the research to be repeatable and achieve comparable results for further research, a detailed procedure followed in this study is provided. Participants presented detailed information on their views on the use of mobile technology, suggesting that technology could help increase the participation and satisfaction of adolescents with their healthcare. In healthcare, evidence-based decision-making has become a common ideal and, to a lesser degree, in social welfare (Munthe-Kaas et al., 2019). Therefore, perceptions of the use of mobile technologies may be considered important for the

transferability of the results of one study within social care and public health. Adolescents face other health issues besides diabetes, and the findings of this study could be applied to other health issues. The connectivity, affordability, and networking issues are not limited to diabetic children, their resolution will benefit young people with other health issues.

Dependability

Dependability was established by documenting all the data collection processes and performing the analysis in detail. This knowledge of the process enables potential researchers to use the same approach to replicate the study in the same context and obtain comparable outcomes with the same number of participants (Wong & Kowitlawakul, 2020). The codes emerging from parents' and teachers' transcripts were compared and contrasted through a triangulation process that ensured that the encoded data was verifiable and accurate. Also, dependability was developed through a consistent audit trail of the study's goals, design, methodologies for data collection and analysis, and presentation of the study results (Wong & Kowitlawakul, 2020). Dependability was also improved by ensuring that audio recordings were audible and clear to enable reliable coding during the interview sessions.

Conformability

Conformability was created by recording procedures through an audit trail. This allows researchers to monitor the study's progress step-by-step through the decisions taken and the procedures listed (Turner et al., 2020). According to Turner et al., audit trails identify the research measures taken from beginning to end and are a fundamental

approach to determining the conformability of qualitative research findings. The research was carried out in the participants' natural settings and transcripts of the interview and accompanying notes were preserved and archived for potential rehabilitation.

To ensure conformability, precautions were taken to ensure that results were derived from the participants' perceptions and narration and were not derived from their personal prejudices or assumptions. The transcripts of the individual interviews were compared to derive common themes to construct categories that helped extract the results of the study. For documenting the reflective notes, different approaches were used, such as documenting the interviewer's feelings, memories, and conclusions. The documented data collection process illustrates the systematic analysis process followed to gather the data that contributed to the making of the recommendations, the triangulation of the individual interview data in detail, and the disclosure of the researcher's prejudices. During the interview, all of the participants answered similar questions. Rather than from individual responses, the coding and analysis were performed collectively. Various methods were used while making reflective notes, such as recording the researcher's thoughts, experiences, and conclusions. The identification of codes and themes was related to the literature, research questions, and the conceptual framework during data analysis.

Summary

The study intended to gain a deeper understanding of the perceptions of teachers and parents in Kenya about the use of mobile technology by adolescents who have diabetes. The analysis of the participants' interviews revealed that all participants

believed that the use of mobile technology is beneficial to young people, especially adolescents with diabetes. However, all the participants were unanimous that reliable mobile health technology is yet to penetrate most Kenyan counties. Also, mobile technology use is influenced mainly by the affordability of a smartphone, reliable internet, and the need to communicate through calling and texting. The clarification of the analysis results, a potential explanation for the findings, and interpretation of the results are presented in Chapter 5. That chapter is focused on the consequences of the findings and discusses the study's limitations, the impact on social change, and future research recommendations.

Chapter 5: Discussion, Conclusions, and Recommendations

This basic qualitative study addressed teacher and parent perceptions of adolescents with diabetes and their mobile technology use. As a promising health self-management strategy, mobile technology can serve as a lifestyle instrument to improve longevity and reduce ongoing negative health circumstances (Fedele et al., 2017). However, very little is known about how mobile technology is seen or used by individuals as a tool to manage chronic disease (Robbins et al., 2017). Mobile technology is the use of smartphones, tablets, and other mobile devices for learning, communicating, and delivering health care and preventive health services, especially in developing nations. However, there are insufficient mobile technology tools in developing countries to address the prevalence of adolescent chronic diseases such as diabetes (Latif et al., 2017).

Diabetes requires long-term monitoring and strict control of blood glucose levels with insulin replacement therapy, with a view to stabilizing it (Hamilton et al., 2017). Moreover, physical and psychosocial issues often arise from the diagnosis. Therefore, parents and teachers are best situated to provide essential support in helping children under their care to get to manage the diagnosis. By addressing the common problems that arise in the ongoing management of day-to-day challenges, parents and teachers help children manage this chronic condition.

The current study focused on parent and teacher perceptions of adolescents with diabetes use of mobile technology by applying the UTAUT model. I sought to address this central research questions: What are the perceptions of parents and teachers

regarding how adolescents use mobile technology for diabetic management in Kenya? I also addressed the following subquestions:

SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?

SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?

SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?

SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?

The analysis of the participants' transcribed interview data led to identification of five themes that addressed the research questions (see Table 5). The theme that addressed SQ1 was technology use. The theme technology availability addressed SQ2 and SQ4. The theme technology ease of use and acceptance addressed SQ3, while the theme technology influence addressed SQ2. Finally, the theme technology support addressed SQ2 and SQ4.

Table 5.

Relationships of Themes to Research Questions

Theme	SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?	SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?	SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?	SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?	CRQ: What are the perceptions of parents and teachers regarding how adolescents use mobile technology for diabetic management in Kenya?
Theme 1: Technology Use	Help in learning and entertainment. Makes it easy to communicate.	Perceived benefits and convenience Available and cost-effective technology.	Perceived usefulness Perceived utility	Better health outcomes. Improve access to primary health care.	Communicate with family members and stay close to peers who could provide support.
Theme 2: Technology Availability	User-friendly and easily accessible software.	Internet access and affordable smartphone devices.	Unreliable and expensive.	Away from home use. Communicate with parents and health care workers.	Essential tool to reduce or prevent the development of diabetes.
Theme 3: Technology Ease of Use and Acceptance	Age and peer pressure.	User friendly. Social media. Peer pressure. Schoolwork.	Attitudes toward technology. Behavioral intentions.	lack of exposure limited internet access.	Communication, social media, learning, and surfing the internet.

Theme	SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya?	SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology?	SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies?	SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents?	CRQ: What are the perceptions of parents and teachers regarding how adolescents use mobile technology for diabetic management in Kenya?
Theme 4: Technology Influence	Peer pressure. Social Media. Communication and entertainment. Learning.	Technology availability. Promotion of peer pressure. Social media.	Learning process Communication tool.	Communicate with healthcare workers or doctors. Makes managing illnesses a lot easier.	Social factors and facilitation influence mobile technology acceptance and success.
Theme 5: Technology Support	Facilitating conditions. Reliable and reduced cost of internet services.	Reliable and affordable internet service.	Availability of resources and skills.	Promotes lifestyle changes, healthy eating, and acceptable behavior.	Reliable and affordable internet service makes mobile technology use more beneficial.

The analysis supported one of the constructs of the UTAUT, the TAM developed by Davis (1986), which deals with the prediction of the acceptability of an information system. UTAUT contributed to my study by providing a framework to explain the acceptance of information technology and articulate the use of such technologies (see Chao, 2019). The model's theoretical basis aided the study in exploring the perceived intention of using mobile technologies. In this chapter, I present and interpret the study findings in relation to the study questions. I also present the study's limitations, recommendations for future research and practice, and implications. The chapter ends with a conclusion of the study.

Interpretation of Findings

All themes that emerged from the study were related to the central research question: What are the perceptions of parents and teachers regarding how adolescents use mobile technology for diabetic management in Kenya? The five themes of technology use, technology ease of use and acceptance, technology availability, technology influence, and technology support that emerged from coding were also based on the UTAUT, which researchers had adopted to analyze factors that influence the adoption, acceptance, and use of mobile-based technologies (Islam, 2015; Seethamraju et al., 2018). The results of these studies were essential to my research because they indicated that four constructs in the UTAUT model—EE, FC, PE, and SI—influenced behavioral intent to use mobile technology solutions in a meaningful and beneficial way. Seethamraju et al. (2018) validated the predictive capabilities of the UTAUT model in the implementation of health service mobile technologies in developing countries.

The first theme, technology use, was related to SQ1: What are teachers' and parents' perceptions regarding the usefulness of mobile technology as an educational tool in Kenya? The results showed that mobile technology use among adolescents with diabetes in Kenya appears feasible and acceptable. Also, mobile technology use could be beneficial to children if appropriately used. However, mobile technology use is hindered by unreliable internet access, particularly in rural areas. The study findings also showed that mobile technology use motivates students to learn and communicate with friends and family. In addition, the findings showed that adolescents use mobile technology for social media and surfing the internet.

The current study findings were consistent with the TRA that attempts to clarify and describe the relationship between attitudes and behaviors within human actions (Tuck & Riley, 2017). Tuck and Riley (2017) suggested that an individual's decision to engage in a particular behavior is based on the consequences they believe will emerge as a result of their actions. The current study findings showed that teacher participants perceived mobile technology use as a factor that motivates students to learn. This finding was consistent with a study by Domingo and Garganté (2016), who suggested teachers' perspectives on the use of mobile technology to improve learning reflect their perceptions of how this technology influences learning processes. Unlike teachers in the current study who saw mobile technology as an educational tool, parents in the current study perceived mobile technology as a communication tool to contact and exchange views with their children.

Participants in the current study indicated that mobile technology use enables education and social life areas to be explored and covered by gathering information quickly. This was consistent with the findings of Ippoliti and L'Engle (2017) that mobile technology use is widely recognized as a useful tool to reach young people. In another study on mobile technology use in diabetes management, Hannon et al. (2018) found that technology has improved the self-management of chronic diseases such as diabetes. The improvement is due to blood glucose self-monitoring technologies that have facilitated parental monitoring of blood glucose remotely in real time. Although teacher participants in the current study perceived mobile technology use as a tool to aid in knowledge acquisition, parent participants indicated that mobile technology use would boost communication between children, parents, and health providers. Therefore, mobile technology use could help adolescents manage their health conditions more effectively by allowing quick and effective communication with teachers, parents, and health care providers.

The second theme, technology availability, was related to SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology? This theme was also related to SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents? A finding from the current study showed that mobile technology use could help everyone regardless of their social and economic status. This finding was consistent with a study by Khan et al. (2019) that showed that children from various social backgrounds often benefit from mobile technologies in equal measure. However, current teacher and parent

participants indicated that a big gap exists between the mobile technology use between the haves and the have-nots. Participants reported that there are more mobile users in urban areas than rural regions due to unreliable internet access in some rural parts of Kenya. Current study findings were consistent with the Davis (1986) TAM, which forecasts the acceptability of the process and considers the changes required to the system to make it suitable for users. Technology in Kenya is not affordable, and only a few towns have reliable internet access. As the parent participants reported, technology services in Kenya come at a cost, thereby putting a strain on subscribers' budget for proper health care of their children with diabetes. While examining the actions of users of the electronic learning platform via the UTAUT model, Jaya et al. (2017) found that social factors and facilitation are positively affected by the degree of acceptance and mobile learning performance.

Facilitating conditions play a critical role and create a direct impact on the use of any system (Hamzat & Mabawonku, 2018). According to Triandis (1979), behavior cannot occur without the required objective environmental conditions. The use of technology in Kenya is hindered by internet reliability, internet connectivity, internet cost, and smartphone affordability. The current study revealed that if technology in Kenya were readily available, it could be useful to children when making healthy lifestyle changes. Moreover, Musyimi et al. (2018) indicated that mobile technology use can improve primary health care access, particularly in rural areas with limited access to health information. An increase in the accessibility to mHealth has created and

encouraged willingness to use it for medical intervention, possibly due to its perceived benefits (Kirui, 2018).

The technology ease of use and acceptance theme was related to SQ3: How do teachers and parents perceive the ease with which adolescents use mobile technologies? Study finding showed streamlined services may provide outreach and motivate behavioral changes that may benefit adolescents with diabetes. In addition, advances in mobile technology may make it easier for adolescents to manage diabetes and provide opportunities for them to share the burden of care with others with similar conditions. The results were consistent with TAM, which suggests that two key factors determine the information system's acceptability: perception of benefit and the perceived convenience of use (Davis, 1986). The current study revealed that the ease of use and peer pressure are key factors in influencing the adolescent's acceptance of mobile technology. According to Verkijika (2018), motivation, encouraging condition, perceived confidence, social influence, and perceived risk significantly impact mobile technology use intentions. Also, Chao (2019) concluded that the UTAUT model provides a framework that explains both the acceptance of information technology and its practical use. Because UTAUT is typically used in research and practice to explain the degree of information technology acceptance, UTAUT is also adopted in studies focusing on mobile services' acceptance and use (Dwivedi et al., 2017).

The fourth theme, technology influence, was related to SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology? The teachers expressed that the introduction of ICT as a subject in Kenyan schools has

motivated children to use technology. Results from this study indicated that advancements in technology are inspiring children to use mobile technology. Ease of use of technology and peer pressure are other factors influencing students' acceptance of mobile technology. Most parent participants indicated that their children ask for a smartphone because their peers are using them. Also, other factors that influence mobile technology use include the affordability of smartphones and internet services. Findings from this study were consistent with TAM's forecast that predicts user-friendliness and perceived value are the most important determinants of mobile technology use and are influenced by external variables (Davis, 1986). Anderson-Lewis et al. (2018) found mobile technology has the potential to influence attitudes toward health via public health initiatives and health education, particularly among underserved populations.

The current study indicated a consensus among teachers and parents that one of the factors that influences mobile technology use among adolescents is peer pressure. Parents indicated that peer pressure encouraged their children to want to use mobile technology, whereas teacher participants stated that technology advancement influences young people to use technology. Jaya et al. (2017), while analyzing the behavior of electronic learning platform users via the UTAUT model, found that social factors and facilitation positively influence mobile users' degree of acceptance and success. Teacher and parent participants' perceptions in the current study echoed the Jaya et al. finding by indicating that social factors such as communicating with family and friends as well as the availability of smartphones and internet access influences technology use among adolescents. Moreover, Davis (1989) discussed perceived usefulness and PEOU and

suggested that these two factors determine users' attitudes toward technology. Subsequently, the factors impact technology users' behavioral intentions and influence the technology use.

The technology support theme was related to SQ2: What factors do teachers and parents perceive influence adolescents to use mobile technology? This theme was also related to SQ4: What are teacher and parent perceptions of mobile technology use as a means to manage the health care of diabetes for adolescents? Results indicated that, with reliable and affordable internet service, adolescents could benefit from mobile technology to self-manage their diabetes, which could lead to improved health for adolescents in Kenya. This study findings were consistent with Jaya et al.'s (2017) findings, which indicated that if people have easy access to technical support using certain technologies, they are more likely to use that technology. Moreover, Jay et al. suggested that facilitating conditions forecast the presumed desire of individuals to use mobile technology.

Therefore, the availability of resources, skills, and technical infrastructure may play a significant role in the use of mobile technology among diabetic youth (Hamzat & Mabawonku, 2018). The current findings indicated that children with diabetes need support to take full advantage of mobile technology. For example, internet connections and affordable devices could be made available to low-income families. As Kazi et al. (2017) observed, access to mobile technology is not evenly distributed in Kenya. Some communities have lower technology literacy levels, less exposure to mobile technologies,

and less reliable network connectivity than others. Also, teachers and parents should monitor children's mobile technology use to minimize inappropriate use.

In their research, Hilliard et al. (2018) observed that supporting parental involvement in adolescent diabetes self-management promotes optimal diabetes outcomes. As Muralidharan et al. (2017) observed, mobile technology could improve diabetes patients' outcomes with added support from healthcare professionals. In addition, Adepoju et al. (2017) determined that evidence provided on cell technology usage as a clinical decision support system is a sign of growth in the domain. It can enhance healthcare service delivery in low-resource settings. Participants in this study had similar perceptions that mobile technology access was an important addition to the healthcare toolkit, promoting adolescent health and learning. Besides, participants described how access to technology has contributed to enhancing adolescents' personal awareness and the advancement of healthy lifestyle practices. FC play a critical role and create a direct impact on the use of any system (Hamzat & Mabawonku, 2018). According to Triandis (1979), behavior cannot occur in the absence of the required objective environmental conditions.

Overall, the study found that teachers and parents encouraged the use of mobile technology for communication, health management, and social networks. The study idicated that without a social network, mobile technology has little value. In addition, teachers and parents indicated that most mobile technology users use it to reach out to a family member or a friend. Previous work has shown that access to and through mobile technology has allowed communication between family members, friends, and co-

workers (Bennett et al., 2018). Moreover, MPCU learning theory is based on the idea that people learn in the context of social interactions and experiences by watching what others do (observation) (Thompson et al., 1991). Findings from this study indicate that adolescents use mobile devices not only to communicate with family members but also to stay close to their peers who could provide support.

In addition, the PC utilization model suggests that social factors impact the use and perceived effects of BI, which subsequently affect actions. Most participants in this study expressed that mobile technology provides BI that influences adolescents to connect to family members and peers in novel ways. Technology also provides youth with anonymous avenues for seeking health information, especially in diabetes care. The participants' sentiments agreed with the findings of Jaya et al. (2017) that suggested that social factors and facilitation positively influence mobile technology acceptance and success. In this context, peer pressure to use technology is one of the primary means of SI. Parents and teachers in this study indicated that one of the factors that influence mobile technology use among adolescents is peer pressure.

This study has shown that the use of mobile technology among adolescents with diabetes in Kenya seems feasible and acceptable. Also, if properly used, mobile technology may help children overcome health issues such as diabetes. However, the use of mobile technology is hampered by poor access to the internet, particularly in rural areas. Also, the study findings indicate that adolescents use mobile technology for social media and internet surfing. This study demonstrates, based on teachers' and parents' perceptions, the feasibility of mobile technology use among adolescents with diabetes.

The findings of the study may become an essential tool to help in diabetes management or prevent the development of diabetes among adolescents in Kenya. Mobile technology is increasingly being used to enhance health service delivery in peripheral areas (Kliner et al., 2013). This stance is consistent with the position of Kirui et al. (2012) on the advantages of mobile technology in the fight against rural poverty. Furthermore, Khan et al. (2019) found that mobile technology is a feasible option for providing all regions in developing countries with quality education. Their research showed that, regardless of how experienced the students are in the use of it, mobile technology positively influences all students.

Insights gained from teacher and parent participants' perceptions may encourage and help to successfully respond to a wide range of barriers to adolescents' adherence to diabetes management, thus creating healthy communities. With current technological innovations, clinical and research communities continue to have hope for self-management of diabetes. Effective communication between providers, patients, and caregivers is, therefore, essential to overcome the many challenges faced by adolescents with diabetes and to improve treatment adherence and, therefore, influence social change. Therefore, it was important to learn the parents' and teachers' perception about mobile technology. The results of this study, arising from a need to better understand these perceptions, may help adolescents in developing countries to adopt beneficial lifestyle changes, make better health management decisions, and make more effective use of this technology. The current study findings may help mobile health technology software

designers to improve the learning tools to bring about high-level satisfaction in the health management and preventive environment.

Limitations of the Study

There are some drawbacks of this research that should be addressed in future studies. First, the study relied heavily on teachers' and parents' perceptions and excluded adolescents' perceptions. Second, participants in this study were limited to parents with at least one diabetic child and teachers who teach diabetic children. Also, the participants were limited to those having basic knowledge of mobile technology. Further, the participants were selected for being residents of particular geographical regions, namely, Nairobi and Murang'a counties. There are forty-seven counties in Kenya and conducting the study in two counties may have introduced bias in the interpretation of the findings. The proximity of the two counties limited the addition to diversity of the sample from rural regions of Kenya that may not have the health facilities comparable to those in the two counties. Expanding the research to include other counties in the country could reduce the bias. Furthermore, assumptions restricted this study. It was assumed that participants in the study understood the intent of the research and interview questions were constructed to be answered honestly. It was assumed that participants could accurately remember their experiences. Also, through the perspectives and experiences of the participants, it was believed that reactions contained rich and thick explanations.

By asking clarifying questions, I tried to make sure that the study participants understood the intent of the study and the interview questions, but some questions may have been misunderstood or misinterpreted. The study participants, however, replied to

all the study questions and displayed little or no hesitation in answering any of the questions. Although the research questions may have restricted the study, the research questions were checked by the methodologist to improve their consistency and accuracy. Also, trial interviews were conducted with four persons in my advanced qualitative research class to improve the research questions. However, omission of asking appropriate questions as intended may have limited the study's results. Furthermore, interviewees may not have expressed their true opinions when responding to questions, which may have resulted in errors in the findings. When analyzing research findings, this problem was carefully addressed by contrasting the data results derived from the responses of the parents and the teachers.

Recommendations

The results from this study indicated that mobile-enabled methods undoubtedly play an unparalleled role among adolescents in the management of their diabetes. The findings were based on the use of mobile technology by adolescents with diabetes and may thus benefit from a comparison of the results obtained from the same model for adolescents with a broader spectrum of chronic conditions. However, we need to pay attention to their possible limitations, including intergenerational gaps in ownership of smart devices and the digital divide in the internet access. Ten out of fourteen (71%) of the participants said that many adolescents who need a smartphone could not afford it and that access to the internet is limited. Even those who can afford a smartphone cannot provide it to all members of the household. Future studies might examine why a large number of adolescents in Kenya cannot afford a smartphone or access internet services.

Seven out of the nine parents who participated in this study said that they had difficulty in maintaining internet services on their smartphones and providing one to their children. Wu et al. (2021) defined digitally deprived groups as groups of individuals who are far from a digital technology for economic, social, and cultural reasons.

Teachers and parents indicated that a large proportion of Kenyan populations is digitally deprived. Mobile technology forms the basis of mobile health, but most people in Kenya do not use mobile phones to access the internet. Of these there are two categories: those who own a mobile phone but do not use it to access the internet and those who do not own a mobile phone (Wu et al., 2021). In the digitalization process, we must recognize that alternative solutions need to be offered to such digitally deprived groups as adolescents in rural Kenya so that they are not left behind by developments in mobile health technology. Future research should focus on the impact of region-specific mobile technology on diabetes management and the availability and cost-effective technology. Also, the research could be extended to other counties besides the two included in this study to get a more comprehensive result.

With a dramatic increase in the use of mobile technology in low-and middle-income countries such as Kenya, mobile technology has a great potential to make health services directly available to people and improve care engagement (Kazi et al., 2017). However, accessing mobile technology in rural settings in Kenya may pose significant challenges and opportunities where connectivity is minimal, but the impact of such technologies would be enormous. Future studies should explore why there exist huge disparities in the internet connectivity in Kenya. Despite regional differences, a great

proportion of participants from Nairobi and Murang'a expressed their desire that they would like to see their adolescent children use mobile technology for their healthcare. Overall, participants indicated that they would like the Kenyan government to do more to ensure that all people who need access to affordable mobile have it, regardless of their social-economic status or region.

All the participants indicated that mobile technology use enables exploration of various areas of education and social life and gathering required information quickly. Therefore, future studies should look into developing a user-friendly technology that is region-specific. That is, design software that can be accessed quickly and can bring together all the stakeholders—patients, healthcare workers, doctors, and parents. The technology should be made accessible to all and the internet connectivity/network made reliable in all regions of Kenya to ensure that information can be received at anytime and anywhere. In addition, future studies could use a design-based study approach to lay out mobile-enabled patient education for the self-control of diabetes in a Kenyan setting.

Implications

This study was conducted in an attempt to fill a gap in the literature and gain a better understanding of how teachers and parents perceive the use of mobile technology by diabetic adolescents in Kenya. The purpose of this basic qualitative research study was to explore parents' and teachers' perceptions of the use of mobile technology in diabetic care in Kenya. This section discusses the implications for practice and for future research.

Research Implications

This study showed that access to health services in most regions in Kenya can be minimal. All the participants felt that there is a need to make technology user-friendly and affordable because not all students with diabetes can afford smartphones. Technology should also be made accessible to all, and connectivity/network made reliable in some areas in Kenya. The study showed that adolescents use mobile technology for communication, social media, learning, and surfing the internet.

Participants showed a desire for the use of mobile technologies, which they believed would improve the quality of their children's lives but which they said were out of their reach. These technologies included smartphones and reliable and affordable internet bundles. Despite the appetite for it, there was a lack of clarity about what such technologies should include or look like in the Kenyan context. Current study findings indicate that most participants would like to see a mobile health app designed for developing countries to cater to their diabetic children's needs. The reliability of internet services was another issue that the study revealed. A reliable network is one that delivers information to a user anywhere and at any time. Access to mobile technology is thus not evenly distributed in Kenya and some communities have lower levels of technology literacy, exposure to mobile technologies, and less reliable network connectivity than others (Kazi et al., 2017). With reliable and affordable internet service, there is a significant potential for greater use of mobile technology to strengthen health services and help prevent or manage diabetes among young people in Kenya. However, mobile technology use is hindered by unreliable internet access, particularly in rural areas.

Practical Implications

Findings indicate that there is a notable potential for the use of mobile technology to strengthen health services and help prevent or manage diabetes among young people in Kenya, which can bring about positive social change. Also, current study findings show that mobile technology use among adolescents with diabetes in Kenya appears feasible and acceptable. Mobile technology has several benefits for adolescents with diabetes in the context of health management. Technology makes managing illnesses a lot easier. On the contrary, it can be a major distraction to the child's life in terms of behavior due to social media's influence, especially if it is not appropriately used. Technology is not always useful to adolescents because some of them are not using it productively. For example, they use technology to download music, comedies, and movies, some of which are not age appropriate. This hinders positive learning. Two teachers and five parents indicated that children use technology to access inappropriate sites on their smartphones. Therefore, parents and teachers should devise a mechanism to monitor use of technology by children.

My study also revealed accessibility and usability issues with mobile technology in Kenya within the social-economically disadvantaged groups—such as the inability to purchase smartphones and internet services. Also, due to physical distancing and near-complete global lockdown, mobile technology and digital social networks play an unparalleled role in health information exchange (Wu et al., 2021). In the self-media age, mobile technology users increasingly regard influencers as trustworthy sources of knowledge within their peer networks. However, this approach lacks the knowledge and

responsibilities associated with the inspection and dissemination of information, which encourages the dissemination of disinformation that destabilizes public trust and threatens public health (Wu et al., 2021). One of the parent participants said that, "age-inappropriate sites, movies and entertainment, learning, social media, communication, games, and entertainment are some of the key drivers in the children's technology environment" (P1). Therefore, parental control on their children's access the internet is essential.

Implications for Social Change

The study may offer positive social change by providing new insights for the self-management of diabetes that can lead to improving health for adolescents with diabetes in Kenya. Findings from the study indicate that adolescents with diabetes might benefit from mobile health technologies' services. Adolescents could take a more proactive role in their diabetes care by using mobile technologies to develop skills and confidence to manage their diabetes independently. Also, the cognitive and emotional barriers of adolescents confronting diabetes alone could be diminished by encouraging supportive family involvement in diabetes management and avoid diabetes-specific family conflict. Streamlined services might provide outreach and motivate behavior change that may benefit adolescents with diabetes. Moreover, advances in mobile technology might simplify adolescents' diabetes management and provide opportunities for them to share the burdens of care. Insights from teacher- and parent-participants' perceptions might encourage and help in successfully overcoming numerous obstacles to adherence that adolescents face and create healthy communities. With the current technology

innovations, clinical and research communities continue to have hope for diabetes self-management. Therefore, effective communication between providers, patients, and caregivers is essential to overcome numerous challenges facing diabetic adolescents and improve adherence and bring about positive social change.

Conclusions

This study explored parent and teacher perceptions regarding how adolescents use mobile technology for management of diabetes in Kenya. The findings show that mobile technology use among adolescents with diabetes in Kenya appears feasible and acceptable. Also, mobile technology use could be beneficial to children if appropriately used. However, mobile technology use is hindered by unreliable internet access, particularly in rural areas. In addition, the study findings show that adolescents use mobile technology for communication, social media, learning, and surfing the internet. The results also show that, with reliable and affordable internet service, an adolescent could take advantage of mobile technology for the self-management of diabetes that might lead to improved health for adolescents in Kenya. Based on teachers' and parents' perceptions, this study demonstrates the feasibility of using mobile technology by adolescents with diabetes. The study findings may become an essential tool in reducing the impact of diabetes among adolescents in Kenya.

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Appendix A: Invitee Letter

Dear Invitee,

My name is Francis Kanyugi, and I am a doctoral student at Walden University's Richard W. Riley College of Education and Leadership. I am kindly requesting your participation in a doctoral research study that I am conducting titled: Parent and Teacher Perceptions of Mobile Enabled Education for Adolescents with Diabetes in Kenya. The intention of my study is to analyze the behavior patterns of diabetic adolescent's use of mobile technology as perceived by parents and teachers in order to find out whether the implementation of the technology is well accepted and utilized by the user for health benefits. Participation is completely voluntary, and you may withdraw from the study at any time. Your participation in the research will be of great importance to assist in social change in ensuring that diabetic adolescents are taking advantage of services provided by mobile health technologies. Thank you for your time and participation.

Sincerely,

Francis Kanyugi

M.A. M.S, Doctoral Student, Walden University.

Appendix B: Recruiting Script

Hello, my name is Francis Kanyugi, and I am a doctoral student at Walden University's Richard W. Riley College of Education and Leadership. I am in the Educational Technology & Design Program. I am calling to invite you to participate in a research study about perceptions of mobile technology use by adolescents with diabetes.

Your participation in this study is completely voluntary. This means that you do not have to participate in this study unless you want to.

I will be collecting information from you during this phone call. Before I ask you the screening questions, I would like to tell you about what I will be doing with the information you give me.

I will use the information you will provide to aid in understanding how teachers, parents, and diabetic adolescents use mobile technology to address issues associated with diabetes. This information could then be used to develop ways to further educate parents, teachers, and adolescents regarding the use of mobile technologies to assist in minimizing health risks associated with diabetes.

Your personal information will not be kept if you choose not to enroll in the study or if you do not qualify to be in the study.

Would you be willing to answer some questions to help me determine if you are eligible for this study? (If yes, proceed; if no thank them for their time and end the call).

Good. I will ask two questions. Please answer yes or no to each question. You may answer them individually as I ask it or wait until I am done asking.

1. Are you familiar with mobile technology terms such as texting, apps, Internet, connectivity, and Social networking?
2. Have you ever used mobile technologies such as text messaging and applications?

Is your response to any of these questions "yes?" (If person says no, thank them for their time and that they are not eligible for the study. If they answer yes, proceed)

Do you have any questions?

Are you willing to participate in this study? (If person says no, thank them for their time. If they answer yes, proceed)

I will be calling you in three days to let you know the date and the location of the interview. Meanwhile, I will text, WhatsApp, or email the consent form for you to sign. Please have the signed form ready on interview day. I will collect them before the start the interview.

If you have any questions or if you decide to change your mind on participation in the research, I can be reached at +1 703 732 5284 or Francis.Kanyugi@WaldenU.edu.