Exploring Psychosocial Challenges in Type-1 Diabetes Self-Management During Transition to College as a Foundation for Informed Design of Personalized Technological Aids

Philip H. Schroeder[1]; Dylan A. Hazlett[1]; Syeda Z. Narmeen[2]; Kelly E. McCain[3]; Taylor K. Puhl[2]; Rupa S. Valdez[2]

[1]Dept. of Systems and Information Engineering, University of Virginia, Charlottesville, VA, USA;
[2]Dept. of Public Health, University of Virginia, Charlottesville, VA, USA;
[3]Dept. of Biology, University of Virginia, Charlottesville, VA, USA;

Summary
There is growing literature suggesting that T1D self-management presents significant psychosocial challenges, particularly for incoming college students during the transition to their new social environment. However, little research explores design interventions to address these challenges. This study aims to understand the psychosocial aspects of transitioning to college and their effect on how individuals manage their T1D. Five themes related to T1D self-management in college were identified after qualitative analysis of 12 semi-structured phone interviews: self-care in daily activities, public attention and perceptions, social support, mindset towards self-care, and technology for self-care tasks. These themes informed design recommendations for a potential platform that allows those with T1D to 1) connect with one another to build social support within university communities and 2) catalog questions and advice regarding personal experiences with T1D self-management.

1. Introduction

1.1. Overview of Type 1 Diabetes

Type 1 diabetes (T1D), typically diagnosed during childhood or adolescence, is an autoimmune reaction that prevents the pancreas from producing insulin, a hormone that facilitates cellular glucose uptake and allows for homeostatic regulation of blood glucose levels[1]. T1D currently accounts for 5% of all diabetes mellitus cases and is expected to increase in prevalence by 70% before 2020[1,2]. With an inability to produce insulin, people with T1D must continuously monitor their blood glucose levels and administer insulin appropriately. Failure to do so correctly can quickly lead to blood glucose levels that are too high, hyperglycemia, or too low, hypoglycemia, which can present serious health risks. Hyperglycemia, if prolonged, can lead to neuropathy, kidney failure, cataracts, infection, and vascular disease[3]. Hypoglycemia is accompanied by both physiological and neuroglycopenic responses, including anger, confusion, shivering, shaking, and, in severe cases, death[4].

1.2. Challenges of Type 1 Diabetes Self-Management

Although guided by physicians, the monitoring and regulation of blood glucose levels is primarily devolved to the individual with T1D. The illness work associated with T1D self-management includes checking blood glucose and administering insulin, which involves determining target pre-meal glucose levels, the carbohydrate content of each meal, and the amount of insulin needed to counter the post-meal rise in blood glucose[5,6]. Well-documented barriers to accomplishing this work include lack of discipline or motivation, strain of other illnesses, misunderstanding of disease or poor education, inconvenience, and inability to access necessary supplies[5-7].

In addition to these challenges, there is growing literature suggesting that psychosocial challenges of T1D management can reduce discipline with self-care tasks and hinder social well-being. For example, the stress and anxiety associated with performing self-care tasks in public settings have been shown to present significant barriers to consistently executing self-care tasks for those with T1D[8,9]. With life changes, such as moving away from home and transitioning to college, overcoming such psychosocial challenges can become even more difficult[10].

1.3. Current Technologies that Aid Type 1 Diabetes Self-Management

Current technologies for T1D are designed to aid with the procedural tasks of self-management, such as measuring blood glucose, administering insulin, and tracking diet. For example, continuous glucose monitors, which provide for more reliable measures of glucose levels while eliminating the need for constantly pricking fingers for blood, have proven very useful, with many users considering the devices to be life changing and invaluable[11]. Additionally, insulin pumps can be used to replace manual insulin injections, providing for superior management of blood glucose levels, greater ease with planning meals, and increased overall freedom with life activities[12]. Finally, a variety of smartphone or web-based applications, such as Glooko, Sugar Sense, bant, and others, are available to help individuals manage and track diet and blood glucose levels[13]. Although they may reduce the psychosocial challenges of self-management by allowing for more discrete execution of tasks in public setting, these devices fail to directly address the psychosocial challenges of T1D self-care[11-13]. In all, there is a lack of technology that provides support for the social, emotional, and psychological challenges of T1D management, despite growing evidence that such challenges present significant barriers to performing self-management tasks[8-10].

1.4. Increased Psychosocial Challenges of Type 1 Diabetes Self-Management in Transition to College

Young adults with T1D who are entering college are particularly vulnerable to the psychosocial challenges of self-management, as many new obstacles arise during this transition[10,14]. The different social environment and living arrangements of college, along with decreased emotional support from family, reduced access to familiar resources, increased exposure to drugs and alcohol, restricted dietary options and less regular mealtimes, increased self-dependence and academic pressure, and reduction in privacy all make for a diverse array of new barriers that can exacerbate the anxiety and stress associated with managing T1D[6].

The first year of college comes with a lack of familiarity with peers and increased exposure to unpredictable social encounters. The decreased ability to control surroundings can make finding privacy more difficult when performing self-care tasks, which, in turn, leads to discomfort and anxiety for many individuals[15]. Mark Lucherini explains how his concept of "felt surveillance" can cause T1D patients to hide self-management and even ignore their health in public setting to avoid attention and judgment from others[16]. In addition, students often change from a pediatric to adult health care provider in college, which has been shown to cause challenges in adolescents with T1D, as adult providers are often perceived to be less understanding or cognizant of the psychosocial challenges of self-management[14,17].

In all, the diverse obstacles that arise during the transition to college contribute to increased social stress about how, when, and where to perform self-care tasks for managing T1D. However, little has been done to investigate the psychosocial challenges of T1D management during college, particularly during the transition to college[14]. Psychosocial challenges have been shown to not only compromise emotional wellbeing, but also reduce adherence to daily management routines, leading to unhealthy, or even dangerous, blood glucose levels[18]. This is of particular concern with college students, as at least two-thirds of adolescents and young adults with T1D do not adequately manage their condition, with the lowest adherence found among ages 18-19[19]. On the other hand, young adults who feel they are more capable of overcoming psychosocial challenges of T1D have been shown to attain a greater sense of empowerment in managing their condition[20]. In turn, such empowerment, or patient activation, has been shown to increase glycemic control in those with T1D and improve health outcomes for those with other chronic conditions[20,21].

1.5. Study Objective

As discussed, there is growing literature suggesting that T1D self-management presents significant psychosocial challenges[8-10], particularly for incoming college students during the transition to their new social environment[6,14,17]. College students, along with other adolescents and young adults, with T1D have stressed the importance of peer support and connecting with others who have T1D as a means of overcoming these challenges[22]. Web-based systems and mobile applications have shown exciting potential for helping individuals of this age group with T1D self-care[13,15], but such platforms have yet to be fully explored for their potential to help with the psychosocial challenges of T1D[14]. To develop such platforms, first a better understanding of the intended users and environment that characterize the context in which the system will be implemented must be achieved[23-24]. Therefore, this study sought to investigate what psychosocial challenges college students with T1D face with self-management during their transition to college and how they characterize and attempt to address such challenges. Ultimately, the insight gained from this investigation is intended to inform future design of technological aids for T1D management.

2. Methods

2.1. Overview

This qualitative research study was conducted in the fall of 2017 at the University of Virginia (UVA). Recruitment occurred via online social media platforms and flyers. Twelve participants were interviewed over the phone. Interviews were transcribed and coded using inductive qualitative content analysis[25,26]. This study was approved by the UVA Institutional Review Board (IRB) for Social and Behavioral Sciences and all participants gave oral informed consent.

2.2. Setting

Recruitment was conducted by distributing flyers at UVA and posting to Facebook, Twitter, and Reddit. Initial information from interested participants was collected using SurveyMonkey, an online survey cloud-based software. For chosen participants, semi-structured interviews were conducted over the phone, in private settings, during the times most convenient for interviewees. All participants were living in the continental United States.

2.3 Sampling & Recruitment

Recruitment was conducted via Facebook, Twitter, and Reddit, by reaching out to T1D support groups, UVA social media pages, and the researchers' own online social networks. In addition, flyers were distributed across UVA campus[24, 27, 28]. The online posts included a flyer detailing the purpose of the study, contact information, link to the screening survey, compensation information for study completion, and an invitation to share information with others who may be interested. The online posts also included information linking them to the UVA and the IRB reference number. Compensation consisted of a $20 gift card, for either Target or Walmart.

On Facebook, groups were found by searching "Type 1 Diabetes Support" and "Type 1 Diabetes College." Seven closed group moderators were contacted, three of which gave permission to post. The research team also posted in two UVA class Facebook groups. On Twitter, pages were found by searching two hashtags, "#T1D" and "#type1diabetes." Four Twitter pages were contacted, all of which gave permission to post. On Reddit, pages were found by searching "Type 1 Diabetes." Four pages were contacted. After failing to hear back from page moderators within 24 hours, the research team posted to the page. The post would be immediately removed if requested.

The screening survey asked ten questions regarding the name, age, gender identity, race, preferred contact method, university, living situation, T1D diagnosis age, and country of residence. The first 100 screening survey respondents were assessed for eligibility, defined by four inclusion criteria: T1D diagnosis prior to college, 18 to 24 years of age, living with roommates or alone, and attending or having recently attended a university in the United States. The age range of eligibility was limited for the purpose of focusing on current college students or recent graduates. A total of 22 respondents met the inclusion criteria. The study's target sample size was 12 participants. Since this study sought to evaluate the transition of self-management from home to college, the 12 respondents who were diagnosed with T1D at the earliest age were emailed to coordinate an interview. If there was no response after 24 hours, they were emailed again. All 12 respondents replied within 48 hours of the initial email.

2.4. Data Collection

Data collection took place in October of 2017 and consisted of semi-structured phone interviews that were audio recorded. The interviews lasted approximately 45 minutes and consisted of 26 questions, organized into three sections: T1D self-management before entering college, self-management during the transition to college, and the usage of technology in self-management. DH, KM, SN, TP, and PS each acted as the lead interviewer for at least two interviews and as an assistant for at least two interviews. Immediately upon completion, interview recordings were uploaded to UVA Box, a secure cloud-based storage service, and deleted from the recording device. After each interview was transcribed by the researcher who conducted the interview, the transcript was de-identified and uploaded to UVA Box. Upon completion of transcription, all interview recordings were deleted from UVA Box.

2.5. Data Analysis

Complete, de-identified transcripts were uploaded to NVivo 11 qualitative data analysis software for coding. The transcripts were analyzed using conventional content analysis, in which coding categories were derived directly and inductively from the text data[25,26]. The coding structure was developed using an iterative process. Initially, only six of the interviews were completely transcribed. Each team member independently coded the same two transcripts to provide a basis for initial discussion and triangulation[29]. Once agreement was reached regarding the coding structure,

each team member used this structure to independently code the four additional transcripts and recode the initial two transcripts. The team then reconvened to discuss results and to come to a consensus regarding a draft coding structure based on these first six interviews. For each of the remaining six interviews, the researcher who conducted the interview transcribed and coded only sections that either changed the analytic framework of the draft coding structure or provided rich examples of concepts already included. The team then met to develop a final coding structure, which was then used to recode each transcript by the researcher who conducted the interview.

2.6. Establishing Trustworthiness

The researchers did not change the interview guide once interviewing began, but began to probe more deeply into answers from participants as it became apparent that further explanations about certain questions would prove useful. The researchers asked each question on the interview guide and probed specifically about topics mentioned by participants in previous interviews. Interview guides were designed in collaboration with the research team's professor and with colleagues outside the research team. As discussed, coding and data analysis were conducted through analyst triangulation with comprehensive discussion[30]. The research team debriefed before and during the study process, focusing on minimizing impact of personal biases. For example, group members worked to acknowledge and account for biases stemming from preconceived notions of individuals with diabetes. It was understood that each interview could elicit new perspectives on T1D[30].

2.7. Positioning

The research team consisted of UVA students from the university departments of Biology, Public Health Sciences, and Systems & Information Engineering. While each researcher had experience in quantitative research, none had previously conducted qualitative research or had recruited participants from social media platforms. Some researchers' familiarity with T1D was limited to observations of peers, while others had lived with individuals with T1D.

3. Results

3.1. Sample Characteristics

Twelve participants were recruited for the study. Participants ranged from 18 to 24 years old and were clinically diagnosed with T1D at ages ranging from 1 to 13 years old. Participants included four females and eight males. Five participants were current graduate students and seven were current undergraduate students at twelve different U.S. universities. Five participants lived alone in college and seven lived with roommates.

3.2. Themes

Five themes were identified through conventional content analysis of the interviews. These themes included: self-care in daily activities, public attention and perceptions, social support, mindset towards self-care, and technology for self-care tasks. Although distinct, these five themes often overlapped with one another. The challenges of coordinating and performing self-care tasks in daily activities were often exacerbated by public attention and perceptions. Social support, both online and in person, was important in helping participants overcome these challenges. Technologies for self-care tasks also helped with these challenges by allowing participants to be more discreet in public settings.

3.2.1. Self-Care in Daily Activities

A common challenge discussed by the participants included those associated with coordinating self-care tasks during daily activities in the new college social environment, particularly in social settings.

Planning and Preparing

Participants expressed the need to plan for potential adverse events*: "always have a backup plan because plans are essential for me to keep my stuff under control."* This involved organizing supplies (e.g., insulin, glucometer, test strips) and carrying *"lots of extra carbs just in case anything happens."* This was made especially difficult *"with events that are not scheduled ahead of time or with spontaneous activities that are always happening here [in college]."*

Worrying

Participants noted that worrying about their blood sugar, and the tasks needed to manage it, often reduced their enjoyment of daily events: *"I know a lot of social activities are a good time to relax and blow off some steam for*

most people, but I still always have that aspect of how my blood sugar is doing." Settings with alcohol and food, which become more prevalent in college, were particularly challenging: *"Every Thursday I go out to eat with friends at a Mexican restaurant and they have really good margaritas, so I have to watch what I am eating and test a lot more frequently...keep in my head that I have diabetes to think about."*

3.2.2. Public Attention and Perceptions

Participants indicated that the challenges of coordinating self-care tasks in daily activities were often exacerbated by unwanted public attention while performing tasks along with the stigma and misunderstanding that seemed to dominate others' perceptions of T1D. These feelings sometimes contributed to decreased motivation to complete self-management tasks during daily activities when they would attract attention.

Unwanted Attention

Participants found it more difficult to perform self-care tasks in public settings due to the unwanted attention from those around them: *"It was always just challenging, or the more embarrassing part, having the center of attention on me. I never really liked the spotlight. I think that is probably one of the most challenging things."*

Stigma

The social stigma associated with diabetes often caused participants to experience feelings of shame or blame when performing self-care tasks in public settings*: "...biggest challenge is again the stigma, like the weird looks when I break out my measuring cups and stuff."*

Misconceptions

Participants also indicated they were constantly confronted with common misconceptions of T1D and how it differs from type 2 diabetes: *"I think explaining it to people sometimes is difficult because they're like 'oh my grandmother has it' and that's not the same kind probably, so I guess just misconception."*

3.2.3. Social Support

Participants discussed the increased importance of social support, including emotional and informational support, from friends, online networks, and healthcare providers in overcoming the new challenges of T1D management in college.

Emotional Support

Participants indicated *"emotional support was essential to mental well-being and kind of being able to cope with the disease"* and how this support increased in college with the greater opportunity to connect with others with T1D, both online and in person, within the larger student community: *"Meeting a lot of the diabetic kids has been a lot of fun because I actually talk to them about things like their experiences with it and we'll have the same ideas or some of the same kinds of stories or the same basis for a story, so it's very fun...very happy."* Participants also noted support from non-diabetic friends and roommates who would provide a sense of security and *"make them feel safe and accepted."*

Informational Support

In addition to emotional support, participants emphasized the importance of information from online T1D networks, where they can find *"tips and tricks"* and *"unguarded answers"* regarding T1D management: *"On Reddit, I've definitely found little tricks that help, like keeping my sensor on a little longer, or recipes for some foods that are low in carbs, and then past experiences of some of the things that happen after drinking alcohol."* Some participants also sought this guidance and informational support from their healthcare providers: *"I just needed some initial support [in the beginning of college] and it made it easier to have an authority figure [their nurse practitioner] who I trusted who could help me manage my numbers…"* However, it was common for participants to express frustration with their medical providers: *"I feel like I can't voice my opinion [to my doctor] without being looked down upon condescendingly…"* This sentiment led some participants to prioritize their online networks, such as Reddit or Instagram support groups, over their providers when seeking information: *"Honestly I'm more comfortable asking Reddit diabetes questions than my doctor."*

3.2.4. Mindset towards Self-Care

Participants frequently referenced a change in their mindset towards their self-management during the transition to college. While a few participants described a decrease in motivation, the majority noted a positive change in how

they viewed and prioritized T1D self-care in college. They attributed this positive change to an increased sense of ownership of their self-management along with a better understanding of the consequences of disregarding self-care.

Realizing Importance of Self-Care

Participants discussed how, prior to college, they did not fully appreciate the seriousness of T1D: *"I understood that my diabetes was serious but I didn't really understand all the full ramifications."* During the transition to college, participants started to better understand, and even experience, the potential dangers of T1D, which served as a *"wake-up call"* and helped them recognize the importance of self-care: *"...it was just me realizing one day that if I don't take care for myself, something bad was going to happen."*

Taking Ownership of Self-Care

Participants also described a growth in ownership of their self-care during the transition to college. They explained how the loss of parental support pushed them to become more independent and take full responsibility of their self-management: *"It's my job. I don't have anybody else to say, hey did you test, did you bolus, that's all on me now ...just being more focused and on top of it, paying attention to trends and stuff, so I think that's something that's happened while I was in college."*

3.2.5. Technology for Self-Care Tasks

As discussed, participants frequently noted how online T1D support groups were an important source of emotional and informational support during college. Other technologies participants discussed were CGMs and insulin pumps, which reduced the burden of manually performing self-care tasks. Participants judged the quality of these devices based on their reliability and how much they could be integrated into daily life.

Reliability

Participants indicated that reliable devices significantly mitigate the burden of coordinating self-care tasks throughout the day: *"Once you don't have to give yourself shots every day, you can carry less stuff around. ...It gave me a lot more freedom in my daily life."* The CGMs used by participants often communicated with smartphone applications, allowing participants to more seamlessly check if their glucose level was *"rising or falling or staying the same, which helps a lot."* Participants were also *"able to be more discreet"* with the devices, reducing exposure to unwanted public attention. However, each participant expressed experiences with devices failing to consistently perform their intended function, often characterizing the devices as unreliable: *"it [CGM] would have problems and would just error out all the time and it was just more of a hassle than it was worth."*

Fitting Lifestyle

Further, even when devices could reliably carry out their intended functions, many participants struggled with fitting the technology into their lifestyle. For example, participants often mentioned that insulin pumps and CGMs became problematic with physical activities, whether that be sports or simply walking with a backpack: *"I haven't done the CGM because I've always played contact sports and they're expensive and hard to take off temporarily."* This challenge was mentioned with more mild physical activities as well: *"it [insulin pump] would get torn out all the time just for my backpack rubbing against it, it would always become an issue."*

4. Discussion

4.1. Summary of Key Findings

In all, participants shared many common challenges with self-care in college, most of which either originated in, or were exacerbated by, the new college social environment. These challenges included planning and preparing for self-care tasks throughout the day, minimizing unwanted attention in public settings, and dealing with stigmas and misconceptions of T1D. However, the new college environment also provided social support, from sources online and in person, to help participants overcome these challenges. In particular, participants emphasized the importance of informational support they received from others with T1D, often prioritizing their advice over that of healthcare providers. CGMs and insulin pumps were helpful with overcoming challenges of self-care by making tasks easier and more discreet. However, these technologies were often unreliable or not conducive to daily activities. Finally, the majority of participants discussed a positive change in mindset towards their self-care in college, which they attributed to an increased sense of ownership of their T1D management and a better understanding of the consequences of disregarding self-care.

4.2. Comparison to Theory

The information gained from the participants may be further evaluated through the theoretical frameworks of the socio-ecological model and sociological trust theory[30-34].

4.2.1. Socio-ecological Model

The socio-ecological model seeks to explain the relationships between different levels of influence on health, covering the intrapersonal, interpersonal, community, institutional, and policy levels[34]. During the transition to college, participants described changes at the intrapersonal, interpersonal, and community levels. At the intrapersonal level, participants were strongly influenced by their mindset towards self-care tasks, discussing the importance of recognizing the dangers of T1D and taking ownership of their daily routines. Prior to college, participants indicated they did not fully recognize the importance of accepting responsibility for their T1D management, fostering a general lack of discipline in self-care tasks. At the interpersonal level, participants often referred to friends, roommates, and social networks in college for emotional support and emphasized the value of building connections with other students who have T1D. This was a significant change from before college, when the primary source of interpersonal support was family. At the community level, participants described an increase in opportunity to meet others of similar age with T1D, which provided significant emotional support. However, the increased exposure within the student social environment also presented both logistical and psychosocial challenges with performing self-care tasks in public settings. Despite alignment at the intrapersonal, interpersonal, and community levels, the participants did not demonstrate any notable connections with the organizational or policy levels of the socio-ecological model. However, given that the interview guide only included questions regarding the immediate social environment of the participants, it is unclear as to whether this lack of discussion regarding the organizational and policy levels resulted from simply not asking about these levels or from the true absence of influence from these levels.

4.2.2. Sociological Trust Theory

Sociological trust theory explains how trust can be a shared experience, influenced by norms and values held common among a group[32]. Institutional trust, trust in information, and technological trust can influence how individuals with a chronic illness perceive others and build relationships with different source of support [14,31, 34]. The majority of participants demonstrated a lack of institutional trust with healthcare providers, questioning their reliability and sincerity with the guidance they provided. This lack of trust often resulted from negative experiences with providers. These participants often turned to others with T1D through online support groups for informational support, as they felt a greater sense of trust with those who had shared common experiences. A few participants, however, described strong relationships with their healthcare providers, often founded in greater trust that resulted from positive experiences with the provider. Finally, some participants had good experiences with self-care technologies, including CGMs and insulin pumps, as these devices demonstrated instrumental trust by being safe and reliable[33]. For example, CGMs tracked glucose levels, and would sound an alarm if glucose dropped too low to indicate a safety risk.

4.3. Comparison to Previous Research

The issues identified in this study aligned well with many of those discussed in current literature, such as the psychosocial challenges of planning, preparing, and performing self-care tasks during daily activities,[4,9] and the exacerbation of these challenges during the transition to college[9,10,14-17]. Further, this study reaffirmed the importance of self-care technologies, such as CGMs and insulin pumps, in overcoming the procedural challenges of T1D. However, this study also revealed insights that have not been fully explored in previous studies. For example, participants of this study emphasized how the transition to college led to the maturation in their mindset towards self-care tasks and the greater opportunity to connect with others who have T1D. Thus, although the transition to college introduced new challenges in self-care, the personal growth and greater social support that also resulted from this transition helped participants overcome the new challenges. These empowering aspects of college are not discussed in previous studies, which primarily focus on the challenges and burdens of the new environment[4,10,14,17]. In addition, the participants of this study expressed a level of disconnect with healthcare providers, and other professional sources of information, that has not been recognized in previous literature[13,15]. Participants believed healthcare providers did not fully appreciate the context of daily life within which their medical advice and recommendations would have to be applied. As a result, guidance from providers often seemed insincere and unreliable. Further, in fear of being judged or misunderstood, participants did not always feel comfortable asking healthcare providers certain questions regarding self-care. The majority of participants heavily prioritized information from others with T1D due to the greater level of trust and shared experience. Due to this dynamic, online networks, such as Reddit, were thought to be more convenient, comfortable, and useful sources of informational support.

4.4. Implications for Intervention Design

This study revealed two empowering aspects of the transition to the college social environment that can be leveraged to address psychosocial challenges of T1D self-care for incoming college students: 1) despite the challenges it presents, the college social environment serves as a powerful source of social support for those with T1D and 2) the most valued source of informational support is often others with T1D, with healthcare providers or other professional sources commonly perceived as unreliable or insincere. A potential platform that could accommodate these social aspects of T1D self-management is a web-based networking forum that allows those with T1D to 1) find and connect with one another based on geographical proximity or university affiliation to build social support within communities and 2) catalog questions and advice regarding personal experiences with T1D management, as posted by users. Such a forum would be designed specifically for users with T1D, providing for greater exclusivity, privacy, and specificity in user experience than that achieved by current platforms such as Reddit or Facebook®. The forum would directly address the expressed desire of participants in this study for comfortable and convenient sources of self-management information, while leveraging their existing usage of social networking and helping them connect with others who have T1D within their college communities. The forum would also include a tab with standard health recommendations regarding T1D management, from healthcare providers and professional sources, to provide users with medically sound information that they can readily access if they choose to do so. Further, moderators would be able to actively audit the forum to ensure all posted information is safe. Finally, the forum could be used to track self-care, by automatically uploading data from CGMs, insulin pumps, and other devices. This feature would provide users the option to share more comprehensive information regarding specific self-care questions and receive more precise feedback. In doing so, this feature would allow users to more seamlessly integrate the different aspects of their care, by directly promoting informational and emotional support within the context of their self-tracking data. Ultimately, the activation of these different aspects of care can be self-perpetuating, in which tracking data and seeking information promotes support from others, and vice versa.

4.5. Study Strengths and Limitations

This study included perspectives from current undergraduate and graduate students from twelve different schools throughout the U.S., who lived alone and with roommates. Therefore, the study captured a diverse sample of experiences with T1D in college, providing insights relevant to a wide variety of college students. However, due to the focus of this study on college students alone, the themes may be limited in the extent to which they can be applied to the broader T1D community. The study was also limited in its sample size, including only twelve participants. Finally, members of the research team lacked extensive experience with T1D and with qualitative methodology, which could have negatively impacted quality of design, execution, and analysis of interviews.

4.6. Future Research

Future work is needed in designing interventions that can better leverage the social support of university communities in helping students with T1D overcome the challenges of self-management during the transition to college. Although this study describes a platform that could potentially accomplish this objective, a more precise understanding is needed of the features such a platform would require. To accomplish this, it may be helpful to more thoroughly investigate the overall social experience of college students with T1D, along with their views of using social interactions as a source of informational and emotional support. When using these insights to build a platform, it would be most effective to use participatory design[38] with current college students, or recent graduates, with T1D.

5. Conclusion

The transition to college presents many psychosocial challenges with managing T1D for incoming college students, including coordinating self-care tasks throughout the day, minimizing unwanted attention in public settings, and dealing with stigmas and misconceptions of T1D. However, this study revealed empowering aspects of the college environment that were used to inform a potential intervention design to help students overcome the psychosocial challenges of T1D self-care.

Clinical Relevant Statement
This study is relevant for developers of e-health technologies aimed at those with type 1 diabetes by providing them with insights of psychosocial challenges of self-care.

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