NCT03676465

PROTOCOL

Background

1. Provide the scientific background, rationale and relevance of this project.

As care shifts to home- and community-based settings, multiple forms of consumer health information technology (IT) are being developed to support patients with their self-management responsibilities. In particular, remote-monitoring systems—in which clinically relevant data are captured, analyzed, and converted into medically relevant information—carry potential for use in multiple chronic diseases that require constant oversight. This research addresses the need to create and evaluate approaches to self-management that integrate consumer health IT interventions facilitating continuous monitoring and both individual and group decision-making.

The purpose of this study is to develop and assess a new approach to self-management that recognizes that many patients with chronic conditions must manage their condition continuously and often do so within a social context. Consumer health IT is being advanced that is responsive to the fact that self- management rarely occurs in isolation; rather, patients often rely on others including a primary informal caregiver. Therefore, there is a need to create and evaluate approaches to self-management that integrate consumer health IT interventions facilitating continuous monitoring and both individual and group decision-making. This proposal seeks to refine and assess such an approach to self-management called CloudConnect, with two specific aims: 1) explicate patient and informal caregiver needs and preferences relevant to the technology core of this self-management approach and 2) evaluate the impact of this self-management approach on engagement and clinical outcomes.

The proposed research addresses questions that relate to the design and performance of a self-management approach for Type 1 Diabetes that integrates remote monitoring of both physiological parameters and patient generated data, informatics processing of multiple data types to assess near-term risk of adverse events, computation of risk profiles that identify linkages between behavior and self-treatment outcomes, clinical decision support, and health information communication systems, all with a focus on dyads of adolescent patients and their local care givers.

The first of two studies associated with this proposal was a needs assessment study that reveals patients' and primary informal caregivers' needs/preferences for the technology core of Cloud Connect (UVA IRB-SBS #2016-0273). This second study will implement, a system that aggregates blood glucose values, exercise, insulin, and meal information collected from individuals with T1D. This information is then analyzed to determine if there are areas of hypo and hyperglycemic risk and how those risk zones may relate to physical activity and insulin dosing behavior. From that analysis, a report is generated and sent to the adolescents and their parents/guardians on a weekly basis giving them insight into how they can increase their ability to control their blood glucose values.

The results of this project will inform the design information technology that improves engagement and clinical outcomes for patients who require continuous monitoring and who engage an informal primary caregiver in self-management outside clinical settings.

Objectives/Hypothesis

The research project proposed here seeks to assess an approach to self-management called CloudConnect, evaluating the impact of CloudConnect on patient engagement, dyad engagement, and clinical outcomes in adolescent T1D.

This assessment will address the essential question of how adolescents and their parent/guardian respond to this new approach to self-management. This study is designed to assess the impact of a T1D-specific CloudConnect implementation on patient engagement, dyad engagement, and clinical outcomes as well as the relationships among these outcome measures for adolescents with diabetes. Throughout this protocol, 'the subject' will refer to the dyad of an adolescent and one parent/guardian.

The randomized controlled trial of CloudConnect is intended to compare the impact of this new model of self-management with use of their personal insulin parameters with the addition of continuous glucose monitoring (CGM) and Fitbit,. if not already in use by subject. Assessment between the study subject/parent using validated surveys and assess clinical outcomes including HbA1c, number of hypoglycemic events, etc. over the 3-month period.

Using this approach, it is expected to address the informatics challenge of determining how to design information technology that improves engagement and clinical outcomes for patients who require continuous monitoring and who engage an informal caregiver in self-management outside clinical settings. Our work extends the design of remote-monitoring systems from stationary, home-based systems to wearable devices that patients can engage with throughout an active day in the community. Our research team—which consists in a biomedical systems engineer, a human factors engineer specialized in consumer health informatics, a pediatric endocrinologist, and a pediatrician specialized in clinical research — works in alliance with the Center for Diabetes Technology at the University of Virginia. Study team members have developed this ambulatory platform that will be used as the foundation for this study.

Rationale: The hypothesis of this study is that individuals randomized to the CGM/Fitbit with no weekly feedback (Control Group) will improve management modestly initially (as a result of either of new access to CGM or the Hawthorne effect of being studied), but their measures of engagement (patient self-management behavior (i.e. personal insulin parameters) and diabetes-related dyad communication) will return to baseline levels by the 12-week evaluation. By contrast, it is hypothesize that individuals randomized to CloudConnect (Experimental Group) will have a greater increase in engagement and dyad communication by 8 weeks that is sustained by 12 weeks (3 months).

It is further hypothesize that adolescents randomized to CloudConnect will have a lowering of HbA1c that is related to the increase in dyad disease-specific engagement. Moreover, our hypotheses are that this unique self-management approach in T1D will increase engagement of adolescents and their informal caregiver through increased communication and self-management behavior, and that this increase in engagement will lead to improved medical outcomes.

These hypotheses are based on data from preliminary studies collected by the study group and the literature. This preliminary data support that parents of adolescents with T1D are eager to follow their child's blood

glucose tracing via remote monitoring — suggesting potential for an increase in involvement with such access and increase in disease-related communication. It is well described that an increase in parental involvement in diabetes control is associated with better medical outcomes such as lower HbA1c. Similarly, when adolescents exhibit increased degrees of participation in their care (such as a subset of adolescents who regularly used their CGM in a large-scale trial), this is associated with a lowering of HbA1c.

We will test these hypotheses using a randomized trial of CGM/Fitbit with no weekly feedback vs. CGM/Fitbit to CloudConnect. In addition to being compared against each other, both approaches will be compared to degree of engagement and efficacy of diabetes control experienced prior to the intervention, this information will be obtained at baseline. This randomized trial of CloudConnect in a chronic disease setting has been designed to assess changes in personal and dyad engagement and the relationship between this engagement and an important disease outcome.

Study Design: Biomedical

1. Will controls be used?

Yes

►IF YES, explain the kind of controls to be used.

The Control Group adolescent subjects will have the same inclusion/exclusion criteria and same characteristics as the Experimental Group adolescent subjects. The Control Group participants will use the study CGM, but subjects may elect not to set alarms or use the CGM Apps. This group will also use a study activity tracker (i.e Fitbit). Control subjects will use their personal insulin parameters throughout the trial. Control Group participants will use study insulin pen at mealtime with their home insulin. Control Group subjects will download their study equipment and provide it to the study team each week. The Control Group will **not** receive a weekly CloudConnect Report from the study team. Follow up visit in-clinic and phone calls, text messages and or/email will be the same as the Experimental Group.

2. What is the study design?

This is a randomized control, open-label, single-site clinical trial. We will target completion by eighty adolscents (age 12-17 years) with Type 1 diabetes and their parent/guardian (age 18+) to participate in a 3 month outpatient study. Participants will be randomized to either a Control Group or Experimental Group. Both groups will use the study continuous glucose monitor, study activity tracker, and a study insulin pen if an multiple daily injection (MDI) user. Subjects who use an insulin pump to treat their type 1 diabetes will use their personal insulin pump. All subjects will be asked to download this equipment and provide it to the study team each week. The study team will communicate weekly with each group. Questionnaires will also be completed at the beginning and at the end of the study. The Experimental Group will receive the CloudConnect Reports. The Control Group will not receive this feedback.

3. Does the study involve a placebo?

No

Human Participants

Ages: 12-17 years old and at least one of parent(s)/guardian(s) (age 18+)/guardian (adolescent/parent dyad is required for participation in this trial)
Sex: Male and Female
Race: All

1. Provide target # of subjects (at all sites) needed to complete protocol.

For the Pilot Study, up to 6 adolescents and 6 parent(s)/guardian(s) may complete the study. These pilot subjects may also participate in the Main Study.

For the Main Study, 160 subjects (80 dyads – consisting of 80 adolescents and 80 adults) need to complete the study.

2. Describe expected rate of screen failure/ dropouts/withdrawals from all sites.

We expect that because the length of the study it could be 20-30% dropouts/withdrawals from the study.

3. How many subjects will be enrolled at all sites?

This is a single site clinical trial to be completed at UVa.

4. How many subjects will sign a consent form under this UVa protocol?

Up to 210 subjects (105 dyads – consisting of 105 adolescents and 105 parent(s)/guardian(s)) will sign consent for the Main Study and up to 16 subjects (8 parent/child dyads) will sign a consent for the Pilot Study. i.e. total = 226 (210+16)

Inclusion/Exclusion Criteria

1. List the criteria for inclusion for Pilot and Main Study Adolescent Subjects

- Willingness to provide informed consent
- Adolescents ages ≥12 and ≤ 17 years old with a parent/guardian (18+ yo) who is willing to participate with the child
- HbA1c ≥7 and ≤ 11 % (point-of-care machine or local laboratory [i.e. LabCorp]) (*This criteria only applies to the Main Study, it does *not* apply to the Pilot Study*) This can be omitted if it is not possible to go to a laboratory or come to the clinic because of governmental restrictions such as Stay-at-Home orders, in which case there are no entry restrictions based on HbA1c.
- Willingness and ability to comply with scheduled visits and study procedures
- Willingness to comply with all the study devices during the entire trial (i.e. commercially-available CGM, Fitbit, Companion Medical inPen)
- One month stability on insulin parameters prior to enrollment
- MDI users should use Humalog® and Novolog® insulin to use in study insulin pen
- Type 1 diabetes mellitus diagnosed at least one year prior to enrollment in the study as noted by the following:

  Criteria for documented hyperglycemia (at least 1 criterion must be met):

  - Fasting glucose ≥ 126mg/dL–confirmed

- Two-hour Oral Glucose Tolerance Test (OGTT) ≥200mg/dL–confirmed hemoglobin A1c (HbA1c) ≥6.5% and documented by history – confirmed Random glucose ≥200 mg/dL with symptoms
- No data at diagnosis is available but the participant has a convincing history of hyperglycemia consistent with diabetes

Criteria for requiring insulin at diagnosis (at least 1 criterion must be met):

- Participant required insulin at diagnosis and continually thereafter
- Participant did not start insulin at diagnosis but upon investigator review likely needed insulin (significant hyperglycemia that did not respond to oral agents) and did require insulin eventually and used continually)
- The diagnosis of type 1 diabetes mellitus does not require documentation of C-peptide level or islet cell antibody positivity.
- Commitment to maintaining uninterrupted availability via cell phone at all times
- No diabetes complications
- Participants must demonstrate English proficiency and proper mental status and cognition for completion of the study.

- Not currently known to be pregnant, breast feeding, or intending to become pregnant (females). A negative urine pregnancy test will be required for adolescent girls who are able to become pregnant. Participants who become pregnant will be discontinued from the study.
- Ability to access the Internet to provide data to the clinical team or to travel to the research center so that the study equipment can be downloaded.
- Medication stability in the preceding two months if taking antihypertensive, thyroid, anti-depressant or lipid lowering medication.

2. List the criteria for exclusion for Pilot and Main Study Adolescent Subjects

- Children outside the ages of 12-17 y.o. or those who do not have a parent/guardian willing to participate
- Diabetic ketoacidosis in the past 6 months
- Pregnancy, breast-feeding, or intention of becoming pregnant
- Current or recent alcohol or drug abuse by patient history
- Mental incapacity, unwillingness or language barriers precluding adequate understanding, cooperation, or ability to fill out questionnaires.
- Any skin condition that prevents sensor placement (e.g., bad sunburn, pre-existing dermatitis, intertrigo, psoriasis, extensive scarring, cellulitis)
- Psychiatric disorders that would interfere with study tasks (e.g. cognitive disability, psychiatric hospitalization within 12 months)
- Use of acetaminophen (*this criteria only applies when the CGM version being used is older than the G6*)
- Use of long-acting insulin that is not Lantus or Tresiba
- For subjects who currently use a close-loop insulin pump and CGM: not being willing to turn off the closed-loop function
- Conditions that would make use of a CGM difficult (e.g., blindness, severe arthritis, immobility)
- Cystic fibrosis

- Current use of oral/inhaled glucocorticoids or other medications, which in the judgment of the investigator would be a contraindication to participation in the study
- Any other comorbidity that at the judgment of the investigator may interfere with the participation on the study (i.e. uncontrolled high blood pressure or thyroid disease, current diabetic microvascular complications, current diagnose of gastroparesis)
- Severe hypoglycemia resulting in seizure or loss of consciousness in the 6 months prior to enrollment
- Use of a device that may pose electromagnetic compatibility issues and/or radiofrequency interference with the Dexcom CGM (implantable cardioverter-defibrillator, electronic pacemaker, neurostimulator, intrathecal pump, and cochlear implants)
- Active enrollment in another clinical trial

No eligiblity criteria is required for parent(s)/guardian(s) other than the legal relationship and 18+ yo.

3. List any restrictions on use of other drugs or treatments.

Use of anti-diabetic agents other than short-acting insulin for CSII subjects or long-acting insulin for MDI subjects, including: metformin, sulfonylureas, meglitinides, thiazolidinediones, dipeptidyl peptidase 4 (DPP-4) inhibitors, glucagon-like peptide 1 agonists and alpha-glucosidase inhibitors

Statistical Considerations

1. Is stratification/randomization involved? Yes

►IF YES, describe the stratification/ randomization scheme.

During the main study, up to 210 adolescents, ages 12 years - 17 years (inclusive), will be recruited with one of their parent(s)/guardian(s), 18+ y.o., in each arm. Based on experience, approximately 40 adolescents & 40 parent(s)/guardian(s) in each arm will complete the study (N=80 adolescents and 80 parents, total 160 subjects). Male and female adolescents will be recruited, and all racial/ethnic groups will be eligible for participation. Participants will be recruited in randomization blocks of 4. The goal is to target a minimum of 10 participants in each of the 4 stratification subgroups based on age (12-14 y.o and 15-17 y.o.) and insulin therapy (CSII and insulin pen). ,

►IF YES, who will generate the randomization scheme?

_____ Sponsor
_____ UVa Statistician. Insert name Answer/Response:
_____ UVa Investigational Drug Service (IDS)
__X__ Other*:* Specify : Center for Diabetes Technology (CDT) personnel

2. What are the statistical considerations for the protocol?

The objectives section and the statistical section should correspond, and any objective for which analysis is unfeasible should be deleted. Also, the estimates and non-statistical assumptions of the statistical section should be supported by discussion in the background section.

The answer to this question should include:
--Study Design/Endpoints

--Recap of study objectives and endpoint definitions. An assessment of how study objectives will be assessed by identifying & defining which endpoints will be used to assess each component of the study objectives.
--The study design should include contingencies for early stopping, interim analyses, stratification factors (If applicable), and any characteristics to be incorporated in analyses.
--The power/precision of the study to address the major study endpoint(s), the assumptions involved in the determination of power/precision.

Study Design:

This study employs a randomized design in which one group of participants will be assigned to use the CloudConnect system and the other group to CGM using their insulin paramenters and treatments.

Study Objectives & Endpoint Definitions:

As mentioned previously, this project seeks to assess how CloudConnect affects participant engagement, dyad engagement, and clinical outcomes in adolescent T1D.

We will assess how adolescents and their parent(s)/guardian(s) respond to this new approach using the Family Communication Inventory (FCI). This diabetes-specific approach was designed by the investigators to assess parent-child communication regarding tasks (discussion of insulin dosing for a given meal, BG trends, need for dose changes). As an outcome measure, scores for parents and adolescents are summed, with higher scores representing higher degree of engagement and T1D-specific communication.

Power/Precision of the study to address major study endpoints:

In using the FCI, we determined based on preliminary data from 220 adolescent/parent participants eligible for the study, with mean (90.3) and standard deviation (12.5) that we are powered to detect a difference of 8.5% in this outcome in the treatment group with 80% power and an alpha of 0.05. This study will require 40 adolescent participants with 40 parent(s)/guardian(s) to complete per arm. Assuming a non-adherence/drop-out rate of 20-30% for Intention-to-Treat (ITT) analysis, 55 participants is yielded per arm.

3. Provide a justification for the sample size used in this protocol.

The study team will attempt to enroll an equal number subjects based on gender, CSII, and MDI use. The study is powered to detect a difference of 8.5% in this outcome in the treatment group with 80% power and an alpha of 0.05. This study will require 40 adolescent participants with 40 parent(s)/guardian(s) to complete per arm. Assuming a non-adherence/drop-out rate of 20-30% for Intention-to-Treat (ITT) analysis, 55 participants is yielded per arm.

4. What is your plan for primary variable analysis?

Because this is a randomized study, our primary outcome (score on the Family Communication Inventory) will be by t-test comparing those randomized to CloudConnect to usual care+CGM. Comparison of secondary outcomes between treatment groups will also be t-tests. Secondary analyses of both the primary and secondary outcomes will utilize multivariable ANOVA, particularly in the event that key variables differ between groups. For example, if average steps per day [as a measure of exercise] is higher in one group vs.

another, this will be used as a variable in the comparison of mean glucose by CGM to evaluate whether there remained a difference in mean glucose once total daily steps was taken into account. Similarly, if there is an imbalance of key participant characteristics among participants who complete the study in one treatment group (such as higher proportion of multiple-daily-injection participants in the CloudConnect group), this will be considered as a variable in the multivariable ANOVA comparing mean glucose by CGM, as a secondary analysis.

5. What is your plan for secondary variable analysis?

- HbA1c
- Mean glucose by CGM
- Percent time in range 70-180 mg/dL
- Percent time in range 70-150 mg/dL
- Percent time <70 mg/dL
- Percent time >180 mg/dL
- Number of low BG
- Average daily insulin dose
- Average grams of carbohydrate entered
- Steps/day by Fitbit
- Questionnaires: Family Conflict Scale, Division of Diabetes Responsibilities, Child Self Management and My-Q scores.
- Response to weekly standardized questions:
    i. *During the past week, did you talk with your parents about your diabetes management? (Yes=1, No=2)*

    ii. If you answered "yes," how good or bad was the tone of that conversation?
    (Likert scale: Very good = 1; good =2; Neutral = 3 bad =4; Very bad =5)

    iii. During the past week, did you change your insulin parameters?
    (Yes=1, No=2)

6. Have you been working with a statistician in designing this protocol?
No

7. Will data from multiple sites be combined during analysis?
No

Study Procedures-Biomedical Research

1. What will be done in this protocol?

PILOT STUDY:
Up to six adolescent subjects and six parent(s)/guardian(s) will be enrolled in a Pilot Study to assess the components used by the Experimental Group of the Main Study. This trial will evaluate if: (i) subjects can be trained to use study CGM + study Fitbit + personal pump (if pump user) or study insulin pen for mealtime

bolus treatments (if MDI) + CloudConnect component which consist of a weekly report based on analysis of the data gathered for each participant; (ii) subjects are able to upload all the data that the team needs to generate the CloudConnect report; (iii) the study team receives the necessary data in a convenient and timely fashion in order to produce the report. Participation in the Pilot Study may be up to three weeks. Both continuous subcutaneous insulin infusion (CSII) and Multiple Daily Injection (MDI) subjects are eligible to participate in this study. Pilot Study participants may participate in the Main Study.

Parent/Guardian Role:
The study team will ask one parent to serve as the 'family spokesperson'. This parent will complete:

- the weekly questionnaires for consistency
- attend training sessions with subject
- download data to study team each week
- participate in the weekly communication with their child (both parents will be encouraged to participated in the weekly communication)

This parent and the adolescent will also be available for contact by the study team (e.g. by phone/text/email) regarding study compliance issues such as uploading of data from CGM, insulin pump, insulin pen (if MDI subject), and activity monitor.

Participation in the study will be about 3 weeks.

Pilot Visits:
Visit 1: Screening Visit (up to 1 hour)

- Demographic information (date of birth, gender, race, and ethnicity)
- Medical and Diabetes History information
- A urine pregnancy test for adolescent girls who can become pregnant. The pregnancy test must be negative to participate.

If study eligible, subject will immediately proceed to Training Visit 2.

Visit 2: Device Training – (up to 1 ½ hours)

- Continuous Glucose Monitor Training – will be trained to use the Study CGM in its full capacity, including setting alarms
- Dexcom Apps Training (if interested in using) - App that will permit the parent(s)/guardian(s) to receive high or low glycemic value alarms
- Activity tracker (i.e. Fitbit) Training
- Study Insulin Pen Training if using Multiple Daily Injections to treat diabetes
- Download device instructions

Visit 3: Weekly Communication (3 weeks/21 days)
Subjects will be asked to provide weekly downloads of all equipment, including the subject's personal insulin pump. Subjects may be asked to repeat a data collection week if the data provided is insufficient or poor quality. The Experimental Group will receive the additional CloudConnect component consisting of a weekly

report based on analysis of the data gathered for each participant. After review by a study physician, the report will be sent via email once a week to both the adolescent participant and their parent(s)/guardian(s).

The weekly contact by phone, email or text will be to:

- Check for AE or SAE
- Remind to download all the data (i.e. CGM, insulin pump/insulin pen, Fitbit data)
- Ask standardized questions:
    I. *During the past week, did you talk with your parents about your diabetes management? Yes or No*

    II. *If you answered "yes," how good or bad was the tone of that conversation? (Likert scale: Very good good Neutral bad Very bad)*

    III. During the past week, did you change your insulin parameters? (Yes=1, No=2)

Visit 4: End of Pilot Study – Return study equipment to study team via CRU (up to 15 minutes) or by FedEx pre-labeled shipment (up to 15 minutes)

A Hemoglobin A1c sample will not be collected at the end of the Pilot Study.

MAIN STUDY: The goal is to complete 160 subjects (80 dyads – consisting of 80 adolescents and 80 adults). A dropout rate of 20-30% is anticipated. Therefore, up to 210 subjects may sign consent with the goal of completing 160 study subjects. Both continuous subcutaneous insulin infusion (CSII) and Multiple Daily Injection (MDI) subjects are eligible to participate in this study.

Parent/Guardian Role:
The study team will ask one parent to serve as the 'family spokesperson'. This parent will complete:

- the weekly questionnaires for consistency
- attend training sessions with subject
- download data to study team each week
- participate in the weekly communication with their child (both parents will be encouraged to participated in the weekly communication)

This parent and the adolescent will also be available for contact by the study team (e.g. by phone/text/email) regarding study compliance issues such as completing questionnaires and uploading of data from CGM, insulin pump, insulin pen (if MDI subject), and activity monitor.

Participation in the study will be about 4 months.

Randomization:

Subjects will be randomized to either a Control Group or an Experimental Group:

Control Group: Personal insulin pump (if pump user) or study insulin pen (if MDI user) for mealtime bolus treatment + study CGM + study activity tracker (i.e. Fitbit). Both pump users and MDI subjects will use their personal insulin and insulin parameters during the trial. The Control Group will be trained to use the Study CGM in its full capacity, including setting alarms and using the CGM App that will permit the parent(s)/ guardian(s) to receive high or low glycemic value alarms. Use of these alarms and apps will be optional for this group. These subjects will also be trained on the use of the activity tracker (i.e. Fitbit). The Control Group MDI subjects will be provided and trained on the use of an inPen (Companion Medical, San Diego, CA) for mealtime bolus treatments. Subjects will be asked to provide weekly downloads of all equipment, including the subject's personal insulin pump. Subjects may be asked to repeat a data collection week if the data provided is insufficient or poor quality.

Experimental Group: Personal insulin pump (if pump user) or study insulin pen (if MDI user) for mealtime bolus treatment) + study CGM + study activity tracker (i.e. Fitbit). Both pump users and MDI subjects will use their personal insulin and insulin parameters during the trial. The Experimental Group will be trained to use the Study CGM in its full capacity, including setting alarms and using the CGM App that will permit the parent(s)/guardian(s) to receive high or low glycemic value alarms. These subjects will also be trained on the use of the activity tracker (i.e. Fitbit). Experimental Group MDI subjects will be provided and trained on the use of an inPen (Companion Medical, San Diego, CA) for mealtime bolus treatments. Subjects will be asked to provide weekly downloads of all equipment, including the subject's personal insulin pump. Subjects may be asked to repeat a data collection week if the data provided is insufficient or poor quality. The Experimental Group will receive the additional CloudConnect component consisting of a weekly report based on analysis of the data gathered for each participant. After review by a study physician, the report will be sent via email once a week to both the adolescent participant and their parent(s)/guardian(s).

Both groups will participate in the same number of visits (completed either in clinic or via phone or video conferencing) and follow up communication contacts done by phone calls, text messages and/or emails during the entire length of the trial. The production of the CloudConnect Report, in combination with the available Dexcom alarms and apps, is the study differential between groups.

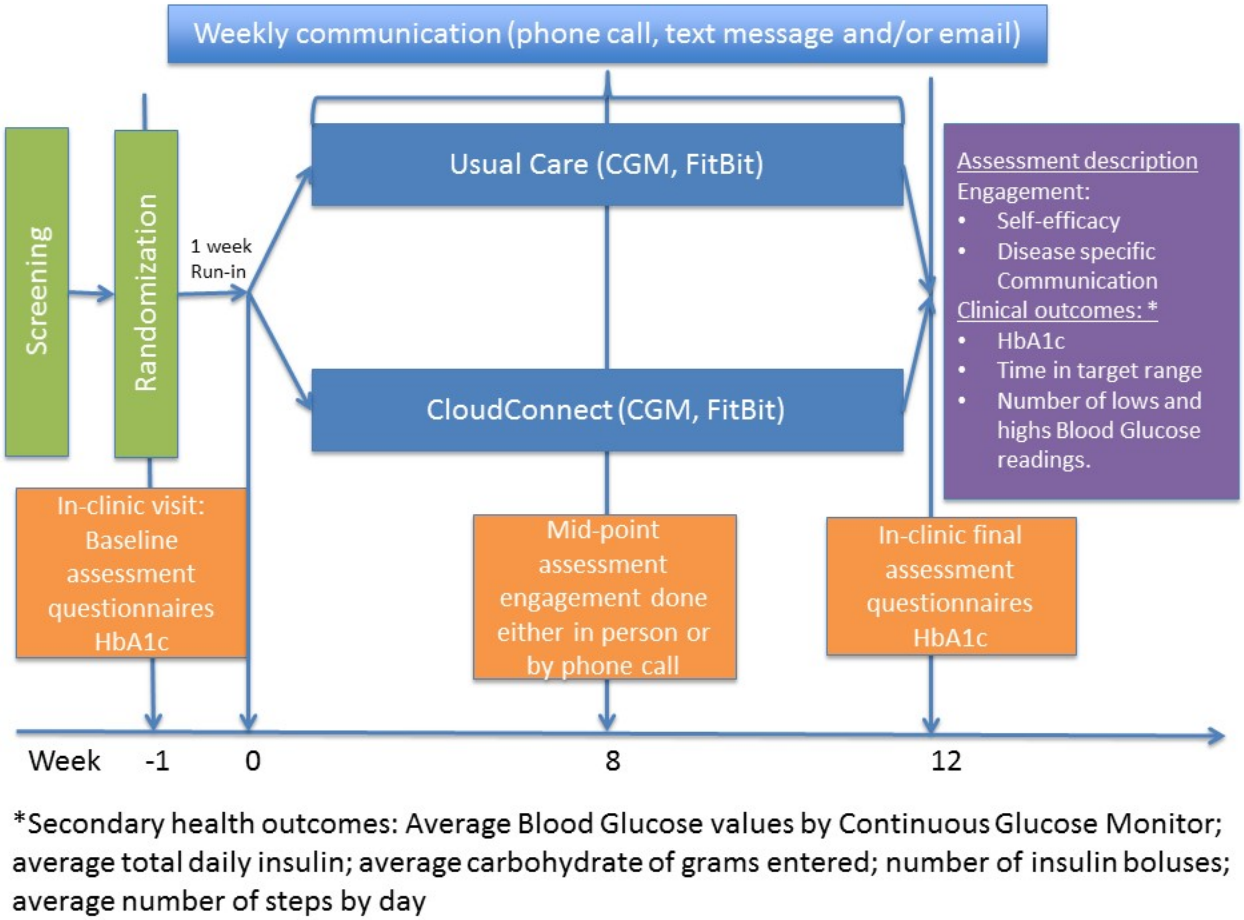

Figure 1: Study Design

There are four visits in the Main Study. Visit 1 and 2 may be combined and may be in person or via phone or video conference. A repeat Hemoglobin A1c will be collected if visit 1 and 2 are greater than 28 days. Vist 3 may be completed by phone. In addition, there will be weekly communication done by phone call, text message and/or email throughout the entire 12 weeks (3 months) of the data collection portion of the study. Method of weekly communications with the adolescent and parent will be based on participant/parent preference. The study team will communicate separately with the child and the parent in order to obtain their feedback independent of the other.

Subjects will be asked to electronically complete the following questionnaires at the completion of Visit 1 and repeated again at the conclusion of their study participation. Questionnaires may be answered remotely (i.e. at home) within a week of the visit or during a CRU visit.

- Blood Glucose Monitoring Communication questionnaire (Hood et al Diab Care 2004)
- Child and Parental Responsibility Questionnaire (adapted from Anderson et al J. Ped Psychol 1990)
- Child Self-Management
- Diabetes Care and Communication
- Diabetes Family Conflict Scale-Revised (Hood et al Diab Care 2007)
- Family Communication Inventory

- MY-Q (deWit et al Ped Diab 2012)
- Questions about CloudConnect use (CloudConnect group only, asked only at study end):
    - On a scale of 1-7, with 1 being very difficult and 7 being very easy, how easy was it to understand the information provided in the weekly reports? Can you tell me why you gave the score you did? What could have made the weekly reports easier to understand?
    - On a scale of 1-7, with 1 being not at all useful and 7 being very useful, how useful were the weekly reports in helping you communicate with your parents/child about managing your/your child's diabetes? Can you tell me why you gave the score you did? What could have made the weekly reports more useful to you?
    - Is there anything else you would like to tell us about your experience with the weekly reports?

The weekly contact by phone, email or text for both the Control and Experimental Groups will be to:

- Check for AE or SAE
- Remind to download all the data (i.e. CGM, insulin pump/insulin pen, Fitbit data)
- Ask standardized questions, which will include the following:
    - For the child participant:
        - During the past week, did you talk with your parents about your diabetes management?
          Yes or No
        - If you answered "yes," how good or bad was the tone of that conversation?
          (Likert scale: Very good good Neutral bad Very bad)
        - During the past week, did you change your insulin parameters?
          (Yes=1, No=2)
    - For the adult participant:
        - During the past week, did you talk with your child about his/her diabetes management?
          Yes or No
        - If you answered "yes," how good or bad was the tone of that conversation?
          (Likert scale: Very good good Neutral bad Very bad)
        - During the past week, did your child change his/her insulin parameters?

          (Yes=1, No=2)

Visit 1: Adolescent subjects will be screened as indicated in the inclusion/exclusion criteria, and the consent form will be signed electronically after all the question related to the study are answered. The consenting process may occur over the phone/video or in-person. Demographic information and medical history information will then be obtained. A physical exam can either be performed at Visit 1 or documentation of a physical exam at a physician/provider visit within one year will suffice. Hemoglobin A1c will be collected with point-of-care equipment or at a local laboratory. This can be omitted if it is not possible to go to a laboratory or come to the clinic because of governmental restrictions such as Stay-at-Home orders. A urine pregnancy test will be required for adolescent girls who are able to become pregnant. Test must be negative to participate in the study.

If the adolescent subject meets eligibility, visit 1 and 2 may be combined. A repeat Hemoglobin A1c will be collected if visit 1 and 2 are greater than 28 days.

Visit 2 (may be combined with Visit 1, may be done via phone or video): Adolescent subjects will be randomized and trained on the use of the study CGM and Fitbit. The CGM will be inserted into their abdomen per manufacturer instructions. Both Control and Experimental Group subjects will use their own personal pump. If the subject uses multiple daily injections (MDI), a commercialy available Bluetooth connected insulin pen (inPen) will be given to both the Control and Experimental subjects in order to be able to collect the data accurately about meal time bolus treatments. Both pump users and MDI subjects will use their personal insulin. Each group will provide the study team weekly downloads from the study equipment and the personal insulin pump. Weekly CloudConnect reports will be provided to the Experimental Group participants *only*.

Depending on the subjects/family preference, the study team contact subjects via phone calls, text messages and/or emails at least once a week during the trial to:

a) Remind them to download and transmit the data
b) Check for AEs or SAEs
c) Ask weekly standardized questions

All subjects will be reminded on how to download study data, if necessary. Both groups may complete a 1-week run-in period if they are CGM-naïve to ensure they are comfortable with the use of the study equipment, that all the study devices work properly, and to address issues related to transmission of the data to the study team. This run-in period may be repeated as necessary up to 3 times at the request of the study subject or study team. This data will not be included as part of the 12 week data collection. For subjects who have CGM experience, the investigator will determine if it is appropriate for he or she to skip the run-in period.

Visit 3 Check-in (Week 8 / on-site, email, or phone):
Subjects will download diabetes equipment weekly and submit the data to the study team for 12 weeks. Subjects may be asked to repeat a week of data collection if the quality of the data is insufficient for analysis.

A Check-In with the adolescent and parent/guardian will be completed to evaluate compliance and to answer any questions that the adolescent or parent may have about the study.

Visit 4 – End of Study (about Week 12): Subjects will be asked to return to the Clinical Research Unit (CRU) to return study equipment (i.e. Bluetooth pen, CGM, Fitbit), if possible. A post-study HbA1c test will be obtained with a point-of-care equipment or local laboratory (same method as screening collection). This can be omitted if it is not possible to go to a laboratory or come to the clinic because of governmental restrictions such as Stay-at-Home orders. Questionnaires will be completed electronically at the end of this visit. Questionnaires may be completed at home prior to this visit or at the CRU.

2. If this protocol involves study treatment, explain how a subject will be transitioned from study treatment when they have completed their participation in the study.

The study intervention is to evaluate the communication between the adolescent study subjects and their parents. The treatment for T1D is subcutaneous insulin either by using insulin pumps or insulin pens. This

treatment will remain the same at the completion of this study. Subjects will return to using their personal diabetes equipment and follow their own insulin parameters.

Subject Compliance with Study Procedures

1. **Explain how the study team will monitor the subject for compliance with the study procedures.** A mid-study visit during Week 8 is planned to assess compliance. In addition, there will be at least 1 phone call or text message per week to remind subjects to download and transmit the required data, if needed.

   It will be at the discretion of the investigator to determine if the patient is not compliant, i.e. three or more weeks with no data received, and the subject will be withdrawn for the study and replaced.

2. **Describe criteria for when a subject is considered to be non-compliant with study procedures.**
   The subject will be dismissed for the study if the subject misses 3 or more weeks of data downloads.

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