Virtual Diabetes care solution – implementation March – April 2016

A feasibility report

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Foreword:

SRCHC designed, developed, and tested a virtual care diabetes management tool within three months between January 2016 and March 2016 in response to the Toronto Central LHIN's *test for change* initiative. In sharing this report, we'd like to thank the following individuals and organizations for their contributions to this test for change initiative.

To start, we would like to thank Margery Konan, Senior Consultant for Health System Design, Integration, & Development along with the Toronto Central LHIN for their support of this pilot.

We would like to thank QoC Health Inc., for their many contributions including involvement in a co-design process, providing managed devices for client and clinician use, and technical support during the short implementation phase.

We also want to thank the following members of the working group, who helped us identify the features needed in a virtual care solution:

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2. Joanne Lewis, Manager, Diabetes Education – Canadian Diabetes Association
3. Leigh Caplan, Nurse Educator – Sunnybrook DEC + PWD
4. Saara Muhaseen, Caregiver and Peer Leader for DSMP
5. Vania Tong, Diabetes Educator – DECNET, South Riverdale CHC

The contributions and support by the staff from the three Diabetes Education Programs and their managers was also critical and greatly appreciated.
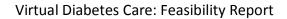
The guidance offered by the following individuals on the steering committee is also greatly appreciated:

1. Andrew Young, VP Services and Product Development – Canadian Diabetes Association
2. Lisa Kha, Data Management Coordinator – South Riverdale CHC
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Tracy Tang, Research Associate, Student, Nutrition and Food – Ryerson University receives our thanks for anchoring all aspects of this time-sensitive feasibility study.

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Overview

The objective of this report is to share results of a feasibility study of a virtual care solution involving the use of an app by people living with diabetes (PWD) and a virtual platform by health care providers (HCP) designed for diabetes self-management PWD (Type 2). The 5 HCPs and 10 PWDs who participated in a month long pilot testing the utility of the solutions were from three Diabetes Education Programs (DEPs) located in Anne Johnston Health Station (AJHS), Flemingdon Health Center (FHC), and South Riverdale Community Health Centre (SRCHC). In this summary report, we will present utility of the virtual solutions from the perspective of the DEPs' HCPs and their clients, utility of virtual solutions as identified in the literature, and direction for the future.

Background

SRCHC designed, developed, and tested a virtual care diabetes management tool within three months between January and March 2016 in response to the Toronto Central LHIN's (TC LHIN) test for change initiative. In November 2015, SRCHC issued a request for proposal to select the best qualified vendor to collaboratively develop a virtual diabetes self-management app. QoC Health Inc. (QoC) was chosen to move forward with the project. The client's app and clinician's dashboard, co-designed by a working group of clinicians, clients, and QoC, was intended to test for the utility of virtual care in DEPs. The client's app has been designed for PWDs to track, review, and capture self-management behaviours that have been identified in literature and by end-users who were part of the working group, to play a critical role in optimal diabetes self-management. The corresponding virtual care platform dashboard is designed for HCPs of these PWDs to observe their respective client's progress and recorded information for remote monitoring. Overall, in the month long implementation of this pilot, we tested the feasibility of the app from the perspective of participating HCPs and PWDs.

Methods

A qualitative research design was chosen to capture the experiences, perceptions, beliefs, and thoughts of the 15 participants with the virtual solution during the month long implementation. Both HCPs and PWDs voluntarily participated in the pilot. For PWDs, the selection criteria required fluency in English, a relationship with the DEP's HCP, and familiarity with smartphone technologies including a valid email address.

For the feasibility study, phone interviews were conducted within two weeks of the month long implementation period to gain user feedback on the experience. A set of questionnaires (Appendix A) were used to collect this information. Further, clients responded to a demographic questionnaire (Appendix B). Collectively, this information represents the primary data set from which results will be presented in a latter section. In order to

substantiate the findings, a literature review was also pursued and this is discussed in the section that follows.

Literature Review

Between 2013-2015, four studies including an RCT, a systematic literature review (SLR), and two meta-analyses have demonstrated small, but statistically significant reductions in HbA1c with various types of virtual care solutions [3-6]. Notably, in the SLR, the mobile phone subgroup of interventions exhibited the most prominent effect on glycemic control [5]. One of the two meta-analyses showed positive impacts of virtual care including diabetes self-management behaviours and diabetes self-efficacy [6]. Most recently, a 2016 study using mobile tablet devices reported that the participants felt significant benefit and satisfaction with using the device. As well, they felt an increased sense of control over their diabetes self-management [7]. Interestingly, however, one study that used both an online and handheld device platform showed that the participants' HbA1C levels were significantly reduced at 6 months, but not at 12 months [8].

Even so, extensive literature review of articles which analyzed a total of 78 studies identified mixed and inconsistent results on the role of virtual care solutions to support self-management for PWDs. These solutions involved internet-based platforms, including computer-based online websites, handheld smart phones apps, phone calls, text messages, and online video-conferencing [1-8].

It has been conclusively shown by the Diabetes Control and Complications Trial that the onset and progression of diabetes complications can be effectively deferred by an improved control of blood glucose levels [2]. For PWDs to effectively and successfully manage their blood glucose levels, it is imperative that they adopt habitual self-care routines [7]. As patients go about their busy daily lives travelling to and from their homes, schools, and workplaces, day-to-day management of diabetes may become very difficult and emotionally taxing [2].

Mixed results from current literature review warrants further investigation on the potential benefits of virtual solution. Specifically, there is a possibility to extend the testing of the virtual solution developed for HCPs and PWDs that allows for rigorous analysis of the interface as well as testing of statistically significant reductions in HbA1c. This will need a larger sample size and longer implementation phase and ideally, a randomized control trial of an interface improved to incorporate feedback identified in the feasibility study, which is discussed next as well as the Phase B feature list that can be found in Appendix C.

Results

Participant profile – Clients

On average, the PWD with Type 2 diabetes was 51 years old. Four self-identified as females and six self-identified as males. Eighty percent of participants had pursued post-secondary education and the rest had some level of education up to primary school. The majority of the clients self-identified as Caucasian/White with 30% self-identifying as members of racial minority, such as African/Black, East Asian, and South Asian, and one client who declined to comment. 80% of the participants had co-morbidities such as anemia, arthritis, asthma, cardiovascular conditions, Marfan's syndrome, osteoporosis, prostate condition, and scoliosis. Only one client lived solely with Type 2 diabetes and one declined to comment. For further clarification, please refer to Appendix D.

Participant profile – Providers

A small number of HCPs (n=5) participated in this pilot. All were female with postsecondary education.

Emerging themes

The testing of any new medium requires learning for all parties involved. During the feasibility study, the transition between identified barriers, recommendations, and elements of satisfaction were fluid. The results presented in this section start with barriers, specified in Table 1. The list on page 6 presents themes with descriptions of concerns raised by both HCPs and PWDs from their participation in the month long virtual care solution.

Barriers	Description
Technical glitches resulting in:	• Lack of data analysis
	• Difficulty with navigation and use
	• Frustration with having to connect the client to QoC for support
Not enough information that will impact management	• Not enough options that reflect how one self-manages
	• Information provided not beneficial to self-management
Not able to make edits to:	• For clients: smart goals, blood sugar level input
	• For providers: clinical lab values
Availability of technical support not apparent to clients	
Lack of synchronization with features from other apps (ex: NOD, EMR, Fitbit, Glucoguide, etc.)	• Healthcare provider having to manually input clinical lab values

Table 1: Barriers

Barriers	Description
Not useful due to incompatibility with personal practice	• Already using alternative device with similar functionality (ex: MyFitnessPal, Glucoguide)
Not able to analyze and make assessments of inputted/given data	• Pilot too short for values to be useful to the healthcare provider • No personalized analysis of inputted blood glucose for clients
Unclear training and confusion throughout the pilot phase	

Table 1: Barriers

Table 2 provides key themes that emerged as recommendations for barriers that closely match the list of items in Appendix C of features that remain to be developed for an improved user experience. The recommendations and barriers highlight a demand for an all-encompassing app that addresses self-care and multiple clinical issues for PWDs with the ability to engage many different HCPs in various healthcare settings

Recommendation	Description
Being able to transfer or input data from external sources	• Transfer food quantities and measurements from other sources (ex: photos from album, MyFitnessPal, Fitbit, etc.) • Transfer blood sugar measurements from meters to their app • Input text-based description of meal to accompany photo • Ability to self-evaluate healthiness of meals in relation to photo taken
Calendar function	• Being able to input meals, snacks, & blood level measurement throughout various times throughout the day
Option to track self-management activities	• Ex: exercise, blood pressure, insulin, weight • Ability to add notes/comments on self-management activities
Option to track and book visits with healthcare providers	• Ability to book appointments using the app • Ability to visit the provider virtually
Availability to export data to collect and share with patient-selected healthcare providers	• Ex: ability to track reports from foot care and eye care
Clear and consistent representation of inputted data across app features	• Centralized "My Reports" feature that encompasses graphical representation of data from all other app features • Ability to view different timeframes for graphs & charts (ex: daily, weekly, monthly, yearly view)

Table 2: Recommendations for solution

Recommendation	Description
Algorithm that prompts recommendations for healthy lifestyle activities or reminders for personal data inputting	• Option to turn on and off notifications (ex: blood sugar readings, articles relevant to data input, exercise, etc.)
Healthcare provider involvement in testing the app prior to implementation with clients	
More options for self-check	• Being able to complete questions within the self-check features at various times throughout the day, weekly, or biweekly • Input text-based description along with Likert scale
Provide better smart goals feature	• Rephrase how the questions are posed (ex: don't ask self-efficacy after achieving the goal)
Dashboard improvisation	• Option to specify which lab values to display with each client (ex: checklist)
Provide a Help/FAQ feature	

Table 2: Recommendations for solution

This final table (Table 3) captures list of features within the app used by PWDs and dashboard used by HCPs that were identified as satisfactory, albeit improvements were still needed incorporating recommendations in Table 2 as well as features list in Appendix C.

Category
Self-Check
Message Board
My Plan/ Care Plan
My Journal
Meal View
Smart Goal
Learning Center
Clinical Lab
Overall Layout/ Ease of Use
Technical Support

Table 3: Satisfaction with existing features of the solution

Summarizing the results, there were prominent trends in participant feedback. All participants supported further development and implementation of virtual self-management apps, despite identified barriers and areas for further improvement. Appendix E also provides user engagement data with key features of the apps discussed in these qualitative responses.

Discussion

From our analysis, there was an overwhelming response favouring virtual care as an acceptable option for diabetes self-management by both HCPs and PWDs receiving services in DEPs. The sample size is too small and the study length too short to make any valid conclusion.

With the convenience and portability of mobile technology, virtual-based interventions have the potential to help these patients with self-management by offering convenient access to resources whenever and wherever they need it most [7]. The provision of virtual care enables clients to be more engaged and effective in their self-management of diabetes, and supports them in making informed decisions around their daily activities [2]. This approach has also been suggested as a potentially lower-costing option for chronic disease self-management that often is valid for PWDs that have more than one chronic condition [3].

Despite optimism surrounding virtual diabetes care, the range of the outcomes these studies outline demand that further research is required. Overall, current research does not show adequate evidence substantiating whether or not using a virtual approach empowers individuals in diabetes self-management. The results of the feasibility study present direction to enhance the use, ease, and helpfulness of the virtual diabetes care solution. In order to better understand the recommendations that emerged and test for effectiveness of the solution developed, we recommend a longer implementation phase of an improved interface with larger sample size of HCPs and PWDs in DEPs.

We are confident that with an improved solution and a longer test phase, we can add to the growing body of literature and learn the effectiveness of the remote monitoring.

Appendix A: Questions

Questions - Clients

1. **What was your overall satisfaction with using the app?**
   (Very Dissatisfied/Dissatisfied/Satisfied/Very Satisfied/Unsure)
2. **Was the app easy to use and move between features?** (Yes/No/Maybe)
   ➢ So did you find the overall app user-friendly? Why or why not?
   ➢ How did you feel about the layout of the app?
   ➢ Did you come across any confusions while using the app?

Now the next few Q's are about the individual components of the app so please think about whether you found them (Not at all useful/Slightly useful/Useful/Very Useful/Unsure)

3. **How useful was the <u>self-check</u> feature?**
4. **How useful was the <u>meal view</u> feature?**
5. **How useful was the <u>smart goal</u> feature?**
6. **How useful was <u>my plan</u> feature?**
7. **How useful was the <u>learning center</u> feature?**
8. **How useful was the <u>message board</u> feature?**
9. **How useful was the <u>my journal</u> feature?**
10. **Please describe how useful you think this app is in helping you manage your diabetes.**
    ➢ Did you find the app easy to understand and use?
    ➢ Do you feel motivated by this app to self-manage your diabetes? Why or why not?
11. **Please describe your overall experience of participating in this pilot.**
    ➢ Was it easy for you to use this app in your day to day life?
    ➢ How would you explain your personal benefits versus costs of participating in this pilot?
12. **Please describe how you think the app could be improved.**
    ➢ If somewhat answered previously, reword to "please describe how ELSE you think.."
13. **Please tell me about any challenges you faced when using the app.**
14. **Did you have to use the technical support?**
    ➢ Could you tell me more about what that was like and how satisfied you were with the support or lack of support that you received?
15. **Would you like to continue using this app to communicate with your DEP care provider?**
    (Yes/Maybe/No)
    ➢ If there was an updated version of this app, would you want to continue using virtual care as an option in helping you manage your diabetes?
16. **Would you recommend an updated version of this app to other patients?** (Yes/Maybe/No)
17. **Do you have any additional thoughts/comments about the app?**

Questions - Providers

1. **What was your overall satisfaction with using the portal?**
   (Very Dissatisfied/Dissatisfied/Satisfied/Very Satisfied/Unsure)

2. **What was your overall satisfaction with the data received from the app?**
   (Very Dissatisfied/Dissatisfied/Satisfied/Very Satisfied/Unsure)
   ➢ Did you find the information you received was appropriate for the purposes of the pilot?
   ➢ Did you feel you had all the relevant information you needed?
3. **Was the app easy to use and move between features?** (Yes/No/Maybe)
   ➢ So did you find the overall app user-friendly? Why or why not?
   ➢ How did you feel about the layout of the app?
   ➢ Did you come across any confusions while using the app?

Now the next few Q's are about the individual components of the app so please think about whether you found them (Not at all useful/Slightly useful/Useful/Very Useful/Unsure)

4. **How useful was the <u>meal view</u> feature?**
5. **How useful was the <u>smart goal</u> feature?**
6. **How useful was the <u>self-check</u> feature?**
7. **How useful were the <u>clinical lab</u> values (*A1C, LDL, HDL, etc.*)?**
8. **How useful was the <u>care plan</u> feature?**
9. **Please describe how useful you think this app is in helping your clients manage their diabetes.**
   ➢ Did you find that the app was appropriate for your clients? (easy to understand and use?)
   ➢ Were there any noticeable differences in behaviour from your clients since using this app? (re: change in attitude, motivation or willingness to self-manage their diabetes?)
10. **Please describe your overall experience of participating in this pilot.**
    ➢ Was it easy for you to adapt to Diabetes Atlas and implement it in your practice?
    ➢ How would you explain the benefits versus costs of participating in this pilot?
11. **Please describe how you think the portal or app could be improved.**
    ➢ If somewhat answered previously, reword to "please describe how ELSE you think.."
12. **Please tell me about any challenges you faced when using the app.**
13. **Did you have to use the technical support?**
    ➢ Could you tell me more about what that was like and how satisfied you were with the support or lack of support that you received?
14. **Would you like to continue to use this application with your patients?** (Yes/Maybe/No)
    ➢ Would you want virtual care as an option for and recommend an updated version of this app to your patients?
    ➢ How do you feel you would or would not benefit from using this app?
15. **Would you recommend this application to other healthcare providers?** (Yes/Maybe/No)
    ➢ Would you recommend virtual care and an updated version of this app to your coworkers?
16. **Do you have any additional thoughts/comments about the app or portal?**

Appendix B: Demographic Form

First Name: _____

Last Name: _____

Gender: □Male   □ Female   □ Other: _____

Age: _____

Marital Status: _____

Please circle the highest year of school completed:

1 2 3 4 5 6 7 8   9 10 11 12 13   14 15 16 17   18 19 20 21 22   above 22

  (primary)   *(high school)*   *(college/university)* *(graduate school)*

Ethnicity:

□Caucasian/White   □Native American or American Indian

□Black or African American   □Hispanic or Latino

□East Asian   □South Asian

□Middle Eastern

□Other (please specify):_____

Chronic conditions. Please check all that apply:

_____Diabetes   _____Asthma

_____Heart Disease   _____Emphysema, COPD or other
                                              Lung Disease

_____High Blood Pressure   _____Arthritis

_____Cancer   _____Osteoporosis

_____Other:_____

Appendix C: Phase B feature list

The development of these features and the associated timeline:

Phase B (1 year post pilot)	Phase C (post Phase B)
❏ Comprehensive graph reports of client data for both client and provider (My Plan, provider portal "Monitoring" tab). ❏ Pre-populated self-management educational repository for clients (Learning Centre). ❏ Secure two way messaging for provider & client (Message Board). ❏ Private personal note taking for clients (My Journal). ❏ Site based provider-client permissions management for providers (Provider Portal: dashboard & global search) ❏ NOD Integration ❏ Expanded clinical data support client created smart goals ❏ Improved Learning Centre content & delivery (graphic content) ❏ Improved client notifications & scheduled reminders Improved care plan notes management for providers (view permissions, note archive) ❏ Improved Learning Centre management for providers (customized provider to client article delivery & content programming)	❏ Predictive algorithm development (individualized behavioural health indicators) ❏ Provider-client virtual visits (video conferencing) ❏ Client prescription tracking (e.g. medication log) ❏ Client non-prescription supplements tracking (e.g. vitamins/supplement log) ❏ Improved social media integration ❏ Client "Circle of Care" social network/peer support ❏ iOS support

Table 4: Feature list for improvements

Appendix D: Client Demographics

Deidentified Name	Gender	Age	Marital Status	Years of Schooling	Ethnicity	Chronic Condition 1	Chronic Condition 2	Chronic Condition 3	Chronic Condition 4	Chronic Condition 5	Chronic Condition 6
Client 1	Male	30	Single	12	White	Diabetes					
Client 2	Male	74	Married	17	French	Diabetes	High blood pressure	Arthritis	Heart disease	High cholesterol	Prostate condition
Client 3	Female	58	Single	15	White	Diabetes	High blood pressure	Arthritis	Heart disease	Marfan's syndrome	Scoliosis
Client 4	Male	57	Married	15	White	Diabetes	Heart disease				
Client 5	Female	66	Single	17	N/A	Diabetes	High blood pressure	Arthritis	Asthma	High cholesterol	
Client 6	Male	32	Common law	16	White	Diabetes					
Client 7	Male	42	Single	17	White	Diabetes	High blood pressure				
Client 8	Female	50	Separated	7	African	Diabetes	Osteoporosis	Arthritis	Heart disease	Asthma	Anemia
Client 9	Male	65	Married	17	East Asian	Diabetes	High blood pressure	Arthritis	Heart disease		
Client 10	Female	33	Single	17		Declined to comment					

Table 5: Client demographic data

Appendix E: User Engagement data

Message Board Feature - PWDs	Message Board Feature - HCPs	My Journal Feature	Self Check Feature	Meal View Feature	Meal View Feature	Meal View Feature
27 messages sent by PWDs to their HCPs	8 messages sent in response by HCPs	2 journal entries saved by only 1 PWD	93% completion rate by 8 of the 10 PWDs who responded 76 times overtime	On average, 2 meals per day saved by PWDs	235 pictures of meals stored between 10 PWDs	137 post meal blood glucose reading submitted by PWDs

Table 6: Sample data from QoC Health Inc

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