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Is a Cloud-based Platform Useful for Diabetes Management in Colombia? The Tidepool Experience

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Highlights

- First cloud platform experience reported in Colombia for diabetes management.
- Experience reported under SARS-CoV-2 pandemic situation.
- Type 1 and Type 2 diabetes patients assisted.
- Several diabetes devices from different manufacturers were considered.
- Diabetes-specific questionnaires of quality-of-life and interviews were completed.
- Complete review of user experience was reported.

Is a Cloud-based Platform Useful for Diabetes Management in Colombia?

The Tidepool Experience

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Abbreviations: Type 1 Diabetes (T1D), Type 2 Diabetes (T2D), multiple daily insulin injections (MDI), continuous subcutaneous insulin infusion (CSII), System Usability Scale (SUS), Problem Areas In Diabetes (PAID), Diabetes Treatment Satisfaction Questionnaire (DTSQs) and Diabetes Quality of Life (DQOL).

Short running title: Is a Cloud-based Platform Useful for Diabetes Management in Colombia?

Keywords: Colombia, Diabetes management, Telemedicine, eHealth, Usability study

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Abstract

Background: *There are several medical devices used in Colombia for diabetes management, most of which have an associated telemedicine platform to access the data. In this work, we present the results of a pilot study evaluating the use of the Tidepool telemedicine platform for providing remote diabetes health services in Colombia across multiple devices.*

Method: *Individuals with Type 1 and Type 2 diabetes using multiple diabetes devices were recruited to evaluate the user experience with Tidepool over three months. Two endocrinologists used the Tidepool software to maintain a weekly communication with participants reviewing the devices data remotely. Demographic, clinical, psychological and usability data were collected at several stages of the study.*

Results: *Six participants, from ten at the baseline (five MDI and five CSII), completed this pilot study. Three different diabetes devices were employed by the participants: a glucose meter (Abbot), an intermittently-scanned glucose monitor (Abbot), and an insulin pump (Medtronic). A score of 81.3 in the system usability scale revealed that overall, most participants found the system easy to use, especially the web interface. The system also compared highly favourably against the proprietary platforms. The ability to upload and share data and communicate remotely with the clinicians was raised consistently by participants. Clinicians cited the lockdown imposed by the Covid-19 pandemic as a valuable test for this platform. Inability to upload data from mobile devices was identified as one of the main limitations.*

***Conclusion**: Tidepool has the potential to be used as a tool to facilitate remote diabetes care in Colombia. Users, both participants and clinicians, agreed to recommend the use of platforms like Tidepool to achieve better disease management and communication with the health care team. Some improvements were identified to enhance the user experience.*

Introduction

The diabetes population in Colombia has a prevalence of 7.4%, representing almost three million people [1]. The public health service is mainly based on a traditional on-site medical consultation, with only 236 endocrinology specialists recognized by national medical associations [2]. Most such specialists are located in Bogotá DC, generating an uneven distribution in a country with a 19% of rural population [3]. Under this scenario, which has been exacerbated by the global pandemic caused by SARS-CoV-2, technological solutions are a very appealing option that needs to be considered [4, 5].

Nowadays, most medical devices for diabetes management (e.g., blood glucose meters, continuous glucose monitoring systems, insulin pumps) have their own proprietary platforms for data uploading and visualisation. The Medtronic CareLink software [6] and Abbott Freestyle Libre [7] are examples of such systems currently available in Colombia. However, if clinicians, or patients, want to review the data from multiple devices by different manufacturers, they need to access each of them separately through their corresponding platforms, which generates a significant additional burden.

This problem can be eased thanks to the use of available diabetes management telemedicine platforms such as Glooko-Diasend [8] or Tidepool [9], which allow cloud-based data fusion from multiple medical devices and provide advanced data management and visualisation tools. These platforms have been evaluated in several clinical studies as a way to facilitate remote health services [10, 11]. However, Glooko-Diasend is not available in Colombia and, to the best of our knowledge, Tidepool has not been used nor evaluated in this country.

In this work, we present the results of a pilot study evaluating the use of the Tidepool platform for providing remote health services to individuals using various diabetes devices in Colombia. The purpose of the study can be summarised with the following research question: *how do people with diabetes in Colombia perceive the use of Tidepool in terms of user experience, existing functionalities and potential future enhancements?*

Pilot Study Design and Methodology

This is a 3-month nonrandomized, open-label study. Participants were recruited from the Hospital Universitario San Ignacio (HUSI) (Bogotá, Colombia). Protocols were conducted in accordance with the Declaration of Helsinki and were approved by the research and institutional ethics committee of the HUSI. All participants provided verbal and written informed consent.

Participants

Inclusion criteria for the study were as follows: Adult participants aged 18 years or older with Type 1 Diabetes (T1D) or Type 2 Diabetes (T2D) diagnosis ≥1 year, no pregnancy, multiple daily insulin injections (MDI) or continuous subcutaneous insulin infusion (CSII) for at least 6 months, no severe hypoglycemia in the past 6 months, no reduced manual dexterity, signature of informed consent, and willing to follow investigation instructions. Participants were required to have a smartphone (iOS or Android operating system) and a computer with internet access at home (Mac or Windows operating system). A minimum of five participants was considered sufficient for usability testing purposes, since it has been reported that the cumulative probability of detecting problems diminishes rapidly above a low threshold [12] and the international IEC standard suggests that many usability problems can be detected in formative studies with five to eight participants [13].

Two endocrinologists on the research team (AG and DH) analysed the uploaded data and provided feedback to the participants every eight days. Treatment information was sent through the text messaging tool integrated into Tidepool. Participants could review all text notes sent by the healthcare staff using either the Web or Mobile environment. The clinicians also participated in certain parts of the study, as detailed in the next section. For clarity, the term “participant” is used to refer to non-healthcare staff participants, unless otherwise specified.

Software System: Tidepool

Tidepool is a free-to-use cloud-based software platform that the diabetes community can use to access, manage and share data from devices produced by a variety of manufacturers (Abbott, Roche, Medtronic, etc) [14]. It allows sharing of information with the healthcare practitioners in order to obtain valuable feedback for treatment. Tidepool includes three work environments: Web, Mobile, and Uploader. The Web environment allows users to visualize and retrieve information or data from medical devices, and share it with the clinicians and relatives. The mobile app can be used to include daily notations and as a communication channel with the healthcare practitioners. Uploader is used to transfer the data from insulin pumps and/or glucose monitoring devices to the platform once it has been transmitted to the desktop machines via the USB connection of the device manufacturers' equipment. Figure 1 summarizes the Tidepool software architecture joining the three environments to the platform using a HTTP protocol, where the database (DB) is located. The platform infrastructure is managed by an orchestrator system called Docker engine, which deploys the applications into the production environment as containers. Additional details can be found at https://github.com/tidepool-org.

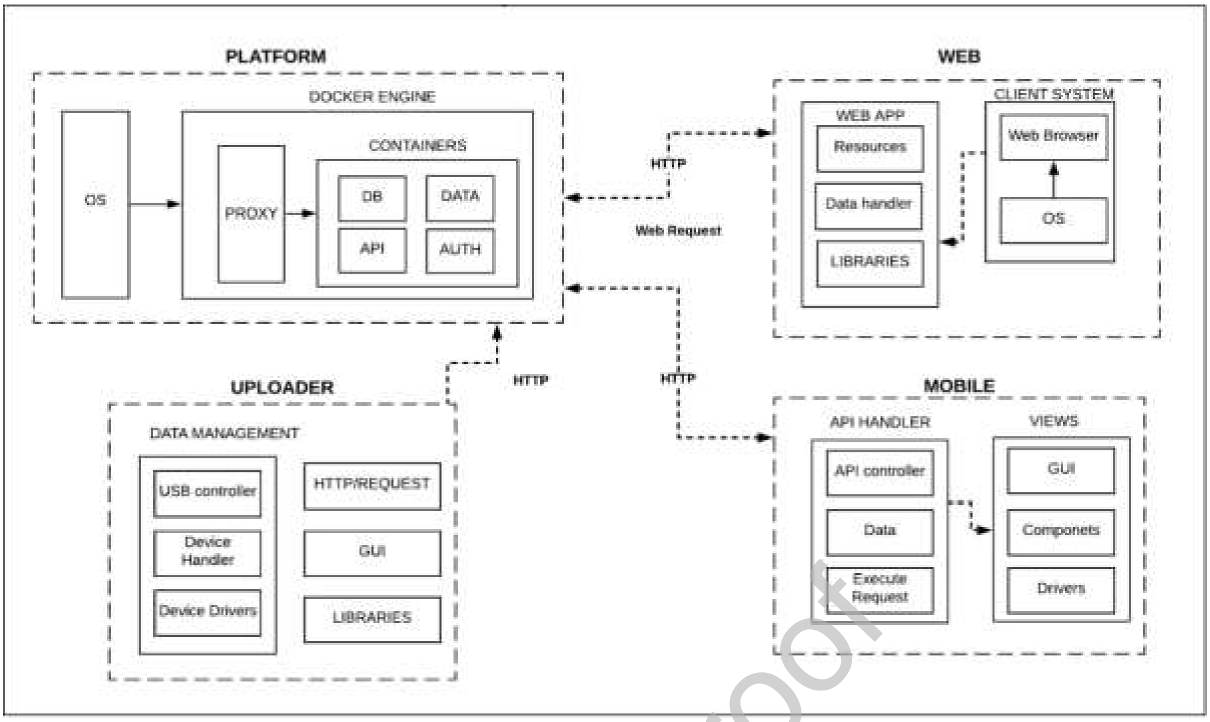

Figure 1. Tidepool software architecture. OS, operating system; GUI, graphical user interface; DB, database; API, application programming interface; HTTP, Hypertext Transfer Protocol.

In this pilot study, the participants accessed the three environments through anonymised Tidepool website accounts. Each participant received a numeric username, assigned randomly, and an associated password. Clinicians used the web tool only. The clinical staff who participated in the study were previously trained in the use of Tidepool.

Methods

The protocol included one screening visit, two follow-up visits, and a last screening visit (see Figure 2), all originally scheduled to be face-to-face. Figure 2 also details the number of active participants registered and the time spent at each visit. During the screening visit, participants received a training session and demographic, clinical, psychological and usability data were collected. The clinical information included type and duration of diabetes, current treatment, HbA1c. A pre-study usability survey was also conducted to determine their experience in the use of computers and smartphones. The questions are shown with the results in Figure 3. The following diabetes-specific questionnaires of quality-of-life were completed: Problem Areas In Diabetes (PAID) [15], Diabetes Treatment Satisfaction Questionnaire (DTSQs) [16] and Diabetes Quality of Life (DQOL) [17].

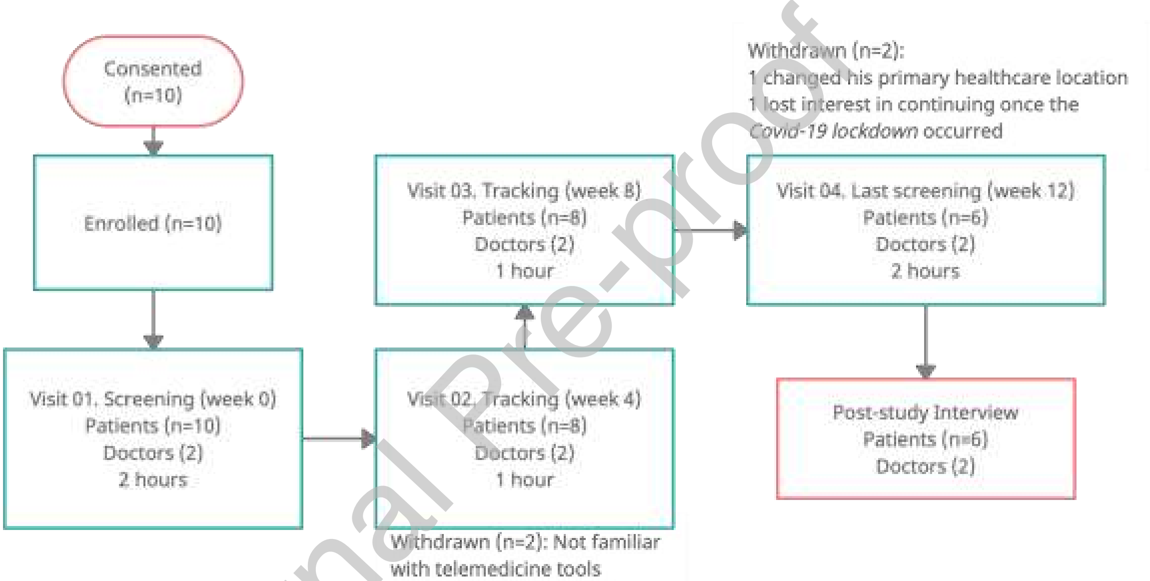

Figure 2. Participant flow chart. Participant flow and study visits.

During the follow-up visits, all participants and clinicians provided their impressions about using the Tidepool environment through a usability survey comprising four questions: How was your experience with the system so far? Which features have you found the most useful? Are there any screens or information that you think didn't work, or which you haven't used? Are there any enhancements that would make it more useful to you?

In the last visit, participants provided additional psychological data through the same questionnaires used at baseline. A post-study telephone interview was conducted with all participants and clinicians to discuss their overall experience. The interviews were centred around the same script as the usability survey, together with additional probe questions. Participants were also asked about frequency and duration of interactions with the system. Finally, the System Usability Scale (SUS) [18] was used to measure user satisfaction with the interface. SUS scores range between 1–100, with 68 considered to be the average [19]. The scale is widely referred to as an industry standard in the business and technology industries.

Once the data collection was completed, thematic analysis [20] approaches were employed to analyse the qualitative data, guided by six well-established phases [21].

Results

Participant characteristics and devices

Seven T1D participants and three T2D participants (five MDI and five CSII) were recruited at baseline. However, there were four drop-outs, as can be traced in Figure 2: two were not familiar with telemedicine tools and did not want to continue in the middle of the study (visit 02 of Figure 2), one changed his primary health-care location at the end of the study and it was not possible to maintain communication, and one lost interest in continuing once the Covid-19 *lockdown* occurred. These exceptional circumstances might help to explain why those two participants did not attend the last visit considering that a technical support researcher was recruited to maintain good communication with participants throughout the study, and comprehensive educational videos and documentation were created to respond to the most frequently asked questions.

Table 1 shows the demographics information of participants that completed the study. The post-study visit (the interview) was originally scheduled face-to-face for February-March 2020, but due to some delays and later to the Covid-19 *lockdown* in Colombia (since March), most of them finished the study between March and May 2020. The lockdown affected participants differently as they did not all start the study at the same time, however the post-study visit was conducted by phone for everyone. Three different diabetes devices were used: one FreeStyle Optium Neo glucose meter (Abbott Diabetes Care, Witney, UK), two flash FreeStyle Libre glucose meters (Abbott Diabetes Care, Witney, UK), and three insulin pumps Minimed 670G (Medtronic Diabetes, Northridge, CA, US).

Table 1. Demographics of participants that completed the pilot study. BMI, body mass index; CBG, capillary blood glucose.

Demographics	Median (Q1-Q3)
	n=6
Gender (male:female)	3:3
Age (years)	54 (48.7-63)
BMI (kg/m2)	27.1 (25.5-29.9)
Therapy (MDI:CSII)	3:3
Duration of diabetes (years)	21 (10.5-29.2)
HbA1c (mmol/mol)	49.1 (42.6-53)
Number of CBG measurements per day	6 (6-8.2)
Type of diabetes (T1:T2)	4:2

Usability Findings

1. Pre-study questionnaire

Participants were asked questions about their use of computers, browsers and phones (see Figure 3 for a summary of the questions and responses). There were nine responses from the group of ten recruited participants. Only one considered themselves to be a novice user of technology. The majority claimed that they use a wide variety of applications daily in computers, web browsers and mobile phones. The exceptions were spreadsheets, games and diabetes apps.

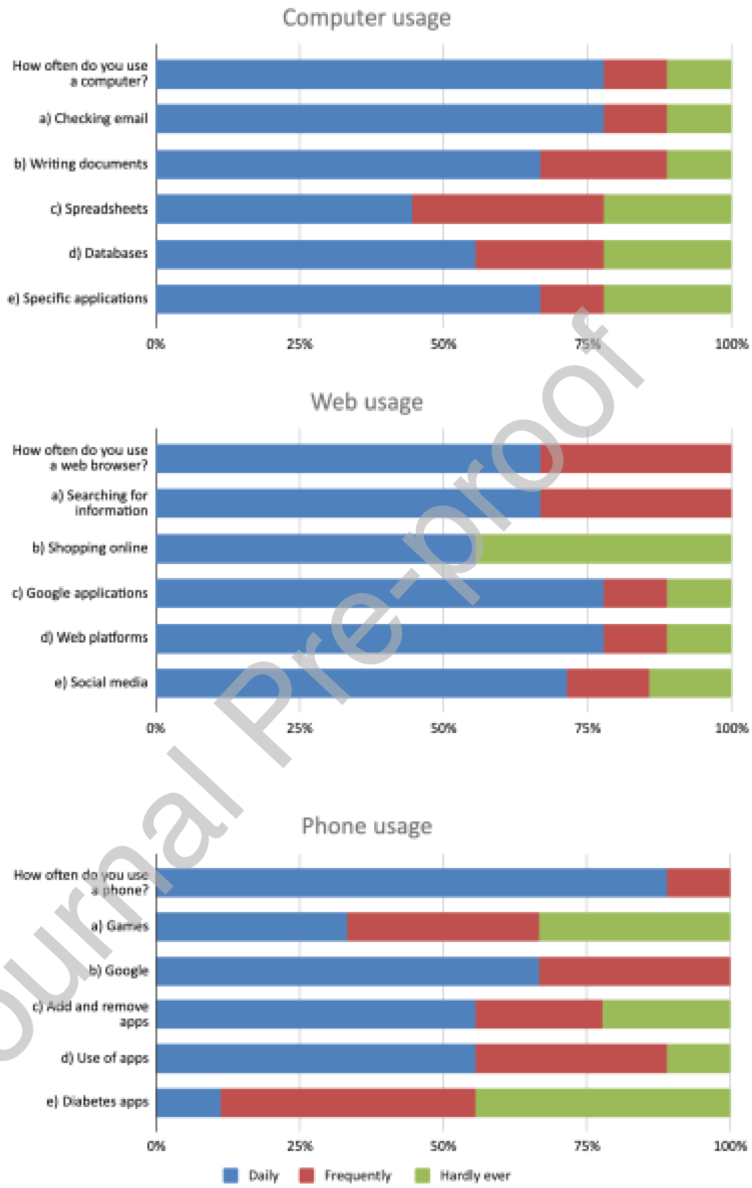

Figure 3. Graphical representation of the usability questions and answers.

2. Follow-up questionnaire

A total of six participants completed the SUS questionnaire (P1-P3 and P8-P10) one month before the study conclusion. The SUS scores had a mean of **81.3** and standard deviation 19.5. The score equates approximately to being on the 92nd percentile in comparison with a large number of studies, which can be interpreted as being **Grade A**: "People love your site and will recommend it to their friends."[19]

3. Quantitative data

Clinicians inspected the data every eight days, which was the participants' upload frequency. All participants adhered to this regimen, except for P1, who only uploaded data once a month. The system was seen as quick to use, with clinicians commenting that it took only a minute to access patient data, and five minutes in total to review them. Participants found the upload process quick and easy on the whole, but use of the Notes facility was sporadic, with most only using it a few times at the start. Respondents were keen to continue using the system after the end of the study.

4. Qualitative data

The responses to the surveys and interviews were captured as audio-recordings. Participants P1-P3 and P8-P10 responded to the interview (n=6) which was undertaken at study conclusion. There were seven respondents to the post-visit survey, which also included P6, and was undertaken after the second visit. The two clinicians responded to the survey and interview (D1-2). All recordings were transcribed, translated and anonymised. Each transcribed data item was checked against the audio recording/written notes for errors of translation and anonymisation. All transcripts and associated demographic data were then uploaded into a data management tool (NVivo 12). The identified themes are described below.

The dominant themes fell into four categories, two aligned directly with the original survey questions (C1 and C2), and two new patterns that emerged after the analysis (C3 and C4). The subjects were (C1) user experience, (C2) enhancements, (C3) data sharing and online communication, and (C4) education. The themes and subthemes are summarised in Figure 4 and some example comments are shown in Appendix.

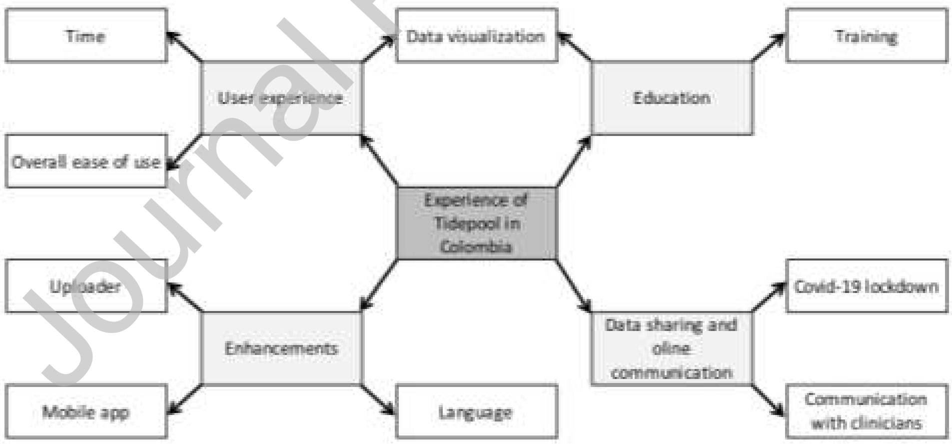

Figure 4. Map of dominant themes.

C1. User experience

The feedback on the user experience overall was extremely positive, especially in relation to the data visualization on the web application and the time investment. Hardly any features were considered not useful.

a. *Overall:* Most participants found the system easy to use, especially the web interface, which concurs with the SUS score result. The system also compared highly favourably against the proprietary platforms offered by Medtronic and Abbott.

b. *Data visualization:* The data visualization aspects were highly valued, especially the ability to see graphs and statistics, as well as filtering and viewing glycemic outcomes (see Figure 5). Clinicians liked seeing clear and concise reports and identified the ability to view the same data from multiple glucose meters within a single platform as a critical feature.

c. *Time:* The tool was not generally seen as time-consuming. It was seen as efficient in providing quick, at-a-glance patient information, reducing the time spent checking data during consultations.

Figure 5. Tidepool user interfaces. Left: Screenshot of the participant's Tidepool Web interface. Right: Screenshot of the participant's Tidepool Mobile interface.

C2. Enhancements

The main areas identified concerned the mobile app, desktop uploader and language.

a. *Mobile app:* Although the data visualizations on the web application were very popular, several participants commented that they would like the mobile dashboard to mirror the web interface (see Figure 5). Some also desired all of the web functionality to exist in the mobile version.

All respondents appreciated the ability to communicate easily, but the lack of pop-up notifications was seen as a significant drawback. This limitation was particularly frustrating for clinicians because any change of treatment would not be observed by the participant until they logged in.

Clinicians also expressed a desire for the mobile app to include enhanced interactive functionality to engage with the participant more regularly, by sending alarms or notifications similar to those employed by fitness apps for example.

b. *Uploader:* The majority of participants did not find the uploading process too onerous, but many suggested that it would be a huge advantage if the data transmission could be wireless and potentially automated. The withdrawal of some participants due to technical issues with the uploader was cited as a reason for a simpler system with automatic data transfer that can be used by anyone, regardless of age, education and other demographics.

There was enormous demand for increased interoperability with additional devices, including all Colombian glucometers and also physical activity monitors.

c. *Language:* A Spanish language version of the system was also requested.

C3. Online Interaction and Sharing Information

The most prominent characteristics of this theme pertained to communication with clinicians, benefits of using the system during lockdown and sharing of charts and statistics with family members.

a. C*ommunication with clinicians:* The facility to communicate easily with the clinician was very well-received; participants valued the communication facilitated by the Notes functionality in the mobile app, despite its limitations (e.g. lack of pop-up notifications). The knowledge that the clinicians would review their data was a strong motivator to engage with the system. Clinicians also found it easy to remotely monitor patients and make dose adjustments.

b. Covid-19 *lockdown:* The ability to upload data and share it with the clinician during the lockdown imposed by the Covid-19 outbreak was raised consistently as a strength of the system, with future implications for remote communities. Clinicians cited the lockdown as a valuable test of the strength of remote decision making, citing this as another argument for an enhanced mobile version.

C4. Education

Education was a recurring topic, both from the perspective of training and the improved understanding of each individual's condition derived from viewing the data. These observations may point to broader future research questions, beyond the confines of Tidepool alone.

a. *Training:* Two types of training need emerged from the participant transcripts: first, with respect to the installation and use of the system and second, regarding the terminology needed to interpret the data.

b. *Data visualization:* The patients found that the web dashboard itself was an important educational tool that helped them to learn more about how to manage their condition.

Diabetes-specific measures of quality-of-life

The diabetes-specific measures of quality-of-life (PAID, DQOL, DTSQs) outcomes have been reported as medians (interquartile range [IQR]), unless otherwise stated and were tested for normal distribution using quantile plots and the Shapiro–Wilk test of normality. Differences between the baseline and endpoint were tested for significance using the Wilcoxon matched-pairs signed-rank test (see Table 2). Statistical tests were two tailed and results were considered statistically significant if P-values < 0.05. Statistical analysis was performed using Matlab R2018a (MathWorks®).

Table 2. Diabetes quality-of-life questionnaire scores.

		Baseline (n=6) Median (Q1-Q3)	Endpoint (n=6) Median (Q1-Q3)	P-value (Baseline vs Endpoint)
PAID[a]		21.5 (13-28)	17.5 (13-37)	0.75
DTSQs[b]	Global Score	34.5 (31-35)	34.0 (33-35)	0.75
	Perceived hyperglycemia	1.5 (1-3)	2.5 (1-4)	0.75
	Perceived hypoglycemia	1.5 (1-3)	2.0 (1-4)	0.75
DQOL[c]	Satisfaction	31.0 (30-32)	32.0 (26-35)	0.88
	Impact	36.0 (32-39)	34.0 (26-40)	0.13
	Worry: Social/Vocational	10.5 (7-13)	8.5 (8-9)	0.88
	Worry: Diabetes Related	8.5 (7-11)	7.5 (6-12)	0.75

[a]PAID, problem areas in diabetes (scored out of 100 with higher scores indicating distress);

[b]DTSQs, diabetes treatment satisfaction questionnaire (scored out of 36 indicating very satisfied); DTSQs perceived frequency of hypo- and hyperglycemia are scored from 0 (none of the time) to 6 (most of the time);

[c]DQOL, diabetes quality of life (based on Likert 5-point scale from 1 to 5 with high scores indicate dissatisfaction, frequent impact, or frequent worry).

*p<0.05 indicates significance.

At endpoint, the median PAID score (17.5 (13-37)) was lower in comparison with the baseline (21.5 (13-28)), indicating less distress, although no significant changes were detected. Within the DTSQs questionnaire, there was an increase in the perception frequency of hypo- and hyper- glycemia at endpoint, in comparison with the baseline, without significant differences. Regarding the DQOL questionnaire, at the endpoint, slight improvements in scores indicating impact or worry (social/vocational and diabetes related) were detected. However, no significant differences were observed for the global DQOL score nor its subsections, in comparison with the baseline.

Discussion

The main goal of this pilot study was to evaluate the feasibility of using a particular telemedicine platform to enhance diabetes care in Colombia. The results of the study suggest that, overall, Tidepool has a high level of acceptability by both people with diabetes and expert clinicians.

The feedback on the user experience was extremely positive and *most* users found the system easy to use and not time consuming. This concurs with the SUS score result of 81.3 (92^{nd} percentile). Users cited ease of use compared to the existing proprietary platforms available in Colombia (Medtronic [6] and Abbott [7]). In particular, users highlighted the easiness in uploading the data and they found particularly useful the display of the median and glucose ranges, as well as the added advantage of compatibility with multiple devices. Data visualizations on the web application were very popular, with perceived educational benefits. For example, participants valued the ability to view the number of hyperglycemic and hypoglycemic events, as well as the trends at particular times, in order to discuss such information with clinicians. All respondents appreciated the ability to communicate easily throughout the platform (see Appendix for further details).

A number of enhancements were suggested in order to improve the user experience. Participants preferred the mobile version and proposed that it should provide the same functionality as its web-based counterpart, together with pop-up notifications of clinicians' messages. Regarding the device data transmission, a wireless and potentially automated functionality through the web-interface and smartphone was suggested. A Spanish version of the interface was also identified as crucial. Finally, there was a high demand for increased interoperability with additional devices. This included physical activity monitors and all glucometers available in Colombia, such as those produced by Abbott Laboratories (Chicago, IL, US), Roche Diagnostics - Accu-Chek (Basel, Switzerland), Lifescan OneTouch (Milpitas, CA, US), and Procaps group (Barranquilla, Colombia). Most of identified enhancements agree with other user feedback that have experienced Tidepool in the United States [22], particularly in the components of mobile device capability, assistance with patterns, and data download process.

In terms of diabetes-specific measures of quality-of-life, a trend was found towards less distress and higher perception of hyper- and hypoglycemia. These perceptions could be a result of the data visualizations and notifications received whilst using the Tidepool system. Overall, the recruited participants had good diabetes-specific measures of quality-of-life outcomes at baseline, which, in addition to the relatively low sample size, may explain the lack of statistically significant differences emerging between baseline and endpoint.

Limitations

It has to be highlighted that this study has a number of limitations. First of all, the study is not powered, hence the obtained results have to be interpreted with some reservations. However, according to well established literature about usability engineering [13], the sample size, even after the drop-outs, satisfies the minimum required to gather valuable information. It is worth remarking that, although all the participants met the inclusion criteria, some were not familiar with telemedicine tools. From the clinical perspective, although the clinical participants did not find the use of the system too onerous, the utilisation of the platform in a much larger population might raise some concerns. Thus, the addition of functionalities that automates the detection of glucose patterns and the recommendation of changes in the therapy would be a highly desirable feature.

Conclusions

In light of the obtained results, it is possible to conclude that Tidepool has the potential to be used as a tool to facilitate remote diabetes care in Colombia. Users, both participants and clinicians, agreed to recommend the use of platforms like Tidepool to achieve better disease management and communication with the health care team. However, some enhancements were identified to improve the user experience, for example, pop-up notifications, an automatic process of uploading data from medical devices without the need of a PC (e.g. thought the mobile phone), and automatic detection of glucose patterns and alerts.

Based on the study results, a customized version of the platform is currently being developed by the research team. This new version incorporates some of the aforementioned user interface improvements, featuring a Spanish language interface for all environments (i.e., web, mobile and uploader interface), and it is compatible with diabetes devices commonly available in Colombia. Future work will include an evaluation of this new version in a larger population in order to measure the therapeutic impact on glycemic outcomes (e.g., HbA1c).

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Appendix: Themes from interviews and surveys

Theme	**Examples**
	User experience
Overall	"My experience? if I had to rate in on a scale from 1 to 10, I would give it a 9. And whoever invented this would get a 10." (P9)
	"In general, it was good, entering the platform is very easy, accessing the patient data is quite simple and the presentation of the data in the different tabs seemed very simple to me." (D2)
	"Tidepool is easier to use than other systems. For instance I could not upload the data with the Medtronic app." (P1)
	"The average glucose range is also something that I did not see much before perhaps because in the reports that I saw in the other applications, it was not clear to me." (P10)
Data visualization	"I like visualizing my state in the curves. That helps me a lot to wonder 'well, at this time of day, why has it risen or why has it fallen', I have found that analysing that is very useful." (P8)

	"It really helps me to manage their diabetes because it is very easy to use and gives a full set of data of my patients. The tool not only gives me in just a minute an integrated view of a patient but also all values or metrics that are used to treat a patient. I open the application and I see everything, the average, the standard deviation, the trends. So, it is a complete vision, it unifies everything that I need to know about the glucose behaviour of my patient in a single glance." (D1)
Time	"It is very fast, actually it is very fast. I put the glucometer, I put the pump, with any of these the data is uploaded almost immediately. It is fast, I have not had any problems." (P8)
	"The main contribution for me is that it reduces the time that I need to dedicate to check the data of the patient in my appointment with the patient. That is fantastic." (D1)
Enhancements	
Mobile app	"People are more connected to the phone than to a computer so I expected to see the same type of information on the mobile app. The mobile app can only be used to see specific events. I felt that this app was underused." (P10)
	"…to receive notifications when there are messages from the program so I do not need to login to see them." (P2)
	"The only thing that I consider to be a drawback is not being able to receive notifications promptly both from the patient to us and from us to the patients." (D1)

	"The platform could send alarms and notifications to the mobile in a similar way than other apps send notifications, like those apps that tell you that you need to walk or do a physical activity. I mean that if the platform were more interactive with the patient on a daily basis, that could be a good enhancement." (D1)
Uploader	"I think that it could be improved by being able to upload the data from the glucometer via Bluetooth." (P6)
	"I think that there should be an automatic connection between the platform and the glucometer so the patients do not need to upload the data themselves....In this pilot study we lost two, no three patients for the problems at uploading the data from their devices to the platform." (D1)
	"Also I mentioned how it would be a great improvement if the tool could be compatible with more devices." (D2)
	"Integration with a physical activity app" (P6)
Language	"I know that people speak English, but I don't, so it would be nice if it were in Spanish." (P2)
	"And clearly very important to have the system in Spanish. I have no problem with English, but there are colleagues that at some point had some issues with it because it is written in English." (P10)
Online Interaction and Sharing Information	
Communication with	"The system helps the doctor to manage my condition. The data that I send is used by the endocrinologist to decide if the dose has to be increased or lowered down

clinicians	or continues as it is." (P1)
	"I could see their reports in a clear and concise manner which allows me to remotely intervene to adjust their dose in a prompt manner without having to wait to see them in the next medical appointment." (D1)
Lockdown	"Right now, because of the Covid-19 this the tool is the one that I have most at hand to upload data and that the doctor can look at." (P1)
	"In the situation that we are at the moment, with the pandemic, we have to use teleconsultation and telemedicine and Tidepool is a super useful tool." (D1)
	"And it is very applicable currently, using this means there is no need to have face-to-face consultations" (P9)
	"The patients were telling us last week that they would find it interesting to continue working with the platform because in these times, with the pandemic it is much easier for them to upload information than to travel to the center to get checked." (D2)
Sharing data with family	"in my case I also shared … with some family members so they could also be aware of the information and how it assists with the control of my condition." (P9)
Education	
Training	"I think Tidepool can help me create that awareness that I don't need to upload data just to show my doctor but also for me, to have a broader understanding of my diabetes and it helps me. So, I think that's a good outcome for me because I don't know what other patients think but before Tidepool I believed that the data

	was only for the day of the appointment with the doctor." (P10)
	"Well the first thing is that it is very didactic, very practical. It is uncomplicated, and not extremely scientific in the way it outputs the measurements. It might be useful to expand on the information and introduction given, to patients who have been recently diagnosed." (P9)
Visualization	"I upload the information on the computer to see how my glucose has been, it is very nice because I can look at it in the graph. I have finally learned how everything is, how it is handled, and I know how many hypers I have had. For example, I have just uploaded the data and I can see that I had very few hypos, that I was stable. So that tells me that I have been well, that this diet works for me." (P3)
	"I think visualizing my state in the curves, right? That helps you a lot to wonder "well, at this time of day, why has it risen or why has it fallen", I have found that analyzing that is very useful." (P3)
	"I liked to enter the window of trends because well, there you can see the curve and the colors, that purple is where the sugar rose. Well, more or less one sees there, at what moment it is that she gets high sugar levels, in order to tell the doctor what time of day it was highest during the week." (P2)