

Short Commentary

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Digital communication through COVID: A free NHS app for patients with type 1 diabetes improves accessibility and self-management

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Abstract

Introduction: Self-management of chronic disease is increasingly being recognised as an essential tool in chronic disease management. During the pandemic, face-to-face diabetes clinics were suspended, and resources were focussed on delivery of urgent care only. A free NHS app was created to virtually deliver information on every aspect of type 1 diabetes management and to promote patient self-management. The App included an Alerts function to keep patients up-to-date with changes to the service. The aim of this study is to investigate patient perceptions of the App.

Methods: A questionnaire-based cross-sectional study was designed by the diabetes team to obtain quantitative data. The survey was performed via "Google Forms" and was piloted with independent medical colleagues in a different department to ensure the questions were relevant and without bias. All patients who were registered on the app were invited to complete the survey over a 4 week period. Alerts were sent out via the messenger service within the App with a link to the survey, with periodical reminders to ask patients to complete.

Results: 108 patients completed the survey. The mean score of patient accessibility to diabetes information and services before using the App was 5.1, and after using the App was 8.8 ($p < 0.001$). 91% of patients would recommend the app, the NPS is +89. 57.2% of patients "agree" or "strongly agree" that the App helps them schedule and attend their screening appointments, and 73.7% "agree" or "strongly agree" that the App has improved their self-management of type 1 diabetes.

Conclusion: Overall, patients agree the App has improved accessibility to information and services and improved self-management of their condition. Patients are likely to recommend the App to friends and family who have diabetes. The authors recommend a free NHS app can be beneficial in delivering patient information in type 1 diabetes and is a useful tool in improving self-management in chronic disease management.

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Introduction

Diabetes is one of the most prevalent chronic diseases in the UK with approximately 400,000 people living with a diagnosis of type 1 diabetes [1] and its incidence continuing to rise by about 4% each year [2]. The cost of diabetes is a significant economic burden in the UK with around £10 billion being spent every year, which is expected to rise to £16.9 billion over the next 25 years [3]. The largest proportion of spending goes towards complications associated with diabetes. These are potentially preventable with good patient education and improved glycaemic control.

It has been shown that healthcare professional delivered education has a positive impact on patients' glycaemic control [4]. However, the volume and breadth of information that patients are given at the early stages of their diagnosis can be overwhelming. This in turn can lead to patients becoming uninterested or disengaged with the management of their condition [5]. The covid-19 pandemic introduced further barriers into how education was delivered. Face-to-face and group-led sessions became impossible and there was reduced opportunity to connect with patients and keep them engaged.

Self-management of chronic conditions is increasingly being recognised as an essential tool in chronic disease management. Self-management is the ability of a patient to deal with the physical, social and emotional aspects of their chronic condition. It has been shown to improve health outcomes and also reduce the dependence on primary and secondary care [6]. This strategy requires consistent and steady efforts towards furthering patient education to empower patients in making decisions about their chronic condition. The pandemic forced health professionals to seek out alternative methods to deliver this service. This was complicated further by the limited resources available to non-acute services during the pandemic, and the widespread strain that the health service was facing.

There is rising interest in the utilisation of mobile applications to support patient self-management. We proposed that a virtual and easily accessible tool would deliver health information in a more manageable and readily available manner compared to conventional methods. The aim of this project was to create a free, easy-to-use mobile application to provide information regarding diagnosis and management of type 1 diabetes. We endeavoured to enhance patient confidence and improve self-management of type 1 diabetes by increasing accessibility to diabetes information and services.

The aim of this study is to investigate patients' perceptions of a free NHS application for information delivery on type 1 diabetes.

App development and content

Prior to the development of this App, information in this trust was distributed by paper handouts from various multi-disciplinary team clinics, or verbally through the diabetes nurse-led help line. Certain information was delivered by group face-to-face sessions eg. libre device training, carbohydrate counting. No digital information was available. The available content was collated and divided into key sections. The structure of the App was modelled on the MDT approach to a counselling as patient

with a new diagnosis of type 1 diabetes. There was a need to streamline the material and bring the most relevant and useful knowledge to the forefront to ensure that the App remained user-friendly and accessible without being overwhelming (Figure 1).

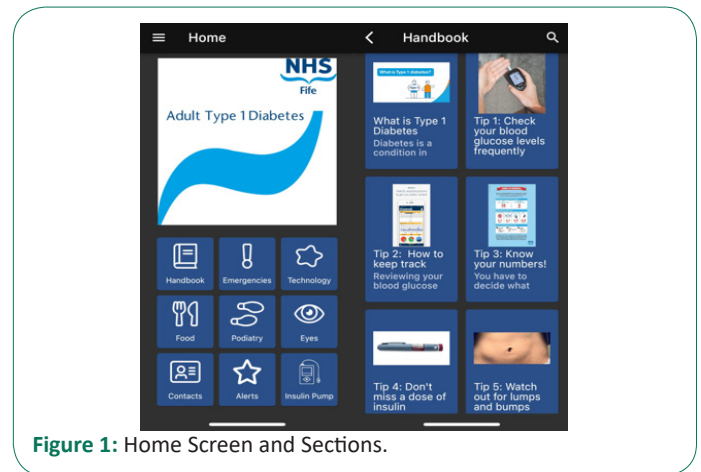


Figure 1: Home Screen and Sections.

The application was divided into categories to cover the key aspects of diabetes care. These included Handbook, Emergencies, Technology, Food, Podiatry, Eyes, Insulin Pump, Contacts and Alerts. The categories were chosen based on frequently asked questions, the subjects of phone calls to the diabetes specialist nurses, and common pitfalls in self-management. A handbook was created as a step-by-step guide on understanding the physiology of diabetes and the day-to-day management including checking, recording and correcting blood sugar readings. Separate sections were dedicated to lifestyle factors including exercise, alcohol, driving, mood and pregnancy.

The most frequent advice sought from the diabetes specialist nurses is around managing acute hyperglycaemia. It was a priority to include practical advice for acute hyperglycaemia, hyper-ketonaemia, sick day rules and diabetic emergencies. The diabetes specialist nurses were consulted to create a step-by-step pathway to aid patients in managing hyperglycaemia at home, giving specific advice on correction doses and frequency of re-checking blood sugars to avoid dangerous states such as diabetic ketoacidosis or hypoglycaemia.

The technology section provided both video and written information on flash and continuous glucose monitoring as well as care and changing of the devices. Detailed guidance was provided on connecting to LibreView and Diasend to ensure patients could review their blood sugar trends at home as well as link to their local diabetes team. A separate section was created for patients to learn more about insulin pumps, in particular who they are suitable for, and which brands are currently available from the trust (Figure 2).

The multi-disciplinary team members were consulted on the specialist sections dedicated to podiatry and eye screening (Figure 3). An in-app link was created to allow patients to book their screening appointments with ease. The contact numbers were also provided for these specialist services.

The content of the app was revised based on MDT feedback from walk-through trials of the various sections. The final product was agreed by the entire diabetes multi-disciplinary team. The finalised content was then structured into an application

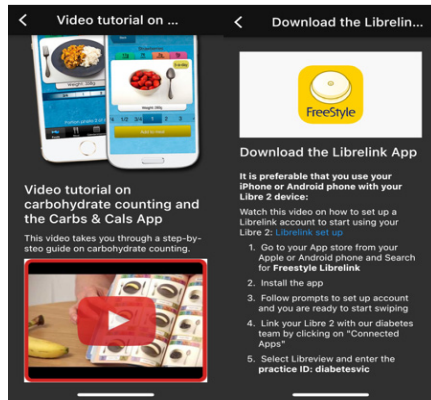


Figure 2: Technology section.

with the help of the communication app specialist Piota (London, UK), who provided the expertise to consolidate our content into a user-friendly application. This enabled us to offer a messaging service to allow the local diabetes team to send out alerts to patients on specific issues. Alerts were utilised to send up-to-date information on virtual clinic dates or respond to recent news alerts regarding diabetes, particularly relevant during the pandemic. The developer service was then able to track and monitor user downloads and keep a record of engagement with the application since its launch in July 2020. At present, there are over 900 users of the App in a trust with a population of 2000 patients with type 1 diabetes (Figure 4).

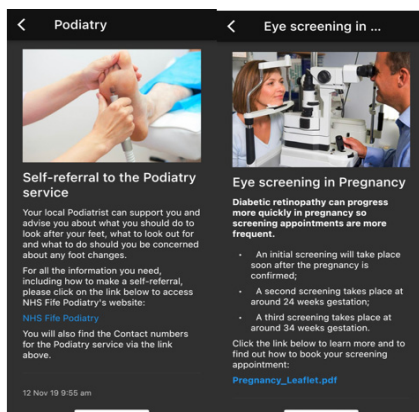


Figure 3: MDT section.

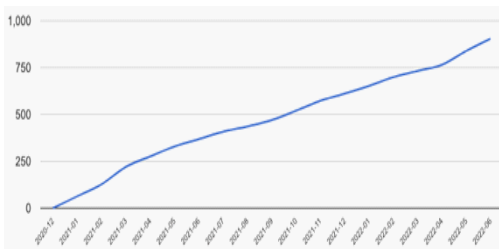


Figure 4: Cumulative Downloads.

Methods

A questionnaire-based cross-sectional study was designed by the diabetes team to obtain quantitative data. Previously published advice on survey study design by Jones et al was taken into consideration [7]. Implementation and reporting were preformed according to the “CHERRIES” checklist [8]. A literature search was performed with the following terms: diabetes, app, type1, self-management, patient satisfaction. Very few articles were found, however Ashurst et al [9] and Nwolise [10] have published their experiences. These were used to form the questions in the survey.

The survey was performed via “Google Forms” and was piloted with independent medical colleagues in a different department to ensure the questions were relevant and without bias. The questions were as follows:

Q1: How would you rate accessibility to diabetes information and services BEFORE using the app? [1-10].

Q2: How would you rate accessibility to diabetes information and services AFTER using the app? [1-10].

Q3: How likely are you to recommend this app to friends or family who have diabetes?

(highly unlikely to highly likely)

Q4: The app has helped me schedule and attend my appointments (eg. eye screening)

(strongly disagree to strongly agree)

Q5: I feel the app has improved my self-management of my diabetes

(strongly disagree to strongly agree)

Q6: Do you have any other recommendations for the app?

All patients who are registered App users were invited to complete the survey over a 4 week period. Alerts were sent out via the messenger service within the App with a link to the survey, with periodical reminders to ask patients to complete. Only fully completed surveys were included in the analysis. Survey responses were analysed using the Google Forms application, which facilitated completeness checks and descriptive analysis.

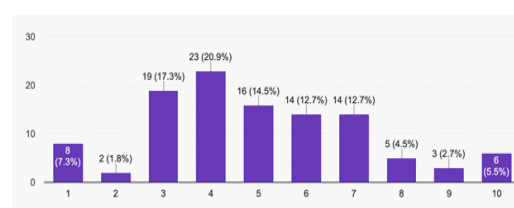
The Friends and Family Test (FFT) is a variant of the Net Promotor Score (NPS) for healthcare. It is a recommendation metric which aims to show an individual’s satisfaction with a product or process in general rather than one specific interaction or time point. This can show potential for service longevity through patient retention and word of mouth referrals [11], which in healthcare terms can be used to help gauge the satisfaction and value of a procedure, practice or employment. The patients were asked “How likely are you to recommend this App to friends and family with diabetes?” Possible responses were “extremely likely, likely, neither likely nor unlikely, unlikely, extremely unlikely”. The validated 5 point scoring system was used, giving a score of 1-5 respectively [12], 1 and 2 being promotor, 3 passive, 4 and 5 detractor. This was consistent with previous application of the NPS in orthopaedic surgery [13].

The mean accessibility pre-app and post-app was analysed with a paired t-test. Data was analysed with Microsoft Excel.

Results

The total number of responses was 108 (n=108).

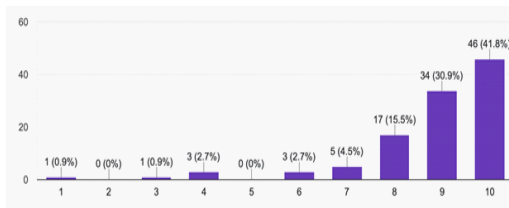
Q1: How would you rate accessibility to diabetes information and services BEFORE using the app? [1-10].



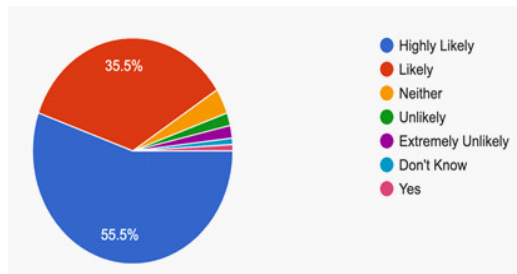
Mean score: 5.1

Q2: How would you rate accessibility to diabetes information and services AFTER using the app? [1-10].

Mean score: 8.8



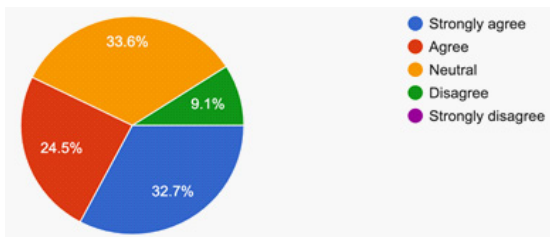
Q3: How likely are you to recommend this App to friends or family who have diabetes?



Highly likely	Likely	Neutral	Unlikely	Highly unlikely	Don't Know
61	39	4	3	2	1

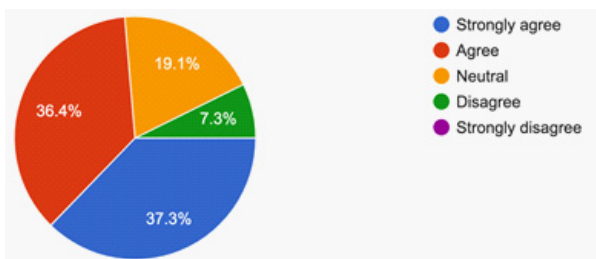
Net promotor Score = +89

Q4: The App has helped me schedule and attend my appointments (eg. eye screening)



Strongly Agree Number (%)	Agree	Neutral	Disagree	Strongly Disagree
36	37	10	27	0

Q5: I feel the App has improved my self-management of my diabetes



Strongly Agree Number (%)	Agree	Neutral	Disagree	Strongly Disagree
41	40	21	8	0

Q6: Do you have any other recommendations for the App?

Appointments could be tracked and set here.

Needs to be gradations of the alert, survey came through same as an alert, this was disconcerting, but realise this may be a limitation of the underlying technology.

More frequent communications, can be long periods with no updates.

Get blood tests results.

I didn't realise that the messages that came to my mobile were accessed under Alerts. Perhaps something could be done to make this clearer?

It's just that little reminder there is help there.

Could do video appointments through it.

I am not sure what the app is for, and what I should use it for. Someone at the hospital said it would be helpful, but not how to use it.

Analysis

Change in score

Mean Score Pre-App	Mean Score Post-App	Change in score	P value*
5.1	8.8	3.7	<0.001

*The Wilcoxon Signed-Ranks Test.

Discussion

This study has investigated the perceptions of 108 patients who use a free NHS App to support their self-management of type 1 diabetes. Overall, a significant increase in accessibility to diabetes information and services has been demonstrated ($p < 0.001$). The NPS of the app is +89. Furthermore, 57.2% of patients "agree" or "strongly agree" that the App helps them schedule and attend their screening appointments; and 73.7% "agree" or "strongly agree" that the App has improved their self-management of type 1 diabetes.

Digital health featured heavily in the 2019 NHS Long Term Plan [14], with strategies for online digital consultations, remote access to electronic notes, and the creation of the NHS App. The COVID-19 pandemic accelerated the rollout of many much needed technological advances, however the NHS App primarily became a tool for COVID-19 information and vaccine status, and was met with mixed reviews due to difficulties in its use [15]. The current study has shown that digital apps can be successfully utilised as part of wider chronic disease management. App-usability is key in keeping patients engaged with the information necessary to improve their self-management. 91% of patients were "highly likely" or "likely" to recommend this App to their family or friends with diabetes. This strongly suggests that the App was both usable and well-liked. The positive result from the Friends and Family Test (FFT) supports the proposition that this App has service longevity through patient retention and word of mouth referrals.

The current study demonstrated an extremely high Net Promotor Score (NPS) of +89. Comparable scores in healthcare are +85 for shoulder surgeries [13] and +71 for hip replacement [16]. For context, other industries such as retail have high NPS for well-regarded brands such as "John Lewis", and "Netflix"

[17]. Less favourable NPS are seen with energy companies which have an average of -10 [18].

Mehmet et al had created an app in 2015 to provide a source of information to their patients with diabetes. They note there are many available apps available to help record meals, weight and blood sugar trends but there is a lack of educational content. They created an app called “Diabetes Key Tips” which was aimed at their patient cohort but free to all to download. They aimed to provide personalised useful information by allowing the user to select their demographics such as: gender, pregnancy plans, smoker/non-smoker, diabetes type 1 or 2, insulin treated and, if so, type of regime. The authors propose this is advantageous to a “one size fits all” approach and will better support self-management. They note they do not yet have any patient feedback and this would be of great benefit in evaluating the value of their App to patients and guide future development [19]. The current study has provided feedback from an impressive number of patients to support that this App has improved accessibility to diabetes information and services in our trust ($p < 0.001$).

Educational resources are becoming increasingly available in digital formats. Our App widens the accessibility of information for patients with type 1 diabetes in a format that is easy-to-access from home or on-the-go, to allow patients the flexibility and freedom to manage their diabetes in a means that fits their lifestyle. Trusts that offer only conventional methods of face-to-face appointments or group sessions may be significantly limiting their population reach as attending these sessions is dependent on travel and time off from work or home commitments. Virtual information allows 24/7 access and removes conventional barriers to information access.

Diabetes Scotland, a charity that supports people with diabetes, is also increasingly adapting technology. Pre-pandemic the organisation ran over 30 support groups, however, the groups could not meet during lockdown restrictions. They subsequently initiated digital support groups, with subgroups such as young persons (age 14-25) with type1, and adults with type2 diabetes [20]. Further resources such as webinar series, and 1-2-1 buddy systems have also been started. A 68% year-on-year increase in calls to their helpline over the pandemic has been seen, putting tremendous strain on healthcare services. The charity reports whilst plans to introduce digital support solution were in place well before the pandemic, it’s roll-out and uptake was enhanced as a result [21]. Our App offers our patient cohort alternative means of accessing information. The App was launched at a crucial period when support was needed the most. Empowering patients to make decisions on the management of their diabetes is not only beneficial to their long-term disease outcomes, but also reduces the pressure on both primary and secondary care services. 73.7% of responders to the questionnaire “agreed” or “strongly agreed” that the App has improved their self-management of type 1 diabetes. Continued empowerment of patients will help to change the focus from complete reliance on health services, to self-management as the standard of chronic disease management.

Incorporating apps and other technologies in management of diabetes is developing more novel methods to improve management of diabetes. Chambers et al describe the use of digital assistants such as “Alexa” and “Siri” with a diabetes companion app could be a promising new development [22]. Their local focus group reported dietary advice can be “confusing” or “difficult to put in practice”, which is consistent with previous reports

by Foroughi [23] and Sawyer [24]. The digital assistants can help quantify grams of carbohydrate on common meals and drinks allowing more informed decision making and insulin dosing. Furthermore, after inputting usual medication regimes, reminders can be set. Footcare was seen as an area which could benefit as pictures and videos could be easily sent to district nurses and other healthcare practitioners, with messaging facilities. Whilst their app was still in a pilot phase, they hoped the technology had the potential to reduce complications which often arise insidiously. The current study shows our App was able to facilitate easier booking of screening appointments for patients. 57.2% of patients “agree” or “strongly agree” that the App helped them schedule and attend their screening appointments. Screening is an essential step in preventing the complications associated with diabetes. By improving patient engagement with screening appointments, we hope that the rate of complications will be reduced in our patient cohort.

Strengths and limitations

Strengths of the study include moderate sample size of respondents as patient response rates are typically very low for online surveys. To the author’s best knowledge, this demonstrates the largest study in the literature of patient perceptions in non-commercial diabetes apps. Limitations of the study include single health board results and lack of biochemical or clinical data to correlate effectiveness. Further work could include measuring attendance rates at outpatient clinics and screening appointments in comparison to annual guidance rates; recording number of phone calls to diabetes specialist nurses, and correlation with glycaemic control via HbA1C measurement.

Conclusion

The current study has explained the creation of a free NHS app for information delivery on type1 diabetes, and investigated the perceptions of patients using the App. Overall, patients agree the App has improved accessibility to information and diabetes services, as well as improving their individual self-management. Patients are likely to recommend the App to friends and family who have diabetes. The authors recommend a free NHS app is beneficial in delivering patient information in type1 diabetes and is a useful tool in improving self-management in chronic disease management.

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