Should we recommend smartphone apps for children and young people with diabetes?

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If asked for advice on which apps are best for children and young people with diabetes, would you know what to say? Mobile health technology has seen an explosion in growth in recent years fuelled by the popularity of smartphones. There are currently 30.9 million Smartphone users in the UK, which represents almost 50% of the population (NewMedia TrendWatch, 2013). Use is expected to grow to 43.4 million by 2017. Ofcom (2012) reported that nearly two-thirds of children aged 12–15 years own a smartphone, which is a 50% rise since 2011. Even children as young as 3–4 years are active users with 1 in 10 regularly using a tablet computer.

Smartphones have created a multi-billion pound app market. Apple opened its app store in 2008 to allow access to a range of apps developed by third-party programmers. Other platforms, such as Android, Blackberry and Windows, followed with their own app stores. Since then, apps have become part of everyday life and health apps are no exception. One report from research2guidance (2012) estimates that by 2015 there will be 1.4 billion smartphone users worldwide, 500 million (30%) of whom will have used mobile health apps.

What can apps offer to diabetes care?

Searching on an app store for diabetes apps yields hundreds of different choices. What is difficult to ascertain is whether the app is safe and has a peer-reviewed evidence base or whether it is suitable for children and young people. This presents a dilemma for healthcare professionals and parents when deciding which ones to recommend or download. Healthcare professionals normally give advice based on evidence. Apps, however, are unregulated and, therefore, good-quality research trials into efficacy are rare.

Research that has been conducted into diabetes apps mainly concentrates on usability and the quality of the information that is made available, rather than specific health outcomes. One study (Rao et al, 2010), that looked at three diabetes apps, evaluated self-reported ease of use but did not look at any clinical outcomes. Users were asked to perform certain tasks on each of the apps, such as entering a range of blood glucose measurements on certain days and times and adding a note to a meal. The research highlighted limitations in the apps, such as requiring manual entry of blood glucose results and a lack of features to help calculate insulin doses based on carbohydrate intake.

Cafazzo et al (2012) recently undertook a pilot project in adolescents with type 1 diabetes. The pilot used thematic analysis of interviews to help design a mobile app named bant. Twenty young people aged 12–16 years used the trial app over a 12-week period, with the primary outcome being the frequency of blood glucose measurements compared with the previous 12 weeks without app use. The app used Bluetooth technology to transmit blood glucose from a meter to the app. The app had a game element where users were rewarded for using the app. Results showed a 50% increase in blood testing frequency from 2.4 to 3.6 tests a day (P=0.06). Results were only based on 12 individuals as two dropped out and there was insufficient baseline data on six of them. There was also no control and too few numbers to give any meaning to HbA_{1c} results, which stayed the same over the 12-week period.

A systematic review by El-Gayer (2013) looked at journal articles related to commercially available apps for type 1 and type 2 diabetes. It questioned whether there was evidence to show that these apps had helped people with self-management: 71 apps and 16 articles were included in the review. The review concluded that app usage resulted in improvements in healthy eating, frequency of blood glucose testing and physical activity. However, limitations in the apps included a lack of personalised feedback and having to manually enter blood glucose data.

App developers are starting to take note of these

Box 1. Tips for the review of apps.

- Download a range of apps for your own smartphone and test them out. Try search terms such as "diabetes", "blood glucose", "diabetes log book" and "carbohydrate counting". Look at the charts on the app stores to see the best-selling apps for health.
- Check where the app is from. Apps made in other countries may not use the right units and their food databases may include different values or recommendations to the UK.
- Look at feedback on the app store. What do other users of the app say about the usability and usefulness of the app? Check the number of reviews and the star-rating.
- Ask patients what apps they use, which ones they like and why? Many will already be using apps, so ask them what they find useful and, importantly, which ones they continue to use on a daily basis. If an app has only been used once or twice and then forgotten there is probably a good reason.
- Who has made the app? Look at the developer's website to see if you can ascertain whether any healthcare professionals have been involved and whether the app is using evidence-based information.
- Does the app present any clinical risk to your patient? For example, dose recommendations of insulin may be incorrect or not take into account insulin action time. Apps that recommend doses of insulin begin to cross the line into becoming a medical device and the current regulation of apps has not yet caught up to tighten the loophole in this area.
- Usability for children and young people: Research has shown that by incorporating gaming and making the apps visually appealing to children the app is more likely to be used continuously and may lead to better health outcomes (Rose et al, 2013).
- What is the main purpose of recommending the app? Is it fit for purpose? Some apps can try to do too much and overcomplicate the process making them less user-friendly.
- Is the app available on the device the young person has? Most apps will normally be available on iPhone and Android platforms, but other platforms, such as Blackberry and Windows, are not far behind. Developers have to spend considerable money to develop an app on each system as they all use different programming language.
- Cost: Many apps are free but then they often only have limited purpose and contain advertising. An app that costs money should not be looked on as a bad thing as it is rare for any to cost more than £5. App development is expensive, so do not be discouraged by it costing a few pounds.

findings, and some are using focus groups and surveys to ensure new diabetes apps have the right components to ensure continuous use. A recent poster presented at the Advanced Technologies and Treatments for Diabetes conference in Paris (Rose et al, 2013) evaluated the MySugr app, which is available in Europe and the United States. The research showed a 10–20% increase per user in the number of blood glucose tests performed per day. There was also a reduction in HbA_{1c} ranging from 4.4–15.3 mmol/mol (0.4–1.4%; *n*=8). The app was easy to use, features gamification and was built on feedback from more than 600 people with diabetes. Health outcome data was limited to a small number of users who took part in a pilot project and a larger study is required to prove long-term improvements in HbA_{1c}.

How to review new apps

With a lack of good-quality research evidence to prove the health outcomes from diabetes apps, one needs to look to other sources of information that can help to indicate whether an app is safe and useful. Unbiased, peer-reviewed articles are one source of information. Recent articles in the British Dietetic Association's (BDA) monthly magazine *Dietetics Today* (2013) and Diabetes UK's *Balance* (2012) are just two examples. These articles give a brief review of available apps for diabetes and offer an unbiased review. The BDA article used a table and score system to review five apps for diabetes, considering areas such as credibility, usefulness, UK standards, ease of use and whether it was easy to understand. Other tips for assessing an app can be seen in *Box 1*.

Conclusion

It is clear that there is an urgent need for more high-quality research into health apps and their ability to improve health outcomes. The growth in smartphone use and development of new and more complex apps is unlikely to slow anytime soon. Healthcare professionals who recommend an app should investigate it and be able to know its benefits for their patient group. Confidence that the information that it contains is accurate, and that it is not going to cause any harm or give any misleading advice, should be a major concern.

Technology has the potential to offer great benefits to the management of diabetes but, until we have clear evidence about particular apps, good clinical judgement and communication with colleagues and patients seem to be the best way forward.

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