

Personalised apps for management and monitoring of gestational diabetes – a survey of patients' and physicians' attitudes

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Introduction

- The needs of women with gestational diabetes (GD) are infrequently met by traditional services. Mobile services could help patients monitor and manage their diabetes, reducing pressure on healthcare services
- Although there are plenty of diabetes apps available, the vast majority track an individual's diabetes (e.g., blood glucose, body mass index [BMI] etc). Few diabetes apps help patients to proactively manage their diabetes and any potential comorbidities. In particular, existing diabetes apps are rarely GD-focused
- We have assessed GD awareness and management, and the feasibility of a personalised app for GD, from both patients' and physicians' perspectives

Methods

- Survey statements for patients and physicians (Tables 1 and 2) were approved by the clinical team at Belfast Royal Victoria Hospital
- Patients attending diabetes clinics answered Part 1 of a questionnaire, with Part 2 distributed to them via an app (an early version of the Intellin[®] app)
- Physicians gave their perception of patients' knowledge in Part 1, with Part 2 based on their opinions
- Statements were scored on a 7-point scale:
 - 1–3: strongly disagree
 - 4–5: neither agree nor disagree
 - 6–7: strongly agree
- Patients in Part 2 participated in a survey on the features of the app

Table 1. Survey statements regarding patients knowledge of GD

Part 1: Patients' survey statements	
1.1	I am aware what GD is and how it may affect my pregnancy
1.2	I know what changes I need to make to ensure that I have a healthy diet
1.3	Exercise is important in GD
1.4	I know how much exercise I should take each week
1.5	Blood glucose (sugar) control is very important in GD
1.6	Diet and exercise may not always control GD
1.7	In some case, it may be necessary to take tablets to control my blood glucose
1.8	In some cases of GD, it might be necessary to use insulin injections to control my blood glucose
1.9	I understand how different foods affect my blood glucose
1.10	In most cases, blood glucose levels return to normal after the baby is born
Part 1: Physicians' survey statements	
1.1	They are aware of what GD is and how it may affect their pregnancy
1.2	They understand the importance of a healthy diet
1.3	They understand that exercise is important in GD
1.4	They know how much exercise they should take each month
1.5	They are aware of the importance of good blood glucose control
1.6	They are aware that they may have to take tablets or injections to help control their blood glucose
1.7	They understand the role that different food groups have on blood glucose levels
1.8	I am confident that my patients could self-manage both hyper- and hypoglycaemia

Table 2. Survey statements regarding patients knowledge of GD

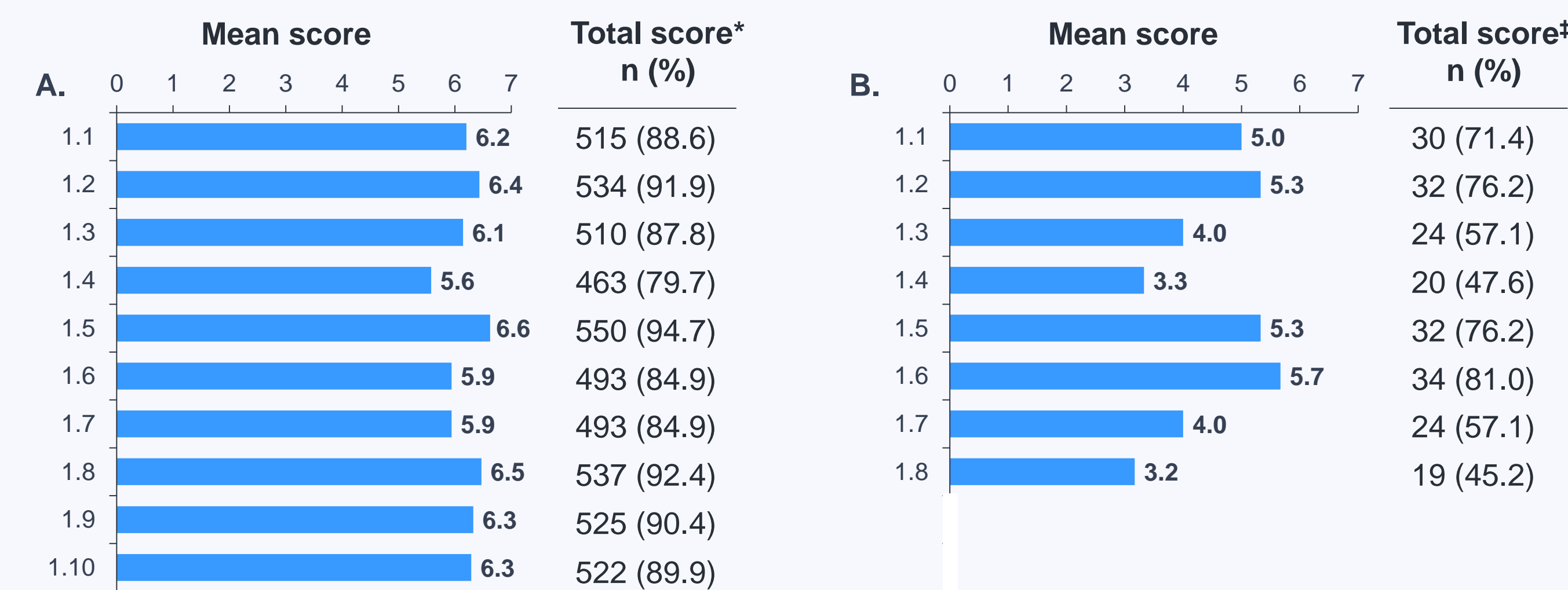
Part 2: Patients' survey statements	
2.1	I use apps
2.2	I use healthcare apps (e.g., for diet, exercise, mindfulness)
2.3	It is important that any app is recommended by my doctor or nurse
2.4	I have searched for an app to help me with my GD
2.5	It would be useful to get appropriate hints and tips to help me with my GD
2.6	I would like to be sent reminders of appointments
2.7	I would like the joint diabetes/antenatal team to see how I'm doing with my blood glucose control and exercise
2.8	I would like to track my blood glucose, weight etc
2.9	I'd like to see how the food I eat effects my blood glucose levels

Part 2: Physicians' survey statements	
2.1	I have enough time and capacity to give all the support necessary to my patients with GD
2.2	I think that an app providing appropriate hints and tips may help my patients manage their GD
2.3	It would be good to be able to send automated clinic appointments to my patients
2.4	I would like to be able to access a dashboard to see how my patients are doing with their blood glucose control and exercise
2.5	I think that apps can play an important part in patients better understanding and managing their GD
2.6	I would like my patients to have an electronic version of their self-management plan
2.7	I would like to be able to see a 'real time' record of my patients' carb intake, insulin and blood glucose levels

Results

- Eighty-three pregnant women attending diabetes clinics, and six diabetes physicians participated
- Pregnant women rated their understanding and awareness of GD higher than physicians rated patients' knowledge (mean 5.58–6.47 vs 3.33–5.67) (Figures 1A and B)
- Physicians were not confident that patients could self-manage hypo-/hyperglycaemia (mean 3.17) or knew how much to exercise to take every month (mean 3.33)

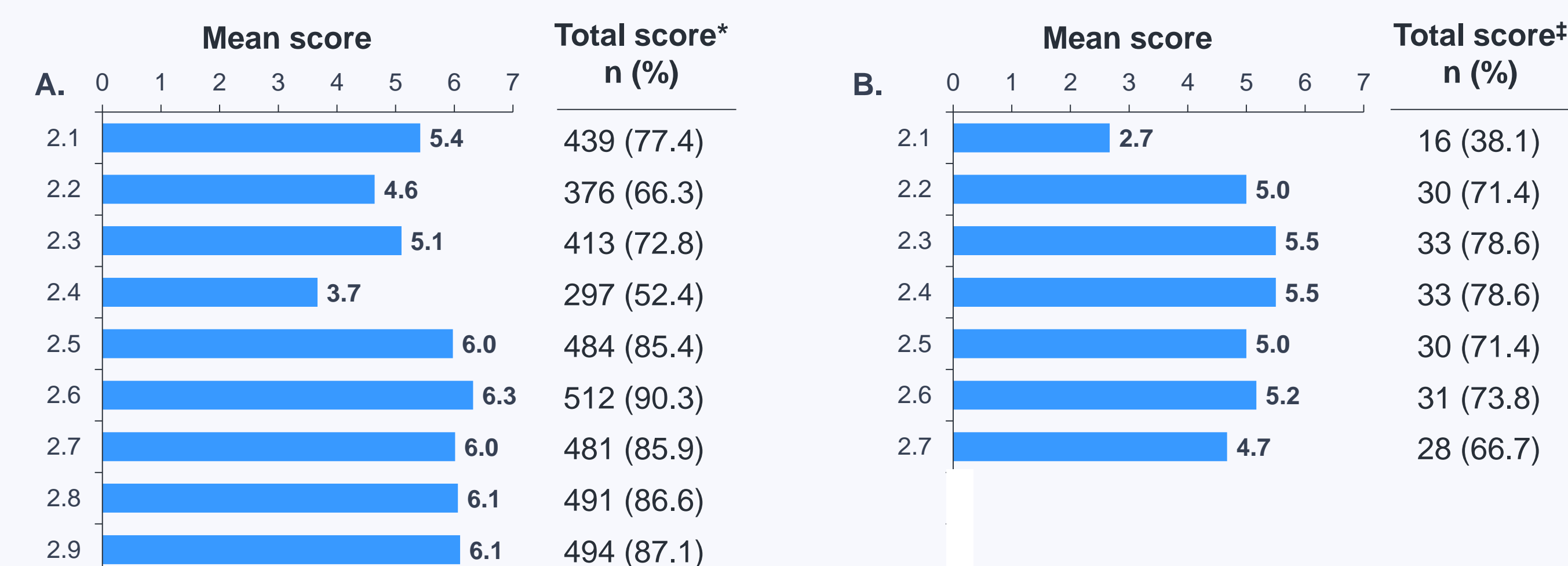
Figure 1. Patients' knowledge of GD (A) and physicians' assessment of their patients' knowledge of GD (B)



* Total possible score 581 from 83 patients; † Total possible score 42 from 6 physicians

- While patients strongly supported technological help with GD management and blood glucose monitoring (mean 5.98–6.32), they also valued access to traditional diabetes management (mean 6.01) (Figure 2A)
- Physicians reported insufficient time and capacity to support the needs of patients with GD (mean 2.67), and were ambivalent regarding the use of technological support (range 4.67–5.0) (Figure 2B)

Figure 2. Patients' (A) and physicians' (B) perceptions of the feasibility of personalised apps for GD



* Total possible score 581 from 83 patients; † Total possible score 42 from 6 physicians

- Twelve patients who participated in Part 2 gave feedback on how they found using the app via an online survey, with most patients finding the app useful (Table 3)

Table 3. Intellin[®] app survey responses (n=12)

How easy did you find it to log in to the Intellin app?		Which of the following features did you use?	
Extremely easy	5/12	Blood glucose tracker	12/12
Very easy	1/12	Carbohydrate tracker	7/12
Easy	3/12	Exercise tracker	3/12
Neither easy nor hard	2/12	Blood pressure tracker	1/12
Hard / Very hard / Couldn't log in	0/12	BMI tracker	1/12
Skipped the question	1/12	Educational content	4/12
The chart (reports) were easy to understand		How likely are you to continue to use an app to help you with your gestational diabetes?	
Strongly agree	3/12	Very likely	2/12
Agree	3/12	Likely	5/12
Neither agree or disagree	2/12	Neither likely or unlikely	1/12
Disagree	4/12	Unlikely	3/12
Strongly disagree	0/12	Very unlikely	1/12
How easy was it to answer the profile questions?		Please rate the overall look and presentation of Intellin	
Very easy	4/12	63% (12 respondents)	
Easy	7/12	How easy – on a scale of 1–100 (100 being easiest) – was it to enter readings?	
Neither easy nor difficult	1/12	55% (12 respondents)	
Difficult	0/12		
Very difficult	0/12		
How useful was the educational content?			
About gestational diabetes	Very useful	5/11	
	Quite useful	5/11	
	Not used	1/11	
Diet	Very useful	3/12	
	Quite useful	6/12	
	Not used	3/12	
Exercise	Very useful	2/12	
	Quite useful	5/12	
	Not used	5/12	

Conclusions

- Patients with GD were keen to actively manage their care
- Patients' understanding of GD management was potentially under-appreciated by physicians
- Patient feedback on the app has been used to create an updated version (shown below) that is designed to proactively manage patients' diabetes and any potential comorbidities. It is currently being used in the INDUCE study (NCT03591081) at Salford Royal Hospital NHS Foundation Trust, looking at the reoccurrence of diabetic foot ulcer. The study is due to report in late 2019

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- CG and RG are both employees of Gendius Ltd

Additional information

- For more information regarding the Intellin[®] app that has been designed to proactively manage patients' diabetes and any potential comorbidities, please look at our website: www.gendius.co.uk
- Intellin[®] has been designed to help in different types of diabetes: Type 1, Type 2, GD and pre-diabetes. It works by taking clinical and demographic information from the user, and then this is run through a 'risk engine' (designed by Nottingham University). The information is referenced against published clinical evidence and a personalised risk profile is generated

