



Digital Health & Care
Innovation Centre



Developing a digitally-enabled universal service model to reduce type 2 diabetes-related risk

Impact of the Prevent the Progress of Diabetes app and brief dietitian call on patient readiness for lifestyle change.

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DOI number

<https://doi.org/10.17868/strath.00091677>

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This document has been written and prepared by the Digital Health & Care Innovation Centre.

The DHI was established as a collaboration between the University of Strathclyde and the Glasgow School of Art and is part of the Scottish Funding Council's Innovation Centre Programme. The DHI is also part-funded by Scottish Government. DHI supports innovation between academia, the public and third sectors, and businesses in the area of health and care.

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Executive summary

This report proposes a digitally-enabled, low cost prevention and support model for reducing type 2 diabetes-related risk and improving readiness for lifestyle change in high priority patient groups.

The proposed model has been developed jointly by NHS Grampian Moray Dietetics department, Maryhill Practice within Moray HSCP, the Digital Health and Care Innovation Centre (DHI) and the [Right Decision Service \(RDS\)](#) – the national decision support service managed by Healthcare Improvement Scotland (HIS). It is based on an 8-week pilot of the [RDS Prevent the Progress of Diabetes app](#)¹ combined with an optional 10 minute signposting and referral call with a dietitian.

The pilot focused on three groups of patients in Maryhill Practice:

1. Those at high risk of type 2 diabetes due to a diagnosis of pre-diabetes
2. Women at high risk of developing type 2 diabetes as indicated by a previous diagnosis of gestational diabetes.
3. Patients already diagnosed with type 2 diabetes who met the criteria for remission interventions.

Methods

Development of the app was based on consultation and co-design with patients and healthcare professionals, underpinned by review of the evidence base around design and implementation of digital tools for diabetes prevention and management. Key findings from the pilot included:

Patients in the agreed priority groups were identified through case-finding searches, and the practice contacted them via a text message to invite them to complete a pre-intervention questionnaire and to use the app. A reminder to use the app was sent after 3 weeks. Patients were given the option to request a dietitian call in addition to using the app, and 65 out of 82 patients (79%) chose to do so. A post-intervention questionnaire to assess impact of the app and call on knowledge, confidence and motivation was issued at 8 weeks after the pre-intervention questionnaire. This follow-up questionnaire was also sent to patients who had not responded to the pre-questionnaire.

Key findings

1. Of the participants who completed the post-questionnaire (n=83), the majority (62.7%; 52) used the app at least once, while 37.3% (n=31) did not use it at all.
2. Almost all participants (92.3%) who had used the app rated the app as easy to use (score 3 or higher on a Likert scale of 1-5), with 38.5% of participants rating it at the maximum 5.
3. 94% of patients who used the app said that their knowledge had improved at least a little, and 88% said that their confidence and motivation had improved at least a little. 54% of participants reported that their knowledge had increased “somewhat” or “a lot.” 52% said that their confidence had improved at these levels, and 56% that their motivation had also improved at these levels. The t-test of knowledge found the mean self-reported knowledge post-intervention as measured by a Likert scale to have increased significantly (P=0.004).
4. T-tests showed that knowledge, confidence and motivation increased equally among patients who used the app in conjunction with a dietitian call (66%) or without a call (34%).
5. Of the respondents who did not use the app, the main reasons provided were lack of awareness, competing priorities, and no access to technology. 5 responses about future improvements to the app also asked for a consultation with a healthcare professional alongside use of the app.
6. The dietitians provided patients with orientation to navigating the app, and made a total of 96 referrals/ information provisions, principally to tier 1, 2 and 3 weight management services (e.g. Prevent IT, Control It, Second Nature Prevent, Counterweight and Counterweight Plus, Oviva) and self-management resources. 56% of patients found the call very helpful, 31% found it somewhat helpful.
7. Almost all respondents who answered the question about behaviour change (46 out of 52) had made or planned to make a change. Of these 67.4% had a dietitian call, and 32.6% did not. This suggests that use of the app alone combined with personal motivation was sufficient for a third of participants to reach the stage of making or planning behaviour change.

The most common change was a change in diet or eating habits (n=34), followed by increasing physical activity (n=15), then starting a weight management programme (n=4).

Proposal for a future digitally-enabled service model

Based on the pilot findings, the pilot proposes a service model which recognises that patients with high, medium and low digital self-efficacy will benefit from different elements of a digitally-enabled prevention and support “bundle.” The bundle elements can be localised and delivered flexibly as a core minimum or extended service approach, to align with local needs and service constraints and contribute to NHS Boards’ Tier 1 universal weight management services, Tier 2 early intervention and Tier 3 targeted intervention services as described in [A Healthier Future](#) .

We envisage this support bundle aligning with and augmenting current and planned weight management services. For example, it can complement the tightly defined referrals to the forthcoming ANIA digital coaching remission pathway by offering readily available support to a wider range of people who meet the criteria for remission. This report describes the detailed results of the pilot and makes recommendations for future development, implementation and further evaluation of the proposed service model.

Recommended next steps include:

1. Make the app available for use across NHS Grampian and more widely.
2. Implement and evaluate the proposed digitally-enabled service model.
3. Engage with the Digital Health & Care Innovation Centre Weight Management Living Lab to define a roadmap for delivery of an integrated service that combines the strengths of the two projects.
4. Support continuous improvement of the app, and implement other key technical improvements – e.g. a national case-finding approach and provision of alerts in the context of the patient record.

1. Project aims and scope

This project aimed to determine whether the Prevent Progress of Diabetes app, in conjunction with support from a trusted health service and specialist dietitians, can be used as part of a digitally-enabled service model to reduce type 2 diabetes-related risk in three high priority groups –

- a. patients diagnosed with pre-diabetes
- b. women with a previous history of gestational diabetes mellitus (GDM)
- c. patients already diagnosed with type 2 diabetes who met the criteria for entry to a remission programme:
 - Diagnosed within the last 6 years
 - 8-65 years old
 - BMI \geq 27 for white Caucasians, or \geq 25 or above for people from South East Asian, African-Caribbean or Black African backgrounds.
 - Latest HbA1c within 12 months \geq 48 mmol/mol if not taking diabetes medication; or $>$ 43 mmol/mol if taking diabetes medication

Specifically, the project aimed to assess:

1. Impact of the Prevent Progress of Diabetes app on
 - patients' knowledge and understanding about diabetes
 - their confidence in managing and reducing their diabetes-related risk
 - their motivation to make lifestyle changes.
2. Impact of augmenting the call with a 10 minute call by phone or NearMe with a dietitian. During this call, the dietitian:
 - Where possible – for example, through screen-sharing with Near Me - showed the patient through how to use the app
 - Recommended the most appropriate weight management service in line with NHS Grampian diabetes pathways (e.g. Second Nature Prevent) and made a referral with the patient's agreement.
 - Offered practical advice and support on management of diabetes risk – for example, recommending diet sheets.

This report outlines the three stages of the project:

- Co-design and development of the app in collaboration with patients and healthcare professionals.
- Piloting and evaluation of the app with support from healthcare professionals.
- Recommendations for a service model for delivery at scale and maximising impact, accompanied by further evaluation and refinement of the approach.

2. Context

2.1 Policy context

[A Healthier Future](#) highlights the public health crisis emerging from the steady growth in incidence and prevalence of all types of diabetes over the past 10 years. In 2021, 287,551 people in Scotland were living with Type 2 diabetes – 6% of the total population (1). It notes further concerns that:

- around 10% of cases of type 2 diabetes remain undiagnosed
- over 500,000 people in Scotland are at high risk of developing type 2 diabetes.
- treatment for people with type 2 diabetes entails significant cost – approximately 9% of the NHS budget and this is expected to grow as population ages.

A Healthier Future calls for action by NHS Boards and partners to reverse this trend and avert the emerging crisis through targeted weight management interventions – the evidence-based approach which is central to both prevention and remission of type 2 diabetes.

This report describes a digitally-enabled intervention to facilitate this lifestyle change and improved weight management, based on the RDS Prevent the progress of diabetes web and mobile app. Development to date and the future recommendations for implementation align closely with the aims and principles underpinning A Healthier Future:

- A whole systems approach based on multidisciplinary and multi-organisational partnership working
- Co-production with communities

- A person-centred and shared decision-making approach to choosing the best approach for the individual.
- Psychological support alongside management of physical health.

1.2 Local context – Moray and NHS Grampian

A Healthier Future calls for GP clusters to deliver the action plan by engaging with evaluation and monitoring of referrals and outcomes in primary care and by integrating type 2 diabetes prevention into primary care improvement plans.

DHI jointly funded this project with NHS Grampian Public Health, to address this need for stronger primary care support in the Moray HSCP and NHS Grampian more widely. Through collaboration with the Healthcare Improvement Scotland Right Decision Service, the project aims to equip these primary care teams and patients with digital capabilities and processes for diabetes prevention and remission. The project responds to evidence of need for prevention and support services for type 2 diabetes in NHS Grampian. A Pre-diabetes and Type 2 Diabetes Support Services Survey in Autumn 2023 revealed that a significant proportion of the 900 respondents – 10% with pre-diabetes, 70% with diabetes – want support in the form of weight management and dietary advice and that they do not know about the services that are available.

Within the Maryhill Group Practice in Moray, which came forward to serve as the pilot for this project, searches in the Vision primary care electronic health record system showed that January 2024 22,424 patients in Maryhill Group Practice

- 1240 are diagnosed with type 2 diabetes (incidence of 5.5%)
- 270 had a diagnosis of pre diabetes and have not progressed to Diabetes (1.1%)
- 89 have a past diagnosis of gestational diabetes (0.4%)

This project aligns with the DHI Rural Centre of Excellence's Living Lab for Supported Self-Management, which focuses on digital innovations which will encourage use of community assets and cross-sectoral care and support, underpinned by use of personal data stores, to facilitate weight management and reduction of risk from conditions including type 2 diabetes and cardiovascular disease.

3.Methods

3.1 Development of the Prevent the Progress of Diabetes app

The web and mobile app were co-designed and developed within the national Right Decision Service platform. Originally piloted and evaluated within DHI, this platform is now led and managed by Healthcare Improvement Scotland. The development process followed three stages, described in an earlier report to DHI (see annex 1.)

3.1.1 Rapid evidence review

Sixteen decision support tools were identified in published studies at the time of conducting this review – autumn 2023. Thematic analysis across these studies indicates that:

- Developing decision support tools for prevention and remission in the three target groups identified is innovative and addresses a current gap in digital support
- Decision support web and mobile apps for citizens and for shared decision-making by citizens and professionals can deliver clinically significant reduction in diabetes risk.
- Decision support prompts embedded in electronic health record systems to identify people with prediabetes can achieve significant improvement in practice – e.g. ordering of HbA1c tests, lifestyle counselling.

Key enablers of successful implementation of decision support include:

- Personalise self-management advice
- Actively support behaviour change through design of the decision support tool, and embedding interaction and dialogue with professionals and peers.
- Target individuals most likely to benefit – e.g. those with medium self-efficacy who recognise gaps in their capability for managing diabetes.
- Build in continued communication over time to sustain impact.
- Integrate decision support into care pathways and clinical processes
- Provide training and support for professionals and citizens

A key study identified was the observational evaluation (2) of the 'Healthier You' NHS England digital diabetes prevention programme. This concluded that a digital intervention in conjunction professional support for behavioural change could be an effective and wide-ranging component of a population-based approach to prevention. This pilot aimed to incorporate, within limited available resource, key elements shown to be effective in this programme.

3.1.2 Consultation with professionals in NHS Grampian

Consultation involved two virtual workshops, and four key informant interviews with professionals in Moray and NHS Grampian, using an early prototype of the app and a series of personas and scenarios as the basis for discussion on design and implementation. Professional representation covered: GP and consultant physicians, dietitians, psychologists, public health.

3.1.3 Consultation and co-design with professionals and citizens nationally

This Grampian-focused consultation was followed by two virtual workshops open nationally to all healthcare professionals and citizens. Citizens were identified through the Healthcare Improvement Scotland and Health and Social Care Alliance patient and public networks, with support from Diabetes Scotland. Participants included: GPs; consultants; dieticians; nurses from across multiple NHS Boards; students; women with current or previous gestational diabetes mellitus (GDM); people with pre-diabetes, type 1 and type 2 diabetes; people with family members with diabetes or pre-diabetes; and people with learning difficulties. There was representation from Scottish, Southeast Asian and South Asian groups. These workshops used an updated version of the app prototype, building on the input from Moray and NHS Grampian stakeholders. Personas and scenarios were again used to stimulate discussion about how the app could be developed to optimise support for different users and contexts.

3.2 Findings

Two major common themes were identified across the evidence base and the consultation workshops:

1. The app should facilitate communication and interaction with trusted healthcare professionals and on the need for access to training and support. Text message notifications to prompt action by the citizen and to open up communication with healthcare professionals were one of the most requested features. This concurs with the evidence base indicating that this approach has good potential for increasing long-term use.
2. The app should go beyond physical healthcare support – e.g. diet and exercise – to incorporate psychological support for mental and emotional wellbeing. This was recognised as essential to build individual readiness for change.

The consultation stage also drew out a number of more specific technology, content and support requirements, including:

- App presentation
 - Use visual content, including pictures and videos, wherever possible.
 - Include more interactive elements
 - Ensure content is easy to read for people with visual impairments and accessible using a screen reader
 - Shortening lists of links and embedding user-friendly content directly in app pages.
- Features
 - Suggested features included options for goal setting, and appointment related questionnaires or information to support shared decision-making.
- Implementation and ongoing support
 - Stakeholders noted that implementation of the app will require a multi-faceted approach, including:
 - Signposting and orientation to the app by healthcare professionals.
 - Awareness-raising and support from support services and community services including link workers, Healthpoint, public libraries, leisure services and third sector organisations.

3.3 App development

The Prevent the progress of diabetes app delivered by the Right Decision Service responds as far as possible within limited resource and at this early stage to these stakeholder requirements:

- Tailors content specifically and clearly for the three high priority groups identified for the pilot:
 - Patients with a diagnosis of pre-diabetes
 - Women with a previous diagnosis of gestational diabetes
 - Patients with an existing diagnosis of type 2 diabetes who meet the criteria for remission interventions.
- Implemented in conjunction with SMS messaging from the pilot practice (Maryhill Group.)
- Supported with the option of a 10-minute signposting call with a specialist dietitian.
- Combines a range of interactive psychological assessment and support tools with guidance and advice on weight management, diet, exercise and other lifestyle factors.
- Incorporates video and other visual resources
- Supports users to navigate the combination of local services and resources within Moray and NHS Grampian and national sources such as Diabetes UK and My Diabetes My Way. User feedback showed confusion over the multiple sources available, difficulties in navigating some websites, and gaps in key content – e.g. My Diabetes My Way does not include resources for pre-diabetes.
- Complies with W3C AA accessibility standards.

The app can be accessed online as a website, or downloaded from the app stores as a mobile app for offline usage.

This multi-channel approach affords the convenience of mobile app access for those who are confident using this approach, and also supports people who have basic skills in Internet usage but are less familiar with downloading mobile apps.



4. Piloting and evaluation methods

The Clinical Lead for Primary Care in Moray HSCP put forward the Maryhill Practice to be the test site for this pilot project.

4.1 Patient identification – case finding searches

Patients in each of the three high priority groups (pre-diabetes, previous GDM, candidates for remission) were identified by running case-finding searches on the Maryhill Practice electronic health record system (Vision). Searches were conducted in January 2024, using Read codes combined with inclusion and exclusion criteria as follows:

General exclusion criteria applied to all groups were:

- Not able to speak English (needing translator)
- Hearing impairment (given that a key part of the intervention was a phonecall)
- Severe kidney or liver disease
- Active cancer
- Palliative or end of life care.

Patients who had not provided mobile phone numbers or who had not consented to receiving text messages from Maryhill Medical Practice were also excluded from the study.

Pre-diabetes

Read codes IGT (impaired glucose tolerance), IFHG (impaired fasting hyperglycaemia) or NDHG (non-diabetic hyperglycaemia)

Inclusion criteria:

HbA1c over 41mmol/mol and less than 48 mmol/mol
BMI >27kg/m

75 year old or under

Exclusion criteria:

HbA1c>48 (they were transferred to the Diabetes remission group) or <41mmol/mol

BMI <27kg/m² >75years old

Palliative care/end of life care.

270 patients were found in the initial search. 149 patients were excluded, leaving 121 to be invited to participate in the pilot.

Gestational diabetes

Read codes L180 - L180800 (diabetes mellitus arising in pregnancy) and 180900 (gestational diabetes mellitus) - excluding other types of diabetes such as Type 1 or MODY (maturity onset diabetes of the young) or Type 3.

Exclusion criteria:

- 1 of the patients was no longer at the practice at the time of going through the list on 20/3/24
- We also excluded patients who were over 75 or who were a normal or underweight (BMI<25)
- Prediabetes or diabetes diagnoses. 9 were transferred to the prediabetes group and 9 to the remission group
- Pregnant

110 patients were found in the initial search. 29 were excluded, leaving 71 who were invited to participate in the pilot.

Remission group

Read code C10F (type 2 diabetes mellitus)

Inclusion criteria:

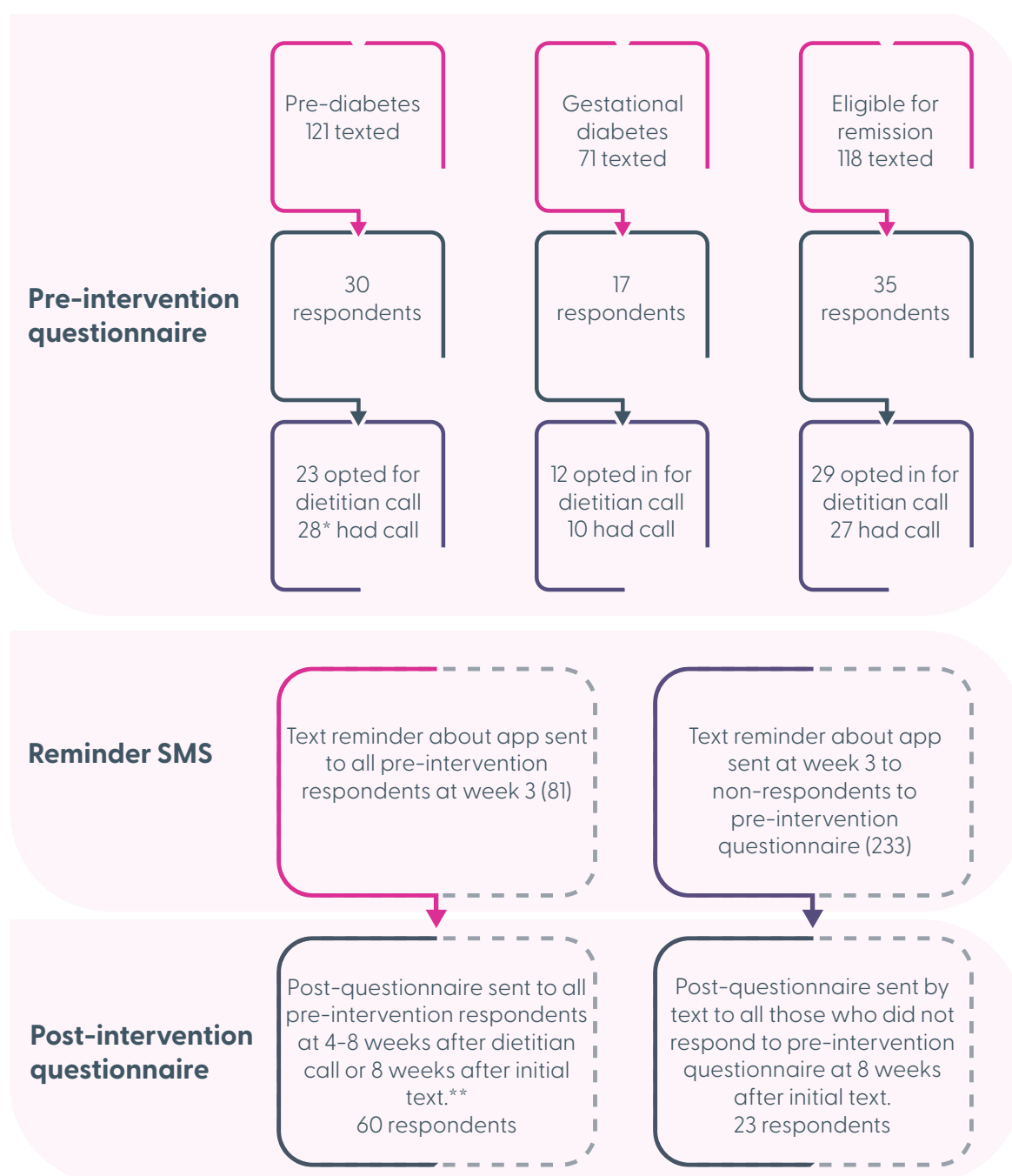
- diagnosed from April 2019 onwards. (within 6 years of diagnosis with type 2 diabetes according to coding on Vision)
- HbA1c>48mmol/mol if not on diabetes medication or HbA1c >43 mmol/mol if on diabetes medication
- BMI>27
- <75 years old

Exclusion criteria: most recent HbA1c <42 mmol/mol
166 patients were initially identified. 48 patients were excluded and 118 were invited to participate in the pilot.

4.2 Process

As outlined in figure 1 below, patients in each high risk group were sent an SMS message signposting them to the web version of the app and asking them to complete a pre-intervention questionnaire. All patients retrieved through the Vision searches – whether or not they responded to the initial questionnaire – were sent a reminder SMS to look at the app at 3 weeks after the initial text message. Those patients who responded to the initial questionnaire were subsequently sent a follow-up questionnaire at 8 weeks after the original text message to assess whether their knowledge, confidence and motivation had improved. The dietitians called those who did not respond to the follow-up questionnaire to invite them to respond by email or to complete the questionnaire with them over the phone.

Patients who did not respond to the initial questionnaire were also sent the follow-up questionnaire. This increased the sample size within which we could compare users versus non-users of the app.



*2 patients rang the surgery to book a diabetes call rather than complete the questionnaire online. 3 further patients were contacted in response to comments in their questionnaires.

**The dietitians proactively called those patients who had responded to the pre-intervention questionnaire but initially did not respond to the post-intervention questionnaire and worked through the questionnaire by phone or sent an email copy when requested

Annex 2 provides the wording of the text messages sent to patients.

4.3.1 Demographic information

Participants were asked to provide their date of birth, gender, ethnicity, age, weight, and height. They were also asked to provide their postcode for assessing level of deprivation using the Scottish multiple deprivation index. Postcodes were mapped to the Scottish Index of Multiple Deprivation (SIMD) to determine the SIMD quintile for each participant.

4.3.2 Improvement in readiness for change – self-rating

In the post-questionnaire, participants were asked to rate to what their extent their knowledge, confidence, and motivation had increased since using the app (“Has using the Prevent the Progress of Diabetes web resource improved your [knowledge about managing/confidence about managing/motivation to manage] your diabetes condition?”) from 1 (“Yes, a lot”) to 4 (“No not at all”).

4.3.3 Pre/post comparison of readiness for change using Likert scales

In both the pre- and post-questionnaire, participants were asked to rank:

- Their knowledge about type 2 diabetes.
- Their confidence in managing diet and lifestyle
- Their motivation to improve diet and lifestyle
- Their current prioritisation of diabetes relative to other things in their life

All these aspects were measured on a Likert scale of 1-5, with 1 being the lowest score and 5 the highest.

4.4 Dietitian call

Dietitians called those patients who had opted for this support via Near Me where possible, or alternatively by phone.

This was not a full dietitian consultation but a brief ten-minute intervention comprising four elements:

- Orientation to navigate the app, where possible with a demonstration using screensharing with Near Me.

- Referral with patient agreement to the appropriate NHS Grampian service – including: Prevent It, Control It, Second Nature Prevent, Counterweight (face to face), Counterweight Plus, Balance Near Me group and Oviva (digital Tier 3.)
- Self-management advice and support, including (for 3 patients) provision of a diet sheet or meal plan.
- Where appropriate, recommendations for action to the Maryhill general practice team – for example, to refer for smoking cessation support, test for coeliac disease or IBS, provide updated HbA1c or weight information.

4.5 Power analysis

A sensitivity power analysis was conducted G*Power, to identify the largest effect size that could reliably be detected with a two-tailed matched pairs t-test using (n=43, alpha=.05, power=.80). It was found that this sample could detect an effect with a Cohen’s d of 0.43 (approx. a medium effect size) at a power of .80.

4.6 Statistical tests

Within-subjects t-tests (or Mann-Whitney U-tests were data was distributed non-parametrically) were used to compare:

- Self-rated knowledge, confidence and motivation at the end of the study among those who used the app more or less frequently, and those who did or did not have a dietitian call. The impact of SIMD score on self-rated knowledge, confidence and motivation was also assessed.
- Pre- and post-Likert scale results for knowledge, confidence, motivation, and priority among those who completed both the pre- and the post-questionnaires. The difference in pre- and post-results was also compared for those who did and did not have a dietitian call and across groups with low and high SIMD scores.
- Pre- and post-intervention BMI scores.

Comparisons across the three high risk groups were not possible due to the low sample sizes in some groups. Missing values were filled via mean imputation (there were no more than 3 missing values per comparison).

5.Results

5.1 Participants

A total of 82 respondents completed the pre-questionnaire, while total of 83 respondents completed the post-questionnaire. In the pre-questionnaire group, 21 respondents did not complete the post-questionnaire; for the post-questionnaire, 23 of the respondents had not completed the pre-questionnaire. This left 60 respondents who completed both the pre- and post-questionnaire.

5.2 Demographics

Demographic information for participants is presented in Tables 1 and 2 below, broken down by whether they responded to the pre-questionnaire, the post-questionnaire, or both.

	All respondents to pre-questionnaire	All respondents to post-questionnaire	Responded to both pre and post questionnaires
Gender	26 male, 55 female, 1 no response	NA	19 male, 41 female
Ethnicity	76 White 2 South Asian, 1 Black, 1 Chinese, 2 no response	77 White 1 South Asian, 1 Black, 1 Chinese, 1 Mixed, 2 no response	56 White 1 South Asian, 1 Black, 1 Chinese, 56 White, 1 Mixed
Diabetes group	31 pre-diabetes, 16 GDM, 35 remission	NA	23 pre-diabetes, 11 GDM, 26 remission
Age bands	36 [< 55 band], 45 [≥55 band], 1 no response	31 [< 55 band], 52 [≥55 band]	26 [< 55 band], 34 [≥55 band]
Had dietitian call	80.5% (66)	61.45% (51)	85% (51)
Deprivation (SIMD quintile 1=most deprived, quintile 5=least deprived)	Quintile 1 – 4 (4.9%) Quintile 2 – 14 (17.1%) Quintile 3 – 16 (19.5%) Quintile 4 – 25 (30.5%) Quintile 5 – 15 (18.3%) No postcode – 4 (4.9%)	NA	Quintile 1 – 4 (6.7%) Quintile 2 – 13 (21.7%) Quintile 3 – 12 (20%) Quintile 4 – 16 (26.7%) Quintile 5 – 12 (20%) No postcode – 3 (5%)

Where a variable is listed as NA, it was not measured in that questionnaire.

In line with the literature on patients in deprived areas being least likely to engage with health services, the response rate was lowest among patients in the most deprived areas. However, it is noticeable that, while numbers were low, all respondents in this group replied to the follow-up questionnaire as well as the pre-intervention questionnaire. This may have been influenced by the proactive follow-up phone-calls by the dietitians (see note in figure 1 above.)

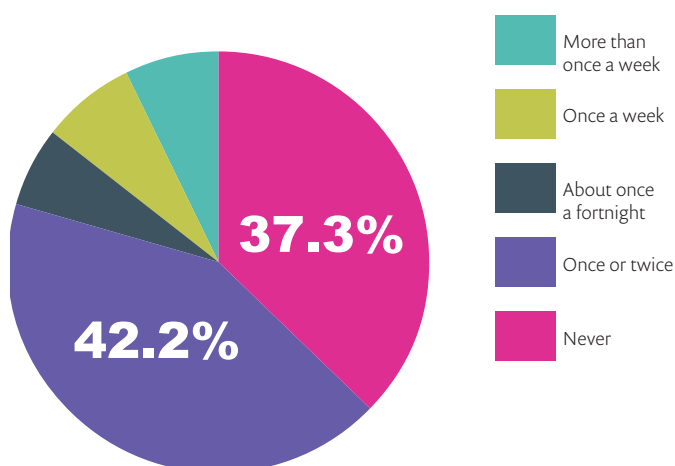
Table 2: Means and standard deviations for age, weight, height, BMI for participants who completed both the pre- and post-questionnaires

	Mean	SD
Age	55.8	11.8
Weight (Kg)	98.8	24.7
Height (m)	1.68	0.095
BMI	34.9	0.43

5.3 App usage rates

Of the participants who completed the post-questionnaire (n=83), the majority (62.7%; 52) used the app at least once, while 37.3% (n=31) did not use it at all. Usage levels are reported below for all participants who used the app (n=52).

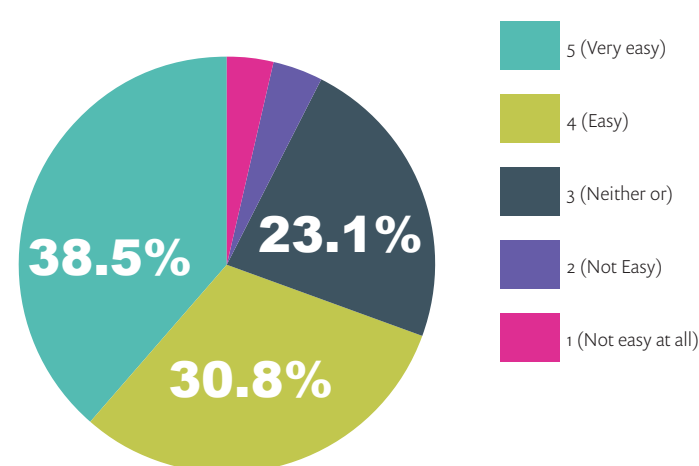
Table 3: Participants' app usage levels for all respondents to the post-questionnaire



5.4 Ease of use

Participants were also asked to rate the app's ease of use on a scale from 1 (Not easy) to 5 (Very easy). Almost all participants (92.3%; n=48) who had used the app rated the app at 3 or higher, with 38.5% of participants (n=20) rating it at the maximum 5.

Table 4: Ease of use of the app



5.5 Self-rating of improvement in readiness for change

Table 5 below displays participants' self-reported ratings of the app's effectiveness in improving knowledge, confidence, and motivation. Data includes all participants who responded to the post-questionnaire and used the app at least once (n=52).

The great majority of participants reported that the app improved all three aspects of their readiness to change. 94% said that their knowledge had improved at least a little, and 88% said that their confidence and motivation had improved at least a little. Focusing on the higher levels of impact - 54% of participants reported that their knowledge had increased "somewhat" or "a lot." 52% said that their confidence had improved at these levels, and 56% that their motivation had also improved at these levels.

Table 5: Participant ratings of app effectiveness in improving knowledge, confidence, and motivation of diabetes management

	Not at all	A little	Somewhat	A lot
Knowledge	3 (5.8%)	21 (40.4%)	15 (28.8%)	13 (25%)
Confidence	6 (11.5%)	19 (36.5%)	19 (36.5%)	8 (15.4%)
Motivation	6 (11.5%)	17 (32.7%)	17 (32.7%)	12 (23.1%)

5.6 Pre/post comparisons of readiness to change using Likert scales

The t-test of knowledge found the mean self-reported knowledge at post-test (M=3.53, SD= .96) to be significantly higher than knowledge at pre-test (M=2.95, SD=1.02; p=.004, t=-2.99).

T-tests of pre/post priority, confidence, and motivation for all respondents who responded to the pre- and post-questionnaire (n=43) did not find a significant difference between pre and post measures (two-tailed p=0.29, 0.11, and 0.45 respectively).

5.7 Referrals following a dietitian call

Of the 53 participants who used the app at least once, 35 (66%) had a call with a dietitian. 18 (34%) used the app without having a dietitian call.

The dietitians observed that of the 66% they spoke to, a number had not used the app at that point. The dietitians' introduction to using the app as part of the call is likely to have been helpful in prompting future usage.

Table 6 below shows the specifics of the total 96 referrals/ advice offerings made as a result of this call.

Table 6: Referrals and advice provided in dietitian call

Outcome after dietitian call	GDM	Pre-diabetes	Remission
Self-management	2	7	2
Prevent It	6	9	NA
Control It	NA	NA	8
Second Nature Prevent	7	3	NA
Oviva (digital Tier 3)	0	2	4
MLC – counterweight (F2F)	1	11	3
Balance (Near Me group)	0	0	1
Counterweight Plus	NA	NA	12
Dietitian 1:1 consultation	2	3	6
Other – see below*	1	3	3
Number of patients called	10	28	27
Total outcomes	19	38	39
Most popular outcome (% of patients called who chose this option)	Second Nature Prevent -digital (70%)	MLC-Counterweight F2F (39%)	Counterweight Plus (44%)

*Other options:

- **GDM** –Culturally appropriate diet sheet requested
- **Pre-diabetes** – diet sheet in post
- **Remission** – 900kcal meal plan requested /bariatric surgery waiting list
- Requests to complete questionnaire over the phone or via email rather than text.

The dietitians also made a number of recommendations for action to the Maryhill general practice team. As outlined in table 7 below, these included updating of clinical parameters around HbA1c or weight, and recommendations for referral – e.g. for smoking cessation or tTG testing.

Table 7: Recommendations for action to the primary care team as a result of the dietitian call

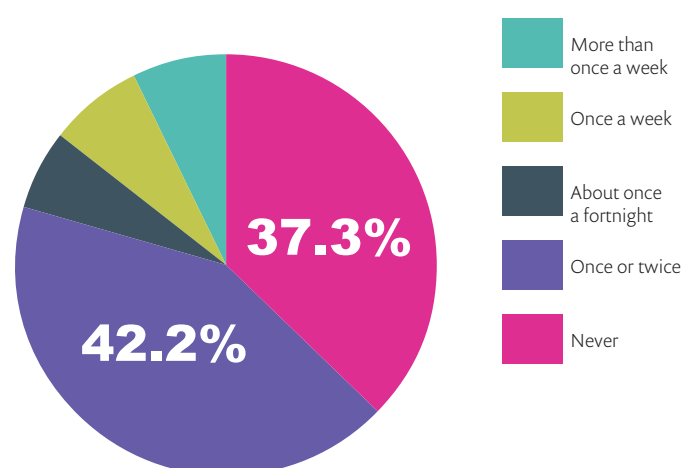
Further Action for primary team	GDM	Pre-diabetes	Remission
Other: smoking cessation		1	
Annual HbA1c/update	7	4	2
Update Weight	3	3	1
To check tTG for coeliac disease – possible IBS		1	1
To request bone scan/coeliac review		1	

5.8 Effect of deprivation

Participants were asked for their postcode in the pre-intervention questionnaire only.

As post-questionnaire responses were needed to assess app effectiveness, only participants who completed both the pre- and post-questionnaire, used the app at least once and entered a valid postcode could be included in an analysis of app effectiveness by deprivation (n=40).

Table 8: SIMD quintiles for participants who completed both the pre- and post-questionnaire, used the app, and provided a valid postcode (n=40)



To compare the most and least deprived groups, participants were collapsed into 2 bands: most deprived including quintiles 1 and 2 (n=11) and least deprived including quintiles 4 and 5 (n=20). Participants in quintile 3 were excluded from this analysis.

A Mann-Whitney U-test was used to compare knowledge and motivation pre- and post-intervention, as this data had a non-parametric distribution. No significant differences were detected (p=.312 for knowledge, p=0.421 for motivation). Confidence data was normally distributed, and a t-test again showed no significant difference in values between deprivation groups (p=0.581).

5.9 BMI pre- and post-intervention

The average BMI among those who responded to both pre- and post-intervention questionnaires was 34.9 prior to use of the app with or without dietitian call, and 35.1 post-intervention. Two-tailed T-tests showed no significant difference in pre- and post-intervention data, or on comparison of groups who: a) did or did not use the app; b) did not have a dietitian call. Realistically, we would not expect to see a large-scale change in BMI only 8 weeks after an intervention

5.10 Qualitative analysis of freetext responses

5.10.1 Pre-intervention responses

a) Use of diabetes information resources

74 out of 82 participants answered the question “What resources (e.g. diet sheets, websites, apps) have you used so far?”

Many respondents said that they had not used any resources (n=33), although almost all respondents (n=77) also answered that wanted to lose weight on a separate question. The most popular resources were websites/apps (n=23), weight loss programmes, plans, or groups (n=9), dietary sheets (n=9), or a specific diet/ meal replacement (n=6).

b) Priorities and issues

In the pre-intervention questionnaire, respondents identified the following issues as priorities for them at that time – see table 10 below.

Table 10: Priorities identified pre-intervention (freetext responses)

What are the main priorities in your life at the moment?	GDM	Pre-diabetes	Remission
Physical health	7	24	24
Weight	10	16	26
Diabetes	1	8	22
Wellbeing	7	17	18
Mental health	6	14	11
Other (free text)*	2	4	1

One GDM respondent highlighted the difficulty in focusing on her own wellbeing with a new baby to look after: ‘Honestly all of that has been put to the side due to the baby but I really want to make it a priority again.’

Other comments in the pre-intervention questionnaire related to co-occurring health issues, medications and reduced mobility leading to weight gain, and issues with confidence:

- ‘Although I am motivated, I have also lost confidence in losing weight as every time I try, I put weight on.
- ‘I am very overweight and can’t seem to find the motivation to lose weight. I have lost a few stone in the past but I mostly did diet with miles of walking. Now I can only walk short distances and have to use a rollator.’

Three respondents in the pre-diabetes group highlighted that prior to the text message they were unaware of a diagnosis of pre-diabetes. 5

5.10.2 Post-test responses

Eighty-three respondents completed the post questionnaire.

a) Priorities and issues

In the post-intervention questionnaire, participants were asked “Is there anything else you want to ask or tell us?” as a free text question; 28/82 responded. Due to the overlap with this question, the responses from the question “What are the main priorities in your life at the moment?” (n=7) were combined with this question.

In descending order of frequency, key themes emerging from responses to this question are:

- 18 participants discussed the other competing factors in their life which made it harder for them to manage diabetes.
- For 12 of these participants, co-occurring health issues were a challenge for them.
- Lack of support in managing diabetes (n=7). Some participants felt that they had been given a diagnosis and then left to their own devices, while others were unhappy that they only found out about their diagnosis through text.

- 3 participants felt that they had lost motivation or confidence after previous failed weight loss attempts, making it harder to keep trying.
- 2 participants were glad that they were now getting more support, even if they had felt a lack of support previously.

b) Reasons for not using the app

31/83 respondents did not use the app. 29 provided reasons, the most common being:

- Not knowing about the app (n=6)
- Competing priorities or lack of time (n=7)
- No access to technology (n=6).
- Self-treating/not concerned/in remission (n=5)
- Ill health (n=2)
- Not confident in using the app (n=2)
- Specific learning need or visual impairment made it difficult to use the app (n=2)

c) Behaviour change

Participants were asked “Since using the web resource, what (if anything) have you changed - or are you considering changing - to prevent the progress of diabetes?”. All participants who used the app (n=52) answered this question.

Almost all (n=46) had made or planned to make a change. Of these 46, 31 (67.4%) had a dietitian call, and 15 (32.6%) did not. This suggests that use of the app alone combined with personal motivation was sufficient for a third of participants to reach the stage of making or planning behaviour change.

The most common change was a change in diet or eating habits (n=34), followed by increasing physical activity (n=15), then starting a weight management programme (n=4).

4 participants also commented that it was difficult to make changes due to other demands in their life, including a busy lifestyle or competing health problems.

Table 11 below summarises the behaviour change responses across the three patient groups.

Table 11: Behavioural changes indicated in freetext responses

Patient group	Number of comments	Improve diet	Increase exercise	Lose weight
Pre-diabetes	24	46%	4%	21%
GDM	11	82%	27%	18%
Remission	26	31%	27%	8%

d) Dietitian call

A total of 51 participants had a call with a dietitian, 32 of whom answered the question “How helpful was it to speak to a dietitian? Please explain.”

Of these 32, 18 (56%) found the call very helpful, 10 (31%) found it somewhat helpful, 2 found it not very helpful and 1 (3%) found it not at all helpful. 1 participant did not provide a score.

Key themes about the benefits of the dietitian call included

- Referred to online resources (n=10)
- Provided a call to action or improved motivation (n=9)
- Provided confirmation, support or encouragement (n=8)
- Signposted to digital programme (n=7)
- Knowledge gained about pre/diabetes, risk and progression of diabetes (n=5)
- Review of clinical picture e.g. bloods, weight (n=2)

Seven participants also gave more negative feedback. Some participants found the call too impersonal, mainly being directed to self-management resources when they desired more direct or tailored support (n=3).

Others felt that the information provided only covered what they already knew, or that they did not retain new information from the dietitian (n=3). One participant advised that they would prefer a face to face meeting with the dietitian.

e) Improvements to the app

44 participants responded to the question “How could we improve the Prevent the Progress of Diabetes web resource?” Forty-four responded. The most common responses were that nothing needed to be added (n=11) or that they couldn't think of anything more to add (n=9).

Five respondents advised that the app should be used alongside face to face appointments. Four respondents asked for additional dietary information – including personalised menus, more cultural variation, more diet sheets .

Three asked for simplification, summarising and streamlining of the content. Two said that they would like the content as a mobile phone app – indicating a need to raise awareness of the mobile app option. Two indicated that the app did not work for them personally.

f) Additional comments

There were 45 responses to the question “Is there anything else you want to tell us?”. As this was a very open question, it had the most varied and idiosyncratic responses. The themes identified from these responses were:

Expressing thanks or a positive attitude towards the support offered (n=8) – e.g. “Brilliant work and thank you for helping myself.”

Wanting more face-to-face contact (n=5) One respondent in the GDM group shed light on how some patients may see a move towards using a web resource as a first means of support - “women like me need actual human support and not just a website.....Apologies for the brutal honesty but it just feels like another way for the NHS to try and save money that just pushes human interaction away.”

Finding there to be a lack of follow up from initial diagnosis (n=3). Wanting to join groups to be motivated by others (n=2). Being unaware they had pre-diabetes before this research (n=2). Disliking online resources in general (n=2).

5.11 How does the dietitian call augment use of the app alone?

79% of respondents to the pre-intervention questionnaire opted for a call with a dietitian, demonstrating the value that a majority of patients place on direct communication and support with healthcare professionals. This is underlined by the finding that 5 out of 42 patients (12%) who responded to the freetext question about improvements to the app requested that the app be accompanied by face to face contact. The positive reports around the experience of the 10 minute dietitian call in the freetext responses (section 6.10.2 d)) confirms that the great majority (87%) of patients benefited from this brief interaction, finding it very helpful or somewhat helpful.

The main objective of the call was to identify services, support and next actions that would help the individual patient.

As shown in table 6 above, the dietitians provided a total of 96 referrals and advice or support interventions. They also made 20 recommendations to the primary care team for follow-up clinical checks and actions (see table 7.)

As illustrated in Table 5 in section 5.5 above, 94% of participants reported that use of the app improved their knowledge, confidence, and motivation to address diabetes-related. 52–56% reported a substantial increase – “somewhat” or “a lot.” T-tests using the data in tables 12 and 13 below indicate that knowledge, confidence and motivation increased equally among patients who had a call (66%) or did not have a call (34%).

Moreover, as indicated in point c within section 5.10.2, around a third of patients committed to behaviour change following use of the app alone, without any dietitian call. Together, these results indicate that there is a group of patients with high digital self-efficacy for whom use of the app alone, along with their internal motivation, is sufficient to improve readiness for lifestyle change and to take action accordingly.

However, the freetext comments also indicate that patients who did opt for a dietitian call then found it helpful in enabling behaviour change and in improving knowledge, confidence and motivation (see section 5.10.2 points c) and d) above.) The dietitian feedback that a number of patients saw the app for the first time during the call, and the patient responses about use of online resources following the call also suggest that the dietitian call was helpful for these patients in increasing their use of the app.

Overall, These results suggest that there is a second group of patients - with medium digital self-efficacy – who benefit from professional support and orientation to using the app in order to achieve the state of readiness necessary to effect behavioural change.

Table 12: Participants who used the app at least once and had a dietitian call (n=35)

Rating	Knowledge %	Confidence %	Motivation %
1 = Yes, a lot	10 (28.6%)	6 (17.1%)	10 (28.6%)
2 = Yes, somewhat	8 (22.9%)	12 (34.3%)	11 (31.4%)
3 = Yes, a little	14 (40.0%)	13 (37.1%)	9 (25.7%)
4 = No not at all	3 (8.6%)	4 (11.4%)	5 (14.3%)

Table 13: Participants who used the app at least once and didn't have a dietitian call (n=17)

Rating	Knowledge %	Confidence %	Motivation %
1 = Yes, a lot	3 (17.6%)	2 (11.8%)	2 (11.8%)
2 = Yes, somewhat	7 (41.2%)	7 (41.2%)	6 (35.3%)
3 = Yes, a little	7 (41.2%)	6 (35.3%)	8 (47.1%)
4 = No not at all	0 (0.0%)	2 (11.8%)	1 (5.9%)

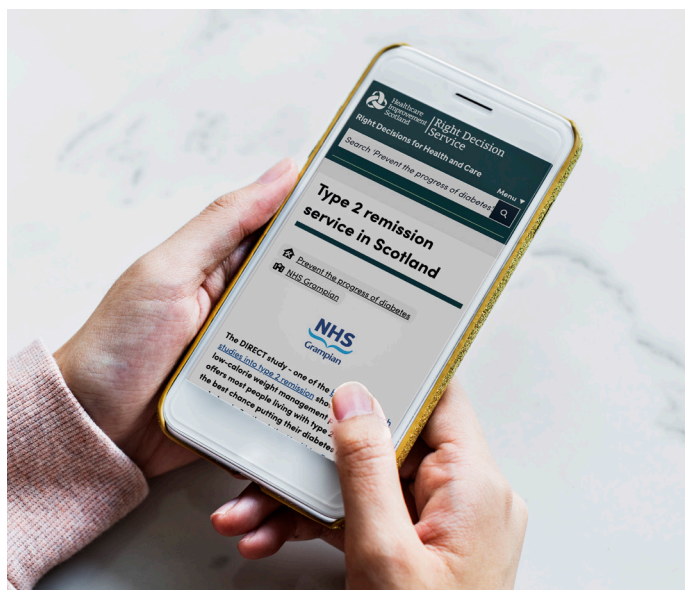
6. Limitations and areas for future improvement in study design.

This pilot has two main limitations which can be addressed in future larger-scale implementation:

6.1 Small sample size

While the study was sufficiently powered to detect moderate and large differences between comparison groups, the sample size was too small to detect small differences.

This may account for the inability to detect additional impact of the dietitian call on knowledge, confidence and motivation compared with use of the app alone, and for the absence of significant differences between pre- and post-intervention Likert scale data for confidence and motivation although participant self-rating indicated improvement in both these aspects.



6.2 Questionnaire design and delivery

For future larger scale studies, it will be helpful to consult with research and improvement experts on questionnaire design for larger scale studies. Questionnaire tools should be tested for reliability and validity prior to large scale use. Consideration should be given to reducing number of questions to improve response rate and to using published validated 'gold standard' questionnaires rather than self-made ones. Several patients expressed a preference for completing questionnaires by email rather than via a text message, and this option should be built into future studies to improve response rate.

7. Conclusions and recommendations

7.1 Make the app available for use across NHS Grampian

The primary recommendation arising from this pilot is to make the app available for widespread use across NHS Grampian and more widely across NHS Scotland. The results of the pilot make it clear that it can offer significant benefit to many patients in terms of improved knowledge, confidence and motivation to change lifestyle behaviour.

The following recommendations provide pointers as to how to maximise the benefits of the app in terms of patient safety, patient experience and service efficiency.

The suggestions are intentionally flexible in nature, being respectful of the resource constraints and capacity challenges within the system. However, regardless of which specific approaches are adopted in different parts of NHS Grampian, the core principle applies of raising awareness and encouraging use across professional and patient groups.

7.2 Deliver a flexible and sustainable digitally-enabled service model

This pilot project points to the potential for a sustainable, low-cost digitally-enabled service model with wide reach and high impact across tier 1-3 weight management services outlined in A Healthier Future:

- Tier 1 – universal services
- Tier 2 – early intervention
- Tier 3 – targeted intervention

This service model aims to:

- Deliver core elements within existing staff and financial resources.
- Be flexible, to operate within local service constraints and circumstances.
- Build in capacity for development and growth where resource allows, to maximise impact and build on initial successes.

The proposed service model is based on a combination of two approaches:

1. Tailored support for patients segmented into three levels of digital self-efficacy, as outlined below.
2. A service bundle approach comprising:
 - Elements of a core minimum service bundle which can be delivered now, within available resource.
 - Extended bundle elements which require some investment in technical or service development.

A practice or cluster may choose, for example, to focus initially just on the core minimum bundle. Over time, they could extend their focus to wider developments with more impact across all target groups.

7.2.1 Segmentation of patient groups

Overall, this study points to three patient groups who are more or less likely to use a digital resource to support prevention and self-management of diabetes:

a) High digital self-efficacy

These individuals were able to use the app to improve their readiness for lifestyle change without requiring a dietitian call. Their knowledge, confidence and motivation to reduce their diabetes-related risk improved, and the majority also confirmed that they had already changed or planned to change their behaviour.

b) Medium digital self-efficacy

This group requested a dietitian call and also used the app, in some cases after the dietitian's explanation of how to navigate the resource. This group also reported improvement in knowledge, confidence and motivation – to the same level as the high digital self-efficacy group who did not request a dietitian call. The majority reported a change or planned change in behaviour, often focusing on actions which reflected the dietitian's advice and referrals.

c) Low digital self-efficacy

These patients were not in a position to use the app, whether due to lack of awareness, confidence, motivation, time or digital access. Some (12% of freetext respondents) expressed a strong preference for face to face interaction with healthcare professionals. There was no improvement in readiness for lifestyle change in this group.

7.2.2 Tailored support for the three groups

a) High digital self-efficacy

For those with high digital self-efficacy, it will be helpful to optimise the capabilities of the app to drive and sustain behavioural change, and using question-based algorithms to guide the user directly to appropriate self-management and self-referral options so that they can independently get the specialist support they require.

b) Medium self-efficacy, providing:

This group will benefit from:

- Signposting and support in using the app from the primary care team and wider community services. This can be facilitated by link workers, support workers, health promotion staff (e.g. Healthpoint) or community agencies such as leisure centre and public library staff.
- One or more routes for referral to appropriate self-management and specialist weight management services. For some more confident patients, an algorithmic self-referral route may enable quick and effective referral. Others may need the option to request a short call with a healthcare professional who has a sound knowledge of diabetes prevention and remission, local diabetes pathways and tier 1,2 and 3 weight management services. In this study, dietitians provided this specialist support; in future, other primary care staff could potentially be trained to take this role. Broadening this knowledge and understanding across the primary care team could potentially also help with the communication of diagnosis of pre-diabetes and suitability for remission. Some respondents in this pilot reported that the text message with the study questionnaire was the first communication they had received.

c) Low digital self-efficacy:

Key interventions for this group include:

- Promotion and communication through targeted channels to raise awareness of the app – responding to the finding that a number of non-users did not know about the app.
- Guidance and facilitation in using the app for those who lack confidence in digital skills. This could involve, for example, support from link workers and health promotion staff or collaborative arrangements with public libraries, leisure services, support groups and third sector organisations.
- Promoting public library services and community services such as [Ability.Net](#) which provide free access to digital technology for those who do not have this at home.

A supporting document repository is available [here](#) to support this report which includes pre and post questionnaires used in the evaluation and free text responses

7.2.3 Service bundle elements

Table 14 below highlights key elements of a core minimum service bundle and an extended service bundle.

Service bundle element	Which patient group (s) will this bundle element support?	Healthier Scotland tier	Notes
Core minimum service – capability already available			
C1 Running of case reports to identify high risk patient groups (pre-diabetes or previous diagnosis of GDM) and candidates for remission.	High, medium and low digital self-efficacy	Tier 1 Tier 2 Tier 3	Section 4.1 of this report provides details of how to run these searches manually within Vision and EMIS. For the future, the intention is to make automated reporting possible via the ESCro database (see section 8.4 below).
C2 SMS text message or email from practice to prompt patient to use the app to support their risk reduction in diabetes. At least one follow-up reminder text or email.	<ul style="list-style-type: none"> High and medium digital self-efficacy Some low digital self-efficacy users when supported by access and orientation to app. 	Tier 1 Tier 2 Tier 3	Evidence base and pilot experience indicate that this type of communication and prompting from a trusted health service will improve uptake of digital interventions.
C3 Prevent the progress of diabetes app, incorporating local services and resources alongside national support.	<ul style="list-style-type: none"> High and medium digital self-efficacy. Some low digital self-efficacy users when supported by access and orientation to app. 	Tier 1 Tier 2 Tier 3	The pilot project confirmed the importance of incorporating comprehensive information about local service options and support alongside signposting to national resources. The Right Decision Service team will work with local NHS Boards to create their 'clone' of the core app, supplemented with local service information.
C4 Awareness-raising for the app by primary care professionals.	<ul style="list-style-type: none"> High and medium digital self-efficacy. Some low digital self-efficacy users – communication by practice will strengthen trust in the service. 	Tier 1 Tier 2 Tier 3	Evidence base and feedback from pilot underline that direct communication from trusted health professionals will build confidence in the app. In this project, dietitians took this role. In other contexts, other healthcare professionals may do so. Light touch awareness and education (e.g. a videoclip) may be needed for healthcare professionals around benefits of the app to patients and how to embed it in their communication with patients.

Service bundle element	Which patient group (s) will this bundle element support?	Healthier Scotland tier	Notes
Extended service bundle elements (require additional development – technical or service /process redesign)			
E1 Patient self-referral capability within the app – directing to self-management resources and tailored services.	High digital self-efficacy. Some patients within medium digital self-efficacy group (some will prefer referral by healthcare professional.)	Tier 1 (referral to community services, e.g. exercise classes) Tier 2 Tier 3	The pilot illustrates the benefits of a seamless user journey from use of the app to build knowledge and motivation through to actioning referral to services. In the NHS or community, RDS team can build self-referral algorithms and forms into the app. Extending capability to enable initial review by primary care team and saving back to patient record will require technical development. Will require engagement with referral target services to agree processes
E2 Provide option (e.g. through the self-referral form) for app users to request a 10 minute call with a healthcare professional to get tailored support and discuss referral options.	<ul style="list-style-type: none"> Medium digital self-efficacy Some high digital self-efficacy users will also benefit from the additional advice with healthcare professionals. Low digital self-efficacy patients may also benefit from the improved knowledge and advice from professionals in face to face consultations. 	Tier 1 (referral to community services, e.g. exercise classes) Tier 2 Tier 3	Will require education and confidence-building for health-care staff around: <ul style="list-style-type: none"> Remission, and diabetes prevention for these high risk groups. Local diabetes pathways, local weight management services and referral criteria.
E3 Provide an interface from the patient record to a direct referral capability which healthcare professionals can use.	<ul style="list-style-type: none"> High, medium and low digital self-efficacy. 	Tier 1 (referral to community services, e.g. exercise classes) Tier 2 Tier 3	The capability for patients to place direct referrals to NHS and community services (and to copy the referral information into the patient record) can also be made available to health and care professionals as part of the RDS decision support platform which already interfaces with patient record systems.
E4 Mobilise the wider multi-professional team and community partners to raise awareness of the app and to support people with limited digital and health literacy.	Medium and low digital self-efficacy May also help to raise awareness among high digital self-efficacy group.	Tier 1 Tier 2 Tier 3	Recognises that signposting patients to the app and helping them to use it does not require healthcare professional input. It involves engagement and some process redesign to involve: <ul style="list-style-type: none"> Non-clinical staff such as link workers, health promotion staff or support workers to promote the app and provide patients with basic guidance in its use. Community services such as public libraries, leisure centres, third sector organisations and support groups to be proactive in raising awareness of the app, providing digital and health literacy support and basic orientation to using the app.

7.3 A roadmap for collaborative development with the DHI Weight Management Living Lab

There is synergy in aims and approach between this Prevent the Progress of Diabetes service model and the emerging service model for the DHI Weight Management Living Lab. Both combine use of a digital app for self-management by a targeted high-risk population group with clinician referral and self-referral to support weight management for prevention of type 2 diabetes and other long term conditions. Each initiative brings unique strengths and areas of focus that could be brought together to maximise overall impact and create an efficient, sustainable approach.

This project recommends that the project leads in DHI, Moray and Healthcare Improvement Scotland work together to define a collaborative technical and service development roadmap that will converge these two workstrands and realise the synergies between them.

7.4 Improvements to the app

The next phase of implementation should look to apply improvements to the app that will increase utility and patient and professional engagement across all levels of digital self-efficacy. Another round of user consultation and user testing is recommended to design and deliver these improvements. The majority of users had no specific improvements to suggest, the most common feedback being to accompany the app with face to face consultation.

The two content and structural areas that some users identified for improvement were:

- Personalised menus, more dietary advice, more cultural variation, more diet sheets (4 freetext responses out of 44)
- Simplifying and streamlining content (3 freetext responses out of 44)

Although not specifically requested, the significant proportion of user feedback indicating the challenges they experience around mood, motivation and feeling unable to make changes suggests that further signposting to emotional and mental wellbeing resources and local support services would be valuable.

Beyond this, the broader feedback on the app and the way it lays foundations for a new service model indicate several further opportunities for strategic development which would form part of the extended service model outlined in table 14 above:

a) Incorporating question-based criteria linked to logic-based algorithms which will direct users to the appropriate self-referral forms for community and NHS services tailored to their needs. For potentially this self-referral information can be relayed back to the GP practice for initial review and confirmation around appropriateness and safety and incorporation into the patient record before forwarding on.

b) Providing links to these referral forms for clinicians to use. These links could be located within the web and mobile app and also within the RDS platform that links with electronic care systems. Creating the algorithmic forms for triaging and referral should be technically straightforward using the Right Decision Service technology. However, negotiation and process redesign work is likely to be needed with the services asked to receive referrals through this route. There would also be a requirement for training and familiarisation of healthcare staff around this new approach. In the short term, an initial step in this direction could involve signposting the available service options on the app, with clear descriptions around what services are on offer and the criteria for referral.

7.5 Improvements to case-finding approach

In this study, Vision searches were defined and run manually across Vision patient records. Rather than having to re-create these searches in every practice, and re-run them manually to identify updates, the recommended approach is to embed the searches as stored procedures within the EScro database, which takes an overnight copy of all patient records across primary & secondary care. This will enable all practices to run automated reports using the same criteria when they wish. In particular, it will enable practices to go beyond the retrospective capturing of at risk patients – the study's approach – regularly identifying and contacting new patients needing support.

7.6 Proactive alerting of the clinician in the context of the patient record

Building the searches into the EScro database in this way will also enable the Right Decision Service platform integrated with electronic care systems to offer proactive alerting of the clinician to need and opportunity to take action at point of opening the patient record. For example, this could be a prompt to discuss remission support for an eligible patient who is not yet on a remission pathway.

8. Recommendations for future research and evaluation

Key recommendations include:

- Enlarging the sample size and including a wider diversity of practice populations, including practices from Moray, NHS Grampian and one or two other NHS Boards. This will strengthen the validity and reliability of the evaluation.
- Testing the core minimum model outlined above, alongside at least one implementation of an augmented model deploying one or more of the additional support components.

9. Conclusion

The pilot has shown how the Prevent the progress of diabetes app from the Right Decision Service, can provide a nucleus of support for a sustainable and flexible digitally enabled service model which increases readiness for lifestyle change to reduce diabetes-related risk in patients with high and medium digital self-efficacy. Potentially, with appropriate digital support, it can also help some patients with low levels of digital self-efficacy. Core elements of this model can be delivered within existing resource.

The project also points to a range of extended service options which will further increase impact. These options include technical development, some service redesign or healthcare professional role development to support referral management and support people who are less digitally confident to use this app.

10. References

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