



**University of Dundee**

## **Using Data to Improve the Management of Diabetes**

Siddiqui, Moneeza K.; Hall, Christopher; Cunningham, Scott G.; McCrimmon, Rory; Morris, Andrew; Leese, Graham P.

*Published in:*  
Diabetes Care

*DOI:*  
[10.2337/dci22-0003](https://doi.org/10.2337/dci22-0003)

*Publication date:*  
2022

*Document Version*  
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

### *Citation for published version (APA):*

Siddiqui, M. K., Hall, C., Cunningham, S. G., McCrimmon, R., Morris, A., Leese, G. P., & Pearson, E. R. (2022). Using Data to Improve the Management of Diabetes: The Tayside Experience. *Diabetes Care*, *45*(12), 2828-2837. <https://doi.org/10.2337/dci22-0003>

### **General rights**

Copyright and moral rights for the publications made accessible in Discovery Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## Supplementary Appendix

### 1. Available linked data for patients with diabetes in Tayside

#### *Prescription encashment*

Prescribing history is available for all individuals residing in Tayside. This is possible because the Scottish Government pays for all prescriptions encashed by individuals residing in Scotland, this is carried out by the process of reimbursement to the pharmacy where the prescriptions were dispensed. The pharmacy provides detailed records of the prescribed items using a unified code provided by the British National Formulary against the CHI number of the individual who was prescribed the medications.

#### *Laboratory data*

All laboratory tests (biochemistry, immunology, virology, pathology) requested in the ambulatory or hospital settings are tested at Ninewells Hospital in Dundee. Results are then extracted by HIC from the Laboratory Information Management System (LIMS) daily. HIC further augment these data by consolidating historical records under common test codes and correcting data for known changes in laboratory equipment and assays over time. Virology test results include COVID-19 results, where additional non-hospital-based testing are made available through a national laboratory testing system in the UK with feeds to HIC for the local population.

#### *Hospitalisation, outpatient attendance and surgical procedures*

Hospitalizations - emergencies, operations, and procedures; records of hospital admissions and stays are collected by Patient Administration Systems within the hospitals, those are then gathered centrally by Public Health Scotland who run a series of validation checks these data are then made available to HIC. These hospitalization records can be associated with an outpatient, inpatient, accidents & emergencies (ER) visit, maternity, or mental health-related visit.

#### *Scottish Ambulance Service*

The Scottish Ambulance Service (SAS) responds to all medical emergencies requiring an ambulance, these can include hypoglycemic episodes. Detailed information on SAS visits including the diagnosis, point-of-care blood glucose measurements etc. are made available to HIC on request.

#### *Specialist registers*

Renal register – all residents in Scotland who have end-stage renal disease requiring dialysis are part of the Scottish Renal Register which is held by Public Health Scotland. HIC can then extract data for Tayside from this register.

Cancer register – information on diagnosis, treatment, and management of cancers are available through the cancer register. Data are available monthly for extraction.

### Walker Birth Cohort

Records of births and deaths in Scotland are maintained by the General Register Office (GRO). The Walker birth cohort leveraged birth record data from 1952 to 1966 resulting in a database of 48,000 births (10). After follow-up in 2002, 21,441 of these individuals were found to be resident in Tayside and aged between 36-50 years. In a sub-group of the Walker cohort, familial linkage is available i.e. children are linked to their mothers or fathers both or to their mothers only. Sociodemographic data on the families and children, along with complete electronic health data are available for the cohort. This is one of the largest birth cohorts available globally. Any parents or children who go on to develop diabetes are automatically included in the SCI-DC system and are therefore flagged for research. This linkage allows for studies on the impact of familial diabetes status on offspring risk.

## 2. My Diabetes My Way screenshots

The following screenshots demonstrate the types of functionality available to people with diabetes who are using My Diabetes My Way to manage their condition.

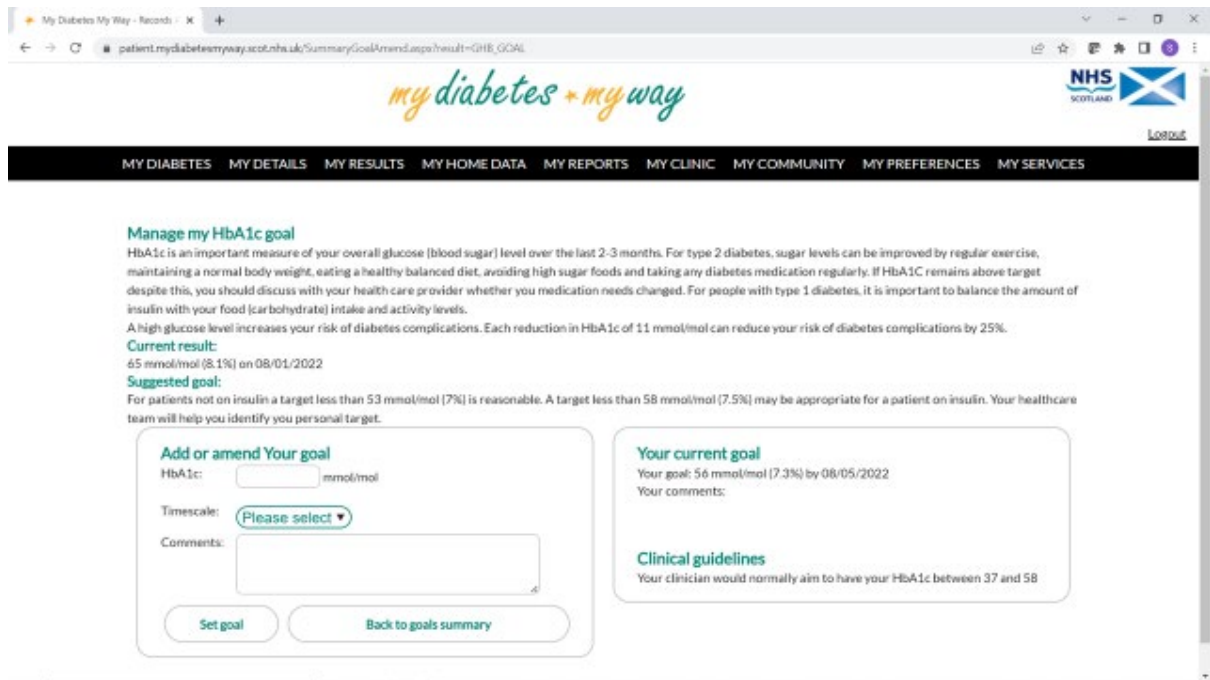
The screenshot shows the 'My Diabetes My Way' website interface. At the top, there is a navigation menu with options: MY DIABETES, MY DETAILS, MY RESULTS, MY HOME DATA, MY REPORTS, MY CLINIC, MY COMMUNITY, and MY PREFERENCES. The main content area is titled 'Care Measures Summary' and includes the following patient information:

- Patient Name:** JUSTA TEST
- Address:** Apt 1 123 Hillside, DUNDEE DD3 4HB
- Date of Birth:** 26/06/1966
- CHI Number:** 666666666
- Type of Diabetes:** Gestational Diabetes (Current)
- Year of Diagnosis:** 2016

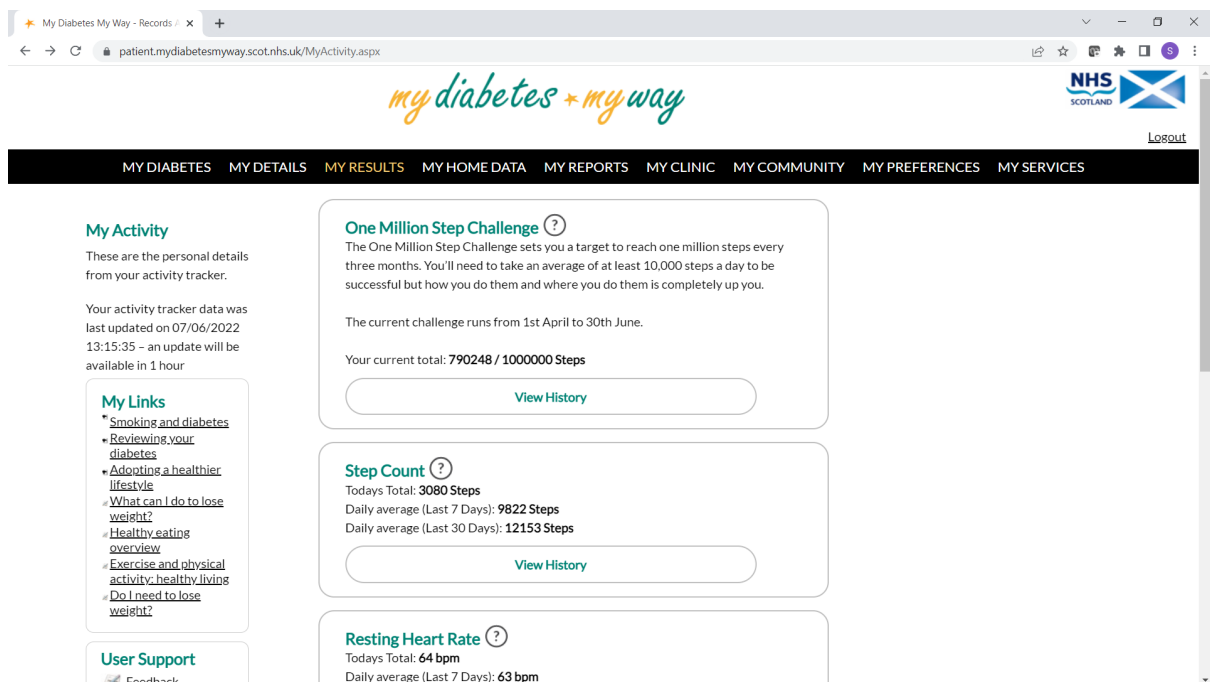
Below the patient information, there is a section titled 'There's a minimum level of care that every person who has diabetes deserves and should expect from their health service. Getting all the checks, seeing the right healthcare professionals and understanding your diabetes are all essential in helping you manage your condition. Use this checklist to make sure you're getting all the care you need.' This section contains five items, each with a status indicator:

- Get your blood glucose levels measured. 86 mmol/mol (10.0%) on 12/02/2018** (Green checkmark): You should have an annual HbA1c blood test to measure your overall blood glucose control. Although there are recommended targets, no two people with diabetes are the same and your target should have been agreed by you and your diabetes healthcare team.
- Have your blood pressure measured. 131/90 mmHg on 27/03/2018** (Green checkmark): You should have your blood pressure taken and recorded at least once a year. There are recommended targets but you should have a target that is right for you.
- Have your blood fats (cholesterol) measured. 13.0 mmol/L on 12/01/2018** (Green checkmark): You should have an annual blood test to measure your cholesterol level. Like blood glucose and blood pressure, you should have your own target that is realistic and achievable.
- Have your eyes looked at. 28/10/2010** (Red cross): You have the right to have your eyes screened for signs of retinopathy every year. Using a specialised digital camera, a photo of your eyes is taken and examined by a specialist who is looking for any changes to your retina (the seeing "part" at the back of your eye).
- Have your legs and feet checked. Active Foot Ulcer** (Red cross): The skin, circulation and nerve supply of your legs and feet should be examined annually. If there is any risk to your limbs, you should be referred to a podiatrist or a specialist foot clinic.

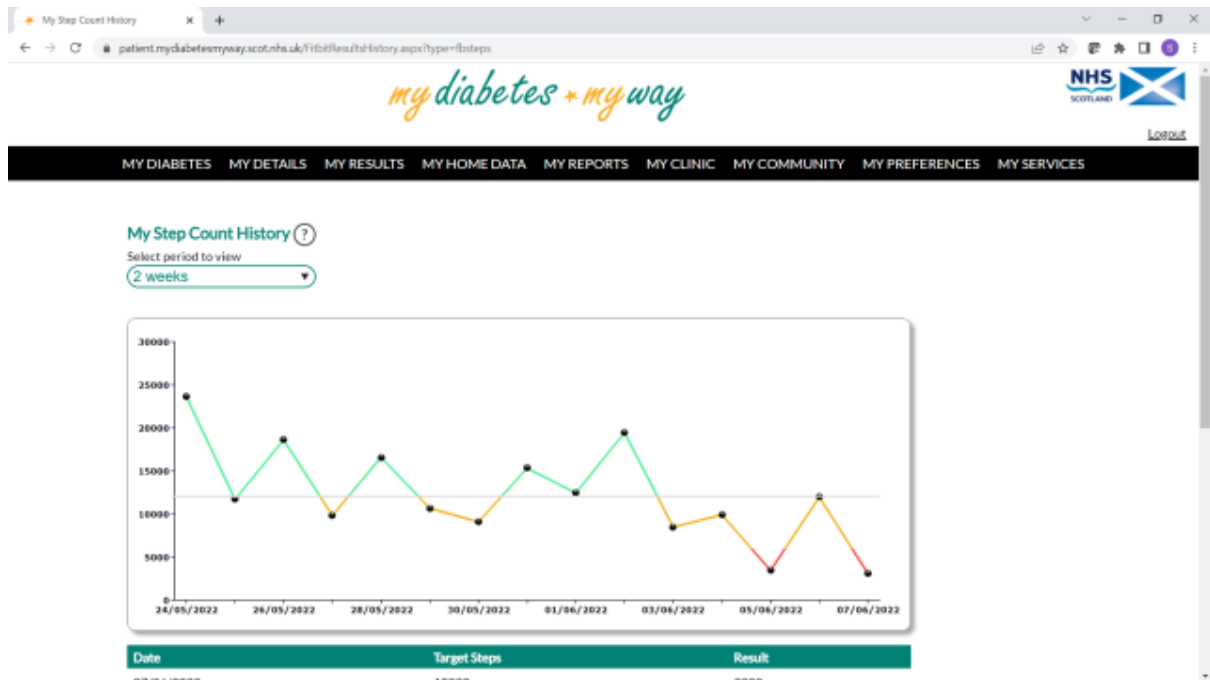
Supplementary Figure 1. Care Measures Summary: this screens reports on the latest status of key diabetes care processes, such as HbA1c and blood pressure record, foot and eye screening and access to structured education. If tests are overdue, patients are advised to follow-up with their healthcare team.



Supplementary Figure 2. Patient Goals: Users can set goals for several test results and to support smoking cessation. This example allows the setting of a goal for HbA1c.



Supplementary Figure 3. Activity Monitoring: Users can connect their activity monitors to automatically collect measurements from their home devices. These measurements currently, include step count, heart rate, sleep, floors climbed, etc.



Supplementary Figure 4. Graphs of Historical Data: Users can review their legacy clinical results and home measurements in graphs and tables. This example shows an individual's previous 2 weeks of step count data, but the same feature is available for HbA1c, blood pressure, weight, etc.

**Wellbeing Test**

This questionnaire can be used to provide information on your overall wellbeing and how you are feeling. It is important to assess this in order to ensure you are coping well with your diabetes. When you complete the test, we will give you guidance on what you can do to improve your current circumstances.

**Wellbeing Questionnaire**

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks.

Example: If you have felt cheerful and in good spirits more than half of the time during the last two weeks, then select the option "More than half of the time".

Please note that this information will not be made available to your healthcare team without your consent, so please contact them in the usual way if you have any concerns.

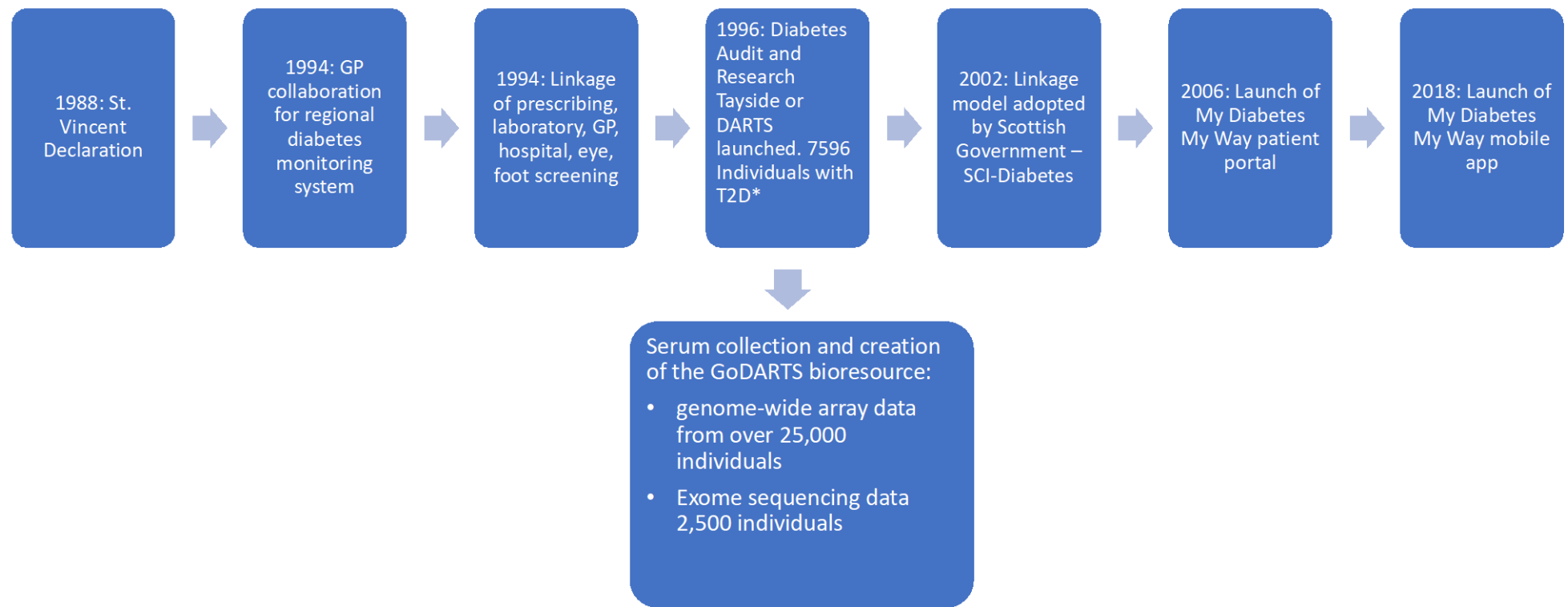
Q1: Over the last two weeks I have felt cheerful and in good spirits

- All of the time
- Most of the time
- More than half of the time
- Less than half of the time
- Some of the time
- At no time

Q2: Over the last two weeks I have felt calm and relaxed

- All of the time
- Most of the time
- More than half of the time
- Less than half of the time
- Some of the time

Supplementary Figure 5. Patient Reported Outcome Measures: Users can report information on wellbeing (WHO-5) and mental health (PHQ-9). On completion of these forms, the results are analysed to present recommended next steps to the patient based on the determined levels of wellbeing and mental health.



Supplementary Figure 6. A chronological flowchart detailing important stages in the development of this resource in Tayside