

Featured Articles

Proof of Concept Project for a Diabetes Prevention Service in Greater Manchester, United Kingdom

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OVERVIEW: Healthcare costs are on the rise in all countries around the globe, but perhaps the most concerning are those associated with the increased prevalence of long term conditions such as diabetes and hypertension. The NHS in Salford, Greater Manchester, and Hitachi have come together to discuss possible collaboration in developing new healthcare services that leverage information and communication technology (ICT) in Greater Manchester. The partnership found that improvement of the IGR Care Call Programme in Salford was a perfect opportunity, generating synergy between the academic track record and clinical expertise of the NHS, and Hitachi's experience and knowhow of delivering lifestyle change programmes leveraging ICT. IGR POC projects were conducted from September 2013 to March 2014 in order to explore and evaluate proposed improvements in delivery efficiency, patient engagement, and accessibility of the IGR Care Call Programme, and found great potential for improvement of the programme in those areas.

INTRODUCTION

HEALTHCARE costs are on the rise in all countries around the globe, but perhaps the most concerning costs are those associated with the increased prevalence of long-term conditions such as diabetes and hypertension. This is due to factors such as an ageing society and a more sedentary lifestyle contributing to the prevalence of such conditions, as well as an increase in the cost of drugs and treatment. Japan and the United Kingdom are no exceptions to this trend, and both countries are eager to address this increasing burden.

PROJECT BACKGROUND

Type 2 Diabetes is a chronic disease that is often preventable, yet causes one of the biggest burdens in healthcare today; the estimated cost of this disease in the United Kingdom ranges from £3.9 billion⁽¹⁾ to £13.8 billion⁽²⁾. In spite of differences in healthcare economy model, ethnic mix, diet, and mentality, there is much to be gained from collaboration between Japan and the United Kingdom.

There have been prominent studies that have shown that lifestyle intervention for people with Impaired Glucose Regulation (IGR)^{*1} can reduce the number who go on to develop Type 2 Diabetes by as much as

58%^{(3), (4)}. However, there are very few standardized implementations of diabetes prevention programmes that are proven to be clinically effective, highly accessible, and have evidence showing visible cost savings.

Based on an earlier successful trial of a telephone-based glucose control support service in 2005, the NHS^{*2} in Salford, Greater Manchester, has been at the forefront of developing an implementation of such a service since 2010, aimed at curbing the apparent increasing prevalence of diabetes and improving the quality of life of patients. The IGR Care Call and subsequent IGR Care Call implementation projects showed that around half of the patients succeeded in reverting back to normal glucose control as a result of a six month telephone-based intervention. Moreover, the 18-month follow-up of the patients from the first year showed that the number of people who had normal glucose control remained at around half, suggesting that the clinical outcomes and lifestyle changes were lasting. Fig. 1 shows the pathway of the original IGR Care Call Programme.

*1 Impaired Glucose Regulation includes the two conditions Impaired Glucose Tolerance (IGT) and Impaired Fasting Glycaemia (IFG) and is commonly called pre-diabetes. Patients with IGR are not able to process glucose in their blood normally, and are at high risk of developing type 2 diabetes.

*2 The National Health Service (NHS) provides publically funded healthcare services in the UK and aims to ensure that patients have equal access to these services.

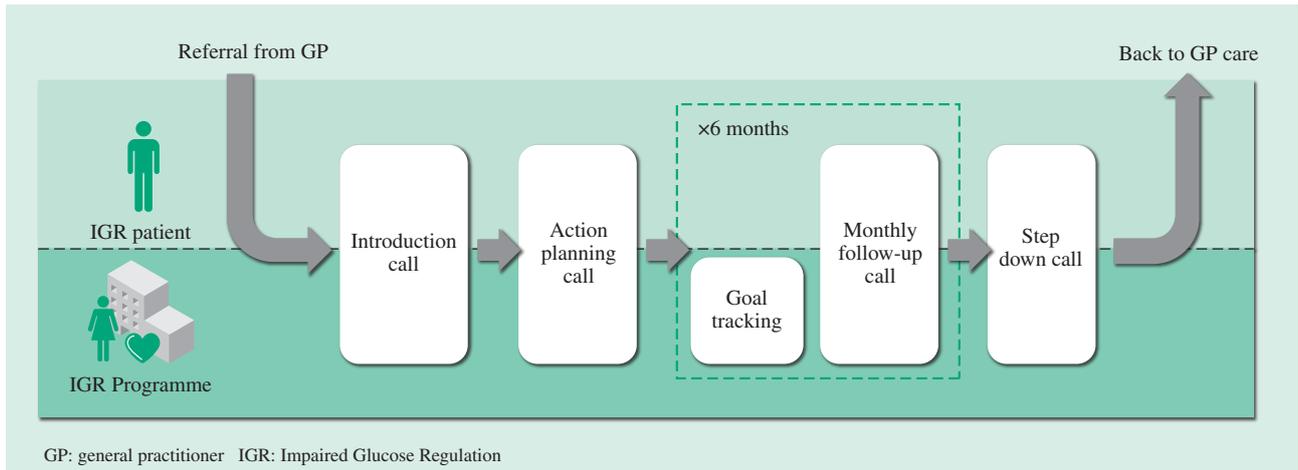


Fig. 1—IGR Care Call Pathway.
The process for the original IGR Care Call Programme in Salford is shown.

In Japan, Hitachi has an established lifestyle change programme targeted at employees of Japanese companies, including Hitachi Group companies, who have metabolic syndrome*3. Hitachi’s programme has been in commercial service since 2009, and has since helped thousands of participants improve their lifestyles. Hitachi’s programme leverages information technology (IT) and telecommunications to deliver the service efficiently at scale, as well as ensure the standard (and consistency) of quality.

Upon coming together to discuss possible collaborations in the joint development of healthcare services leveraging ICT in Greater Manchester, it was easy to see the great synergy between the academic track record and clinical expertise of the NHS, and Hitachi’s experience and knowhow of delivering lifestyle change programmes leveraging ICT in this project.

IGR POC PROJECTS

The direction for the project was to build upon the track record of the IGR Care Call Programme by leveraging the experience and knowhow from Hitachi’s programme, thus it was not merely a localization and deployment of Hitachi’s programme to the United Kingdom. Therefore, the purpose of the proof of concept (POC) projects was to evaluate concepts that could improve the delivery efficiency, patient engagement, and accessibility of the IGR Care Call Programme. The introduction of these new concepts would lead to an improved IGR Care Call

Programme, which would still be based on the proven, evidence-based care pathway.

The following concepts were to be evaluated:

Self-assessment Before Action Planning

The intervention began with a telephone call between the patient and a Diabetes Specialist Nurse (DSN), where an action plan was created based on the patient’s current lifestyle. This was the most time-consuming and expensive part of the programme, and likely to be the least scalable. The proposed concept adds a web-based Self-assessment questionnaire prior to the action planning call to save the time of the DSN in interviewing the patients to get a picture of their current lifestyles. The Self-assessment needs to be robust, but also intuitive so that useful information can be collected from patients who may have little or no clinical, nutritional, or fitness knowledge. Fig. 2 shows the prototype Self-assessment.

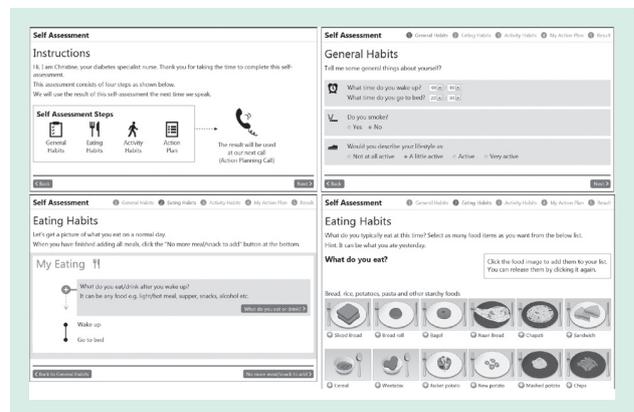


Fig. 2—The Prototype Self-assessment.
The simple, visual interface is highlighted.

*3 Metabolic syndrome is a condition which increases a person’s risk for cardiovascular diseases.

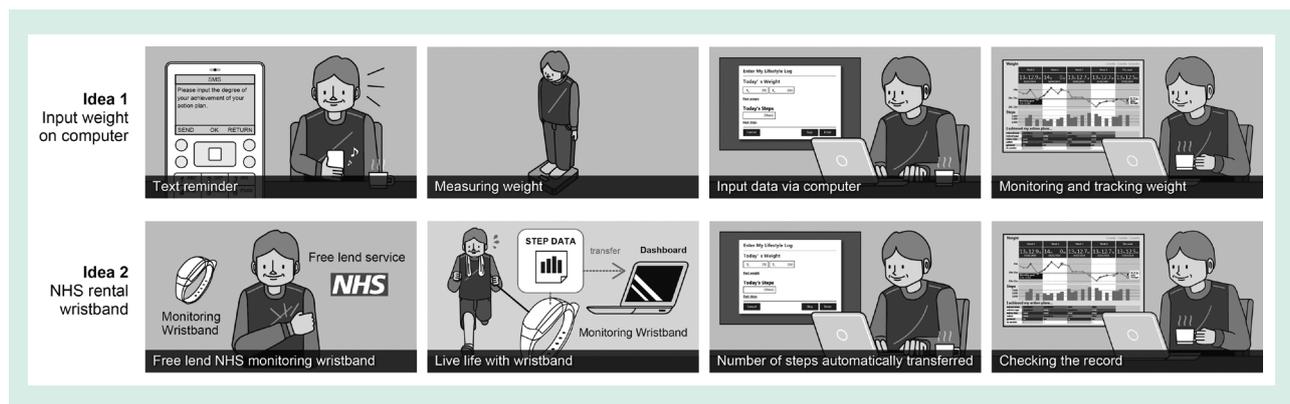


Fig. 3—Examples of Life Log Entry Scenarios. The scenarios are presented to and discussed with patients who have already undertaken the IGR Programme.

Patient Life Log and Process Tracking

Once an action plan was created, patients would try to follow it and were encouraged to record the achievement of their action plans on a provided recording sheet. Patients would then receive monthly follow up phone calls from Diabetes Health Advisors (Health Advisor) who would discuss and give feedback on progress. However, patients found it difficult to remember all the events of the month in between calls, and many did not use the recording sheet. The proposed concept adds a web-based dashboard where patients are encouraged to record not only the achievement of their action plans, but their weight, activities (number of pedometer steps), and food intake. The log will help the Health Advisors gain a better understanding of how the patients are progressing, and make the follow-up calls more productive and engaging. The web dashboard needs to be intuitive and engaging, so a system of automated encouragements based on the life log was also proposed. It should also be suitable for patients with various levels of technological literacy, from the novice Internet user to tech enthusiasts. Fig. 3 shows examples of the life log entry scenarios created for feedback and evaluation.

Health Advisor Dashboards

The action plan and progress of the patient were recorded throughout the programme as notes in the Electronic Patient Record (EPR) system at Salford Royal NHS Foundation Trust (SRFT). This system allowed the recorded information to be shared with the patient’s general practitioner (GP)^{*4} and any other healthcare professionals who needed to access

*4 General Practitioner, a primary care physician, or sometimes known as a family doctor.

it. However, the patient-generated data from the previous two concepts would require a separate system for storing and interacting with the data, given that patients are unable to insert information into the SRFT EPR. This provided an opportunity to create custom web-based dashboards for the Health Advisors, enabling them to see all the log entries by patients and therefore further streamline their workflow, and save time during follow-up calls. The dashboards need to be tailored to fit the pathway and workflow, while having a visual layout similar to the patient dashboard to facilitate smooth conversation during calls. Fig. 4 shows the prototype Health Advisor dashboard.

The above concepts were iteratively refined by creating prototypes, getting feedback from stakeholders, and improving the prototypes. The final

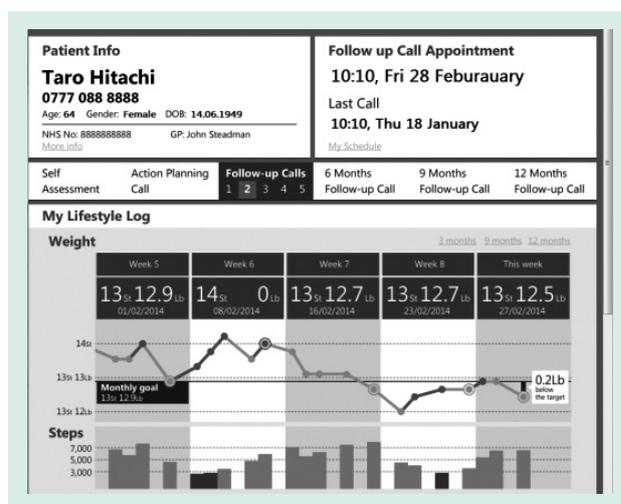


Fig. 4—The Prototype Health Advisor Dashboard. This dashboard enables Health Advisors to see all the log entries by patients and therefore furthers streamline their workflow, and saves time during follow up calls.

prototypes were evaluated by their intended users and data was collected to measure the key performance indicators (KPIs).

POC OUTCOME

Through early interviews with previous patients from the IGR Care Call Programme, we learned that although many patients owned and used smartphones and mobile devices, their primary interaction with IT was with their PCs; therefore the prototypes were designed to be used on PCs, with a user interface (UI) design that could easily be ported to mobile devices in the future.

Evaluation of the final prototype was conducted with focus groups consisting of each concept's intended users. Eight IGR patients were recruited for the Self-assessment, six recent graduates of the IGR Care Call Programme were recruited for the Patient Life Log, and three Health Advisors were recruited for the Health Advisor Dashboard evaluation. Finally, DSN staff from the Diabetes Team role-played the part of the patients in order to evaluate the Health Advisor dashboard, since recruiting from the public was not appropriate. Participants also engaged in focus groups to provide deeper insights into the proposed improvements and suggestions for future enhancements.

Efficiency improvements were apparent with the introduction of the Self-assessment, reducing the time required for the action planning call by 33%, to 40 minutes^{*5}. Patients found the Self-assessment to be intuitive, so 7 out of 8 completed the Self-assessment without technical help from staff. The confidence levels for the quality of the Self-assessment tool and the action plan created from the assessment were 8.4/10 and 8.9/10 from patients and DSNs, respectively. The visual format of the Self-assessment questionnaire and the process by which patients set their own goals and later had it confirmed by the DSNs were powerful devices in ensuring engagement and confidence in setting goals. Fig. 5 shows an example of a completed Self-assessment.

The confidence levels for patients using the Life Log dashboard were also high, ranging from 8.2 to 9.3, and all patients interviewed reported that the tracking would be motivational in achieving their action plans. There were clear preferences regarding how to input their weight and activity data, where most patients

favoured the ability to input data on the web dashboard and short message service (SMS), rather than using commercially-available smart devices such as wireless scales and activity bands, where preferences were split.

The introduction of Health Advisor dashboards also brought significant efficiency improvements, improving the time required for the follow up call by 44%, to 28 minutes. The learning curve for Health Advisors to use the prototype systems was surprisingly low; most were able to operate the screens with only a short briefing on the day of the trial. Confidence levels for the use and benefits of Health Advisor dashboards were lower, at 7.3/10 and 8.0/10, respectively. The focus group interview revealed that the Health Advisors found the dashboard improved workflow by aggregating information and was helpful as a communication platform between the patient and the Health Advisor, but identified room for improvement.

The introduction of these concepts into the IGR Care Call Programme brings minor changes to the care pathway shown in Fig. 6, while preserving the fundamental structure of the programme. It was also identified that because the patient is asked

Patient Info		Action Planning Call Appointment	
Taro Hitachi 36 years old Male		Mon 14 July	
Health Check Result			
Body weight	Body height	BMI	
14 st 2 lb	5 ft 7 in	31.1	
6 Months Goal (Change to Kg)			
Goal	2 lb per month	Target Weight	
I will reduce by 0 st 10 lb	1 lb per week	13 st 6 lb	
Eating habits action plan 🍴		Activity habits action plan 🚶	
I will reduce my cake by 1 piece at 15:00		I will walk for 10 min longer everyday	
I will reduce my chocolate by half bar at 15:00		I will garden for 30 min once a week	
I will reduce my bread by 1 slice at 07:00		I will swim for 30 min once a week	
Habits Sheet			
My eating 🍴			
Wake up			
Breakfast			
Sliced Bread	Milk	Coffee	
Lunch			
Pizza	Chicken	Tea	

Fig. 5—Example of a Completed Self-assessment.

Web-based Self-assessment questionnaire of lifestyle prior to the action planning call saves the time in interviewing the patients.

*5 This includes the time for preparing for the call, the actual call, and administrative tasks following the call.

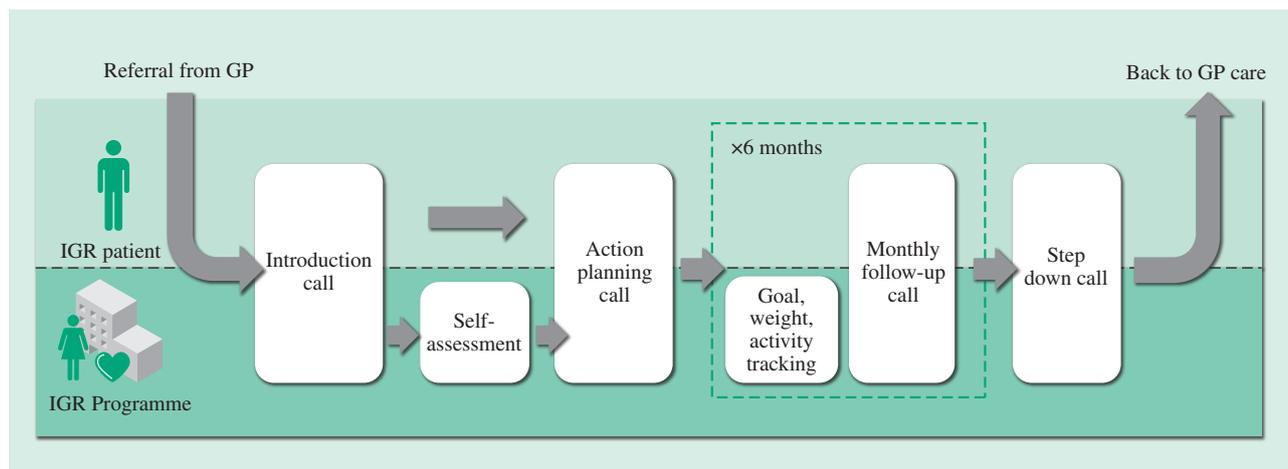


Fig. 6—New IGR Care Call Pathway.

The new pathway incorporates the Self-assessment step and changes to the patient life log.

to complete the Self-assessment before the first contact with a DSN, the patient needs to have proper understanding of IGR and the aim of this intervention. It is recommended that this should be appropriately explained at the time of diagnosis and referral by the primary care health professional.

NEXT STEPS

The POC projects provided insight into the feasibility of the concepts, and deepened our understanding of the IGR Care Call Programme, including its challenges. One of the most prominent challenges faced is the process of recruiting and entry into the programme. Evidence from previous IGR Care Call projects and Hitachi's programme both suggest that a motivated patient who enters the programme with a good understanding of IGR and the importance of making a lifestyle change would perform significantly better in the programme than someone who enters without it. This issue is being explored in the next phase of collaboration between Hitachi and the NHS, where we explore what can be done at the time of diagnosis and referral to improve patient readiness.

While we continue to investigate ways to improve the service, work has already begun to develop the concepts into real world ready systems to be deployed for a field trial of the "new" IGR Care Call service. Meanwhile, the IGR Care Call Programme has now been officially commissioned by NHS Salford Clinical Commissioning Group (CCG), thus becoming one of the first programmes to move out of development, and into a fully commissioned service. Hitachi will also continue to work with the NHS to investigate the

long-term economic effect of this programme, to arm ourselves with the evidence to spread the IGR Care Call Programme to the rest of the world.

REFERENCES

- (1) A. Morse, The management of adult diabetes services in the NHS, National Audit Office, London (2012).
- (2) P. Kanavos, S. van den Aardweg, W. Schurer, "Diabetes expenditure, burden of disease and management in 5 EU countries," LSE Health London School of Economics (2012).
- (3) W. C. Knowler et al., "10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study," *Lancet*, pp. 1677–1686 (2009).
- (4) J. Lindström et al., "The Finnish Diabetes Prevention Study," *Diabetes Care*, pp. 3231–3236 (2003).

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