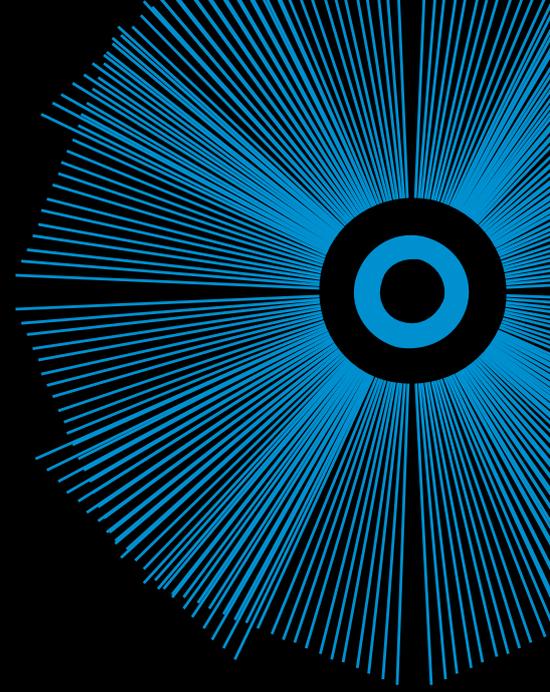




Shine



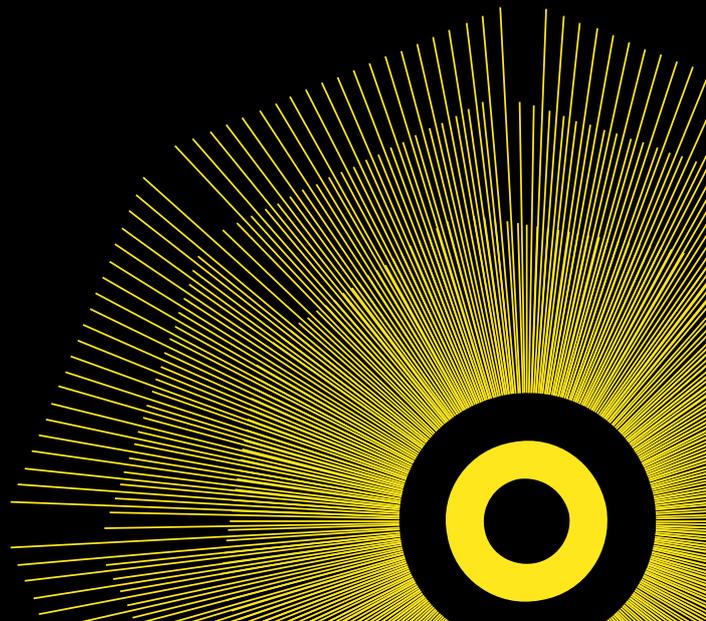
Shine 2014 final report

Virtual Clinic follow up of Joint
Replacement Patients

Royal Cornwall Hospital Trust

September 2015

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Part 1: Abstract

Project title: Virtual Clinic follow up of Joint Replacement Patients

Lead organisation: Royal Cornwall Hospital Trust

Partner organisation: Kernow Clinical Commissioning Group

Lead Clinician: Dan Williams

Abstract

The Royal Cornwall Hospital has designed and implemented a virtual clinic service to follow up hip and knee joint replacement patients in line with national guidelines. Headline numbers from the first year reveal:

- 300 patients followed up in a virtual clinic;
- 520 additional patients choosing the new service for future follow up;
- 0% DNA rate;
- High levels of satisfaction; patients finding it effective, quick and easy but missing the personal interaction;
- All survey respondents reported having an x-ray at a location of their choice; 79% saved money, 70% saved time;
- Significant potential to increase use: only 21% of slots were filled,
- Varied use by surgical teams; 6 to 54% of slots were filled;
- A potential productivity gain converting 2 face-to-face appointments to 5 virtual clinic appointments.

Hip and knee joint replacements are successful operations that are performed in increasing numbers; over 160,000 patients underwent hip or knee joint replacement in the UK last year. National guidelines recommend follow up of each patient with a joint replacement at one, seven and every subsequent three years following surgery. Traditionally carried out via a face-to-face appointment with the surgical team checking a set of questions and an x-ray, it costs £50 million to follow up one year of hip replacement patients.¹

We know that between 90% and 95% of patients are doing well at the 10-year point, so most patients are brought back to clinic just to report that they're doing okay. That said, as with a lot of chronic conditions in medicine, it's vitally important to pick up the occasional problem—the joint replacement that needs further treatment before it fails, occasionally catastrophically so. The orthopaedic team at the Royal Cornwall Hospitals Trust aimed to improve the efficiency of this high volume system using web based technology to collect patient reported outcomes and digital x-ray reports, without compromising quality and patient acceptability. We anticipated that the virtual follow up service would be cheaper for the health service and the patients.

Cornwall has two main hospitals and, like many areas of the country, a network of community clinics with x-ray facilities closer to the communities they serve. So it's been possible to view electronic x-ray films across the network for some time, but only recently

that patient symptoms, such as pain and function, can be viewed remotely in a meaningful way. Patient reported outcome measures, or PROMs are the online tool of choice for this. PROMs are short sets of questions developed and validated during clinical research. Patients register with a web-based system - MyClinicalOutcomes in Cornwall - with the help of a friend or family member if necessary, and complete either a hip or knee PROM, a general well being PROM and an activity PROM.² Choosing to share their health information allows the clinical team to track their progress before and after treatment and into the long term.

Evidence from the three month and ten month patient survey suggest that the virtual clinic follow up service was thought to be equivalent to a face-to-face service with patients generally finding it effective, quick and easy but missing the personal interaction; the results of an in depth qualitative study confirm these findings.

Timely engagement of patients remains a challenge and requires more administrative input than expected. Keeping a central administrator in place has been key. The first patients who chose virtual clinic follow up at operation are beginning to come back to be followed up at one-year. A 'virtual clinic pending list' has been important in introducing patients to the service and keeping track of them; further work, informed by a DH Behavioural Insights workshop, is required to keep these patients engaged. Achieving buy-in from all surgical teams and getting agreement to apply a standard approach to patient follow-up, despite clear national guidelines, has been and remains an on-going challenge. Commissioner commitment via a £216,000 CQUIN will sustain the change into the next financial year.

Part 2: Quality impact: outcomes

We went live with the first surgeon in October 2014 (Table 2b) following a delay in recruitment and training of key individuals. Clinical imaging supported remote booking of x-rays taken closer to patients' homes and outside of the central hospital; a key aim for the organisation, separate to this project. Distinct clinic codes were set up to capture virtual clinic activity. A preliminary survey captured early patient views and a full qualitative appraisal of the project towards the end captured patient, clinician, managerial and commissioner views of virtual clinics.

Patient information was tested, the plan presented to thirty general practitioners and the process of patient contact, x-ray booking and engagement with MyClinicalOutcomes further refined after the first 40 patients were seen. Two changes were made at that point:

1. **Knee replacement** patients were included earlier than planned; and
2. **The virtual pending list** was implemented to enable patients to choose future virtual clinic follow up, at the time of operation or from a face-to-face appointment.

The intention to study compliance with national guidelines as our primary data was, in reality, too complex at this stage of implementation. The ten surgeons saw a total of 2,145 new patients and 5,522 follow up patients over the 11-month project (Table 1). Each surgical team sees a variety of patient problems alongside hip and knee replacement patients (Table 1). While virtual clinic appointments were coded for separately, it was not possible to separately code routine hip and knee replacement patients from patients with other problems attending the face-to-face clinics. Thus, in reality, further work is required to elucidate the effect of virtual clinics on our compliance with national guidelines.

Surgical team	Surgical sub-specialty	New patients seen, n	Follow up patients seen, n
DW	Primary and revision hip & knee replacement	224	571
GB	Young adult hip & primary and revision hip replacement	224	603
RH	Paediatric surgery & primary hip replacement	224	722
SS	Primary and revision hip & knee replacement	224	453
MD	Primary hip & knee replacement	130	296
PE	Primary hip & knee replacement	224	288
JM	Soft tissue and primary and revision knee replacement	224	624
MR	Soft tissue and primary and revision knee replacement	224	780

RK	Soft tissue and primary and revision knee replacement	223	368
MN	Young adult hip & primary and revision hip replacement	224	817
Total		2,145	5,522

Table 1. Subspecialty interest of the ten surgical teams performing hip and knee replacement surgery and the number of new and follow up patients seen in clinic throughout the 11 month project

The primary data therefore evolved to measure the number of patients seen in clinic and booked onto the virtual pending list under each surgical team. Over the first 11 months, the results show 300 patients were seen in or booked onto a virtual clinic (with complete data); a further 520 patients chose virtual follow up in the future (Table 2). Ten out of 11 joint replacement surgeons took part, with the eleventh surgeon subsequently retiring. This good engagement on the face of it hides quite varied rates of participation (Table 2a & 2b). The number of patients choosing future virtual clinic follow up ranged between 22 and 148 patients among the clinical teams (Table 2a) and usage of virtual clinic capacity varied between 6% and 54% (Table 2b).

Surgical team	Patients seen / booked, n	Future patients on pending list, n
DW	100	148
GB	38	43
RH	15	107
SS	34	41
MD	16	30
PE	10	38
JM	14	17
MR	29	39
RK	9	22
MN	35	35
Total	300	520

Table 2a. Number of patients booked into and choosing future (pending list) virtual clinic follow up

Surgical team	Start date	No. clinics	No. clinics minus leave	Available virtual slots	Patients seen	Virtual capacity usage
DW	Oct-14	35	30	150	81	54%
GB	Nov-14	41	32	160	32	20%
RH	Feb-15	26	21	105	12	11%
SS	Jan-15	52	31	155	26	17%
MD	Mar-15	26	18	90	14	16%
PE	Apr-15	11	8	40	6	15%
JM	Feb-15	27	18	90	10	11%
MR	Mar-15	32	20	100	23	23%
RK	Feb-15	31	19	95	6	6%
MN	Dec-14	48	34	170	29	17%
Total		329	231	1155	239	21%

Table 2b. Virtual clinic usage per surgical team

Each one of the 300 patients seen or booked into a virtual clinic potentially frees up a face-to-face clinic slot. The required clinical and x-ray information is collected before the virtual clinic and there was effectively a zero 'Did Not Attend' (DNA) rate; compared to a DNA rate of 6.6% for face-to-face appointments (Table 3); an important consequence secondary to the design of the new pathway.

	Face-to-face	Virtual
Follow up	5522	300
Did not attend	342 (6.2%)	0

Table 3. The Did Not Attend (DNA) rate for face-to-face and virtual follow up

The x-ray film data and PROMs data reviewed in clinic was of appropriate quality to make a decision and issue a report back to the patient and their GP in all cases. Of note as an important part of the virtual clinic project there are now a total of 1,772 hip and knee patients from Cornwall using the web based PROMs service, recording 22,505 scores and 139,992 unique responses on MyClinicalOutcomes. While analysis of this data is beyond the scope of this project, no doubt this growing and powerful dataset will inform treatment decisions at a patient, surgical team and commissioner level in the future.

A patient survey was circulated to the first 80 patients at the start of 2015, three months into the project; 29 (36%) responses were returned. This early data showed nine different hospitals were used for x-ray and 28 out of the 29 responders took less than 20 minutes to complete the online PROM score. 61% of patients found the new service much easier or easier; 7% found it harder or much harder. The full results and feedback from this survey led a review of our patient leaflet and letter.

Patients who used the virtual clinic between February and June 2015 were invited to complete a second online questionnaire about their experience (n=113) via SurveyMonkey; 46 (41%) completed this survey. Most people (91%) felt that ease of appointment set up was either very good or good. Nobody was unhappy with the way the change from a face-to-face appointment to the virtual clinic pathway was managed. Two people felt that the information was not easy to understand, in particular, one respondent replied,

“the technicalities involved were difficult to understand unless I had some medical knowledge. Needed to look up some details to clarify”

All of the respondents reported having an x-ray at a location of their choice; of which 100% reported the date as convenient and 98% the time convenient. 70% of people found the virtual clinic pathway easier than attending a face to face appointment, 9% found it much harder and 20% didn't rate it either easier or harder. 70% of people took less than ten minutes to complete the online assessment and the rest (30%) completed it within twenty minutes. All of the users rated the clarity of the instructions to access the virtual clinic as acceptable with 90% rating it as good or very good and all users were able to use it on their current computer and/or browser. 98% of users were happy with the look of the website however, one person disliked it. Overall 71% of people received either a report, email or clinic letter about their results. One respondent particularly noted,

“Very clear and helpful letter”

The clarity of the follow-up report was rated as acceptable by 95% of respondents, with 68% rating it as good or higher. 29% of patients, however, stated that they did not receive any form of feedback, either a report or clinic letter, from the consultant, upon completion of their scores and x-ray appointment.

Financially 40% of people saved travel costs, 22% saved on parking fees and 13% made no savings. Of the people who identified savings, 79% made a cost saving of up to £10, with 21% saving between £10 and £100. The majority (70%) of patients perceived that the virtual clinic pathway saved them time, 12% felt that they didn't make a saving and 18% didn't know.

79% perceived the care that they received was either very good or good. The majority of these people did not give reasons for why they chose this rating however one person did express that they found the process

“easy to follow and no concerns”

However, another patient, who rated the process as very good did state that they,

“missed the personal - face to face – appointment”

implying that the personal interaction between the consultant and the patient is important component of 'care' and the traditional appointment that they missed. One patient (2%) felt that the care delivered was bad but did not give a reason. When asked to compare the care received via the virtual clinic pathway with a face to face appointment with a consultant, 58%

didn't express an opinion either way, 21% of people rated this as worse or much worse and 21% rated it as better suggesting that preference for a face to face appointment is multi-factorial, potentially dependent on past experience to care and personal circumstances. Interestingly, only 9% of patients felt that their joint replacement surgery was being followed up ineffectively; so care and effectiveness are potentially being seen as individual components.

The majority of people felt that the care was acceptable and functional but 33% of patients missed the personal interaction that a face-to-face appointment would provide. Despite this finding, only 12% of people wouldn't have a virtual clinic appointment instead of a face-to-face appointment in the future.

Part 3: Cost impact

The project anticipated following up between 1,000 and 1,200 patients per annum as virtual appointments. A cost reduction from the conversion of 2 face-to-face to 5 virtual clinic follow-up appointments will be possible with more patients followed up in the same amount of time; decreasing the cost of each appointment. Thus for every 100 patients converted to virtual clinic we anticipate providing 150 additional patients seen using the same resources and time; 250 patients in all or a 250% productivity gain in the future.

While this remains our long-term aim, conversion of existing face-to-face appointments to virtual clinics has not materialised in the anticipated volume for the following reasons:

- Existing legacy systems constrain conversion of outpatient slots between face-to-face and virtual clinics;
- Converting patients from pre-existing face-to-face pathway from follow-up to virtual follow up is challenging;
- Surgical consultant buy-in to virtual follow up via a standard pathway remains variable;
- Demands of operational delivery limits ability to drive change;
- Virtual clinic process requires further streamlining.

Year on year numbers should grow as virtual clinic follow up becomes standardised across the department and becomes the new normal for our patients (Table 4). However, with uptake across surgical teams varying considerably it has been difficult to calculate true costs and any gain in productivity.

	2015	2016	2017	2018	2019	2020
DW	100	40	19	21	5	33
GB	38	20	15	4	2	1
RH	15	58	29	3	0	0
SS	34	13	20	6	0	2
MD	16	11	6	10	0	2
PE	10	29	6	2	0	0
JM	14	0	13	0	2	2
MR	29	13	8	16	0	1
RK	9	13	6	1	0	1
MN	35	23	3	0	3	1
Total	300	220	125	63	12	43

Table 4: Number of patients booked into virtual clinics per annum by the end of the project

The main financial benefit demonstrable to date is the additional income gained by the Trust through the increase in follow-up throughput at no extra cost (see Table 5). Currently the virtual clinic follow-up attracts the same tariff (£76 per patient) as a face-to-face follow-up appointment. The intention being for this tariff to be negotiated to a lower value during the 2015 / 2016 financial year at which point productivity gain will define on-going success or

otherwise. Meanwhile, the project has been supported in the financial year 2015 / 2016 by a Commissioning for Quality and Innovation (CQUIN) target agreed to a value of approximately £216,000.

Virtual clinic patients seen	300
Face-to-face equivalent capacity	120
Additional income gained	£13,680

Table 5: Additional income gained by the trust

In addition, the virtual clinic eliminates DNAs and, whilst the consequent cost saving has been minimal this year given the number of patients seen to date (avoidance of 6.2% DNA rate of 300 patients equates to £1,413 additional income), avoiding an average DNA rate and loss of income of 6.2% will be positively reflected in income longer term.

The patient survey indicates that patients made savings. Financially 40% of people saved travel costs, 22% saved on parking fees and 13% made no savings. Of the people who identified savings, 79% made a cost saving of up to £10, with 21% saving between £10 and £100.

An economic impact analysis is planned in time for the end of financial year CQUIN report. This report will evaluate the opportunity costs of the virtual follow-up clinic from the healthcare provider perspective. Based on the project records of PROMs outcomes, individual patients' resource use and the economic costs of virtual and face-to-face follow-up visits, the economic analysis will model the cost-effectiveness of a typical patient being followed up virtually instead of face-to-face.

A separate analysis will explore the financial impact on providers and the NHS of the virtual follow-up as a function of the rate of adoption of the virtual clinic. Combining aggregate data from the HSCIC on the volume of outpatient appointments and attendances with the share of follow-up appointments and our estimated economic and financial costs we will estimate the percentage increase in the number of attended outpatient appointments per year associated with a 10% percentage point increase in patients' uptake of the virtual follow-ups.

Part 4: Learning from your project

Our aims were to create a better, easier to use, more efficient and comprehensive follow up system for our joint replacement patients. We want to better target our limited face-to-face clinic capacity to those patients who need it most. The virtual follow up service aims to be cheaper for the health service and for the patients.

We envisaged virtual follow up of between 1,000 and 1,200 patients during the first year of the programme. While we have had a somewhat successful start towards achieving this - seeing over 300 patients in a virtual clinic with a further 520 patients choosing virtual clinic follow up in the future - we fell short of our target. We will discuss the key enablers in converting that number of appointments and the reasons why our numbers fell short of plan.

The Enablers

A. Project administrator

Working four days a week, the project administrator was the key role. Initially planned as a short-term position, it became clear that the role was required on an on-going basis throughout the first year. When buy-in across the department improves, the day-to-day administration will move to the individual surgical team secretaries. The administrator role, meanwhile, has the following key responsibilities:

1. **Administration** of patient letters, booking x-ray films local to the patient, ensuring x-ray film and online PROM score are complete before co-ordinating each virtual clinic with the surgical team;
2. **Single point of contact** for all patient queries in addition to the technical support available via the web-based platform;
3. **Registering and training** individual surgical teams: consultants initially, and the junior members of the department as they rotate through each six month post.

B. Virtual pending list

Developed early on, the pending list enabled us to keep track of patients choosing virtual over face-to-face follow up. Engaging with patients early gave them time to register on the web-based platform, with the help of a close friend or family member if necessary, to track their progress for a period before and in time for their virtual clinic appointment.

C. Patient satisfaction

Patient satisfaction was high among those using the service, with an acceptance of the need to change the follow up service among those patients questioned. Technology is seen as a route to improve practice among more of this elderly group of patients than was first thought.

D. CQUIN

A CQUIN of £216,000 will be paid if virtual clinic follow up successfully carries into the 2015 / 2016 financial year. There has been a clear recognition from the commissioners in Cornwall that hip and knee replacement surveillance should follow national guidelines and that the virtual clinic pathway has the potential to do this cost-effectively.

E. The Behavioural Insights (BI) workshop

This took up one morning late in the project, led by a member of the Department of Health BI team. The workshop was attended by not just the core members of the team, but also representatives external to the hospital trust from the commissioning group, and internally from research, communications and innovation. While we were in contact with each of these groups throughout the project, having everyone in the same room energised everyone there. Hearing about and discussing a subject, behavioural insights, not directly related to everyday healthcare, grabbed everyone's attention. There has been a step change in the project since the meeting and we wish we had done it sooner.

The Challenges

Our estimated forecast to see 1,000-1,200 patients in the first year was based on the need to follow up around 1,200 hip and knee patients operated on each year. Given the mean implant lifespan of a hip replacement is 16 years¹ we modelled a requirement of 5-6,000 outpatient appointments per year and estimated that 20% could be converted to virtual clinic appointments. In terms of outpatient capacity, each surgeon averages one clinic per week with 5 virtual clinic appointments converted from 2 face-to-face appointments. Forty clinics per year would enable each of our eleven joint replacement surgeons to see 200 virtual clinic patients, i.e. a total of 2,200 virtual clinic appointments per year. Given the staged inclusion of hip followed by knee replacement patients, and anticipated variable buy in, the 1,000-1,200 patients target was thought reasonable.

A. Discharged patients

A cautious approach to bringing previously discharged patients into the system and back within national guidelines partly led to virtual clinic capacity being under-utilised. We acknowledge that, as the programme matures, we need a better understanding of how well we are following up the 10,000 joint replacement patients that we have operated on over the last 10 years.

B. Clinician engagement

Engagement has been varied. One surgeon did not take part and surgeons other than the lead clinician on the project saw a range of 9 to 38 patients. This variable uptake needs better understanding and discussions are underway with the Trust's eHealth support team to provide a rolling training programme.

C. A non-operational project lead

A non-operational project manager as lead would have had more time to dedicate to the project. Our operational manager had the best understanding of our service but everyday operational demands often took priority. Additional operational managerial support to free up the project manager did not materialize until right at the end of the project.

D. Organisational culture as a barrier to innovation.

Operational pressures are such that parts of the health service are too busy to introduce changes to improve efficiency (Figure 1).

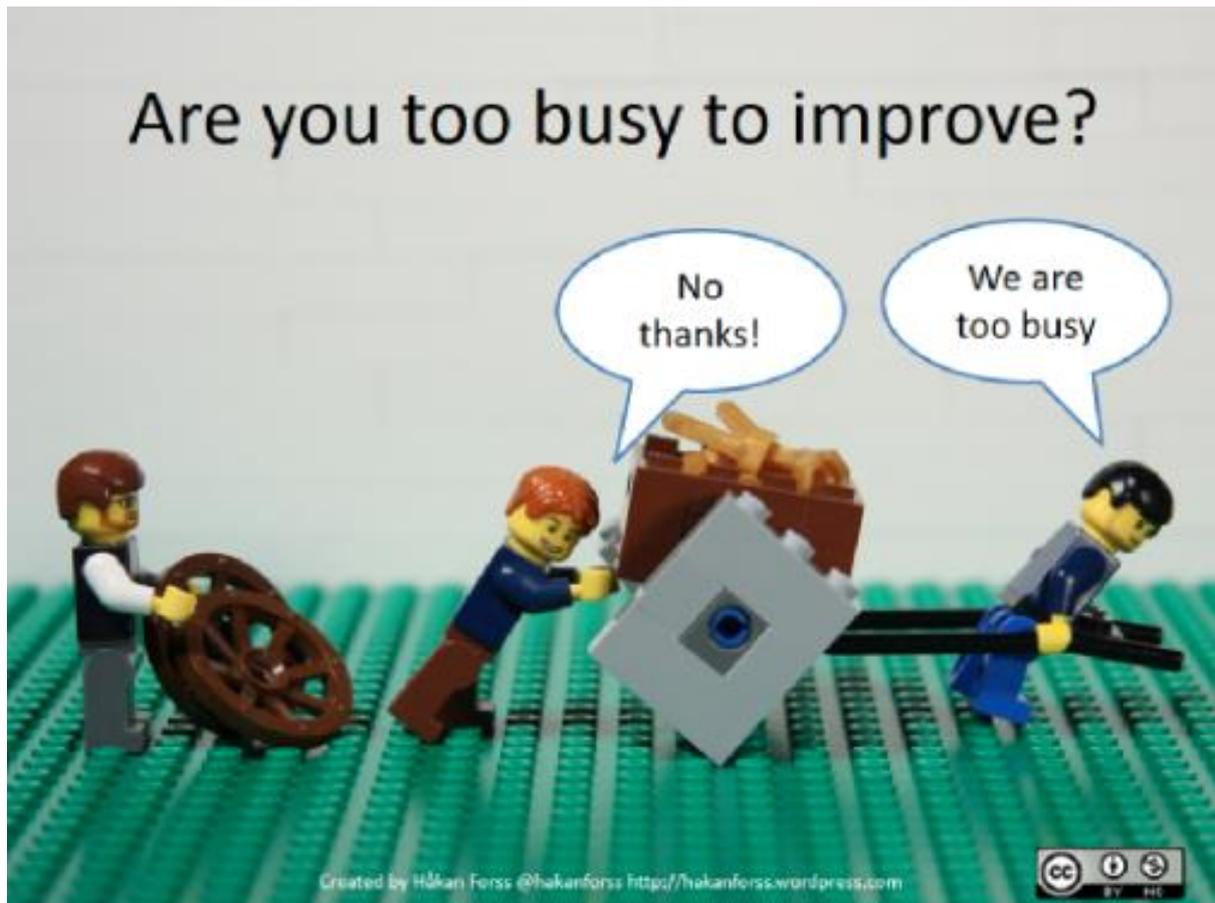


Figure 1

An inconsistent senior leadership group has amplified this at Royal Cornwall Hospital Trust; three different chief executive officers covered the period of this project and one executive lead associated with the project left the organisation. The focus of staff at all levels under these circumstances is often on surviving day-to-day operational challenges rather than embracing innovation to improve the service and make life easier for staff and the service better for patients.

With a stable leadership in place and an improving culture, and with Health Foundation understanding and flexibility, we have re-assigned our Shine underspend. This includes additional project manager support for the project that will allow us to draw together all of the pieces of work and learning from our project.

The lessons flow from the points we have made here, for example:

- a) Select the right team;
- b) Really involve the commissioners early; and
- c) Get everyone involved in the same room as early as possible.

Less obvious, we would also add a desire to better explore ways for patients to drive the change. The patient response in both surveys was surprisingly positive and ran counter to many of the organisational and clinical concerns we and others had. The CQUIN will carry

the project from the point at which the Health Foundation funding finishes; and Health Foundation flexibility has enabled us to utilise our underspend to bridge the gap. We remain only too aware of the significant amount of work that remains outstanding to ensure that virtual clinics continue to work and provide good value for our patients.

Part 5: Plans for sustainability and spread

A key focus of the Shine project for our team was securing a CQUIN payment against virtual clinic follow up. Payment of this £216,000 (50% of £431,479.60) sum is both dependent upon successful progress into the 2015 / 2016 financial year and should ensure that the programme continues. Cornwall is served by a single clinical commissioning group, Kernow CCG, the leaders of which have been supportive in the long run up and roll out of the virtual clinic project. Health Foundation financial and consultancy support, and support in terms of credibility, combined with this CQUIN incentive will carry the project beyond the end of its first year, and more importantly through into the following financial year. From an organisational perspective we are therefore as confident as we can be that the intervention is a sustainable one.

At a clinical level, however, there is still work to do; engagement of and with individual surgical teams remains variable, with under-utilised virtual clinic capacity.

We have recently hired a project manager; following permission to reallocate the budget underspend. This role will bridge the period between the end of the Shine project and the end of year CQUIN report aiming to:

1. Improve surgical team engagement;
2. Implement suggestions from the behavioural insights workshop; and
3. Explore how best to manage the follow up of previously discharged patients.

To do this the role will draw together eight pieces of work:

1. Standardised pathway

Integration and harmonisation of the virtual clinic pathway with the commissioner referral pathway from and back to general practice (see link to current [hip](#) and [knee](#) referral guidelines). An opportunity to bring primary and secondary care closer together.

2. RCHT website

A re-launch is in the process; we plan to include clinician and patient virtual clinic pages, information and the embedded patient video.

3. Virtual pending list

Build on learning from the behavioural insights workshop to improve efficiency of and communication between patients on the virtual pending list. Liaison with DH behavioural insight team and iteration / measurement of improvement will be important.

4. Cost impact

A more detailed independent analysis to delineate costs and communicate what is possible on cost. Aim to achieve a process map with external input from Ruben Mujica Mota, Senior Lecturer in Health Economics at Exeter University.

5. Training package

RCHT IT eHealth support are costing a training package to support consultant and

secretarial teams, together with a rolling programme to cover training of rotating junior medical staff.

6. BBC Spotlight

Remain interested in production of a local news segment.

7. National PROMs Programme integration

This would enable use of pre-assessment resource and provide live visibility of our PROMs before submission to the Information Centre.

8. Paper submission

Major British, European and US Orthopaedic conferences to report progress to a wider audience.

Appendix 1: Resources from the project

1. **Virtual clinic pathway:** see attached 'Pathway' document to be harmonised with existing online GP pathway; see link to current [hip](#) and [knee](#) referral guidelines

2. **Leaflet:** see attached

3. **Qualitative report:** An Evaluation of Service Users and Providers Views and Experience of the Virtual Clinic Pathway for Orthopaedic Joint Replacement Follow-Up Appointments; see attached

4. **Project poster:** to follow for Showcase event

5. **Presentations to date:**

1. Roberts N, Mujica-Mota R, Williams D
The cost of improving hip replacement follow-up in the UK
 - **British Orthopaedic Association Congress, Liverpool, 15-17 September 2015 (podium)**

2. Roberts N, Bradley, Williams D
Adding a reminder Short Message Service (SMS) before and Tablet Computer during clinic improves electronic Patient Reported Outcome Measures (ePROMs) collection
 - **International Society of Pharmacokinetics and Outcomes Research, Dublin 2-6 November 2013 (poster)**
www.ispor.org/research_pdfs/45/pdf/PIH42.pdf
 - **British Hip Society, Exeter 5-7 March 2014 (poster)**
 - South West Orthopaedic Club, Bath 17 January 2013

3. Griffiths-Jones W, Norton M, Fern ED, Williams DH
The equivalence of remote electronic and paper collection of Patient Reported Outcome Measures
 - **European Federation of Orthopaedics and Traumatology, Istanbul, 5-8 June 2013 (podium)**
 - **British Orthopaedic Association Congress, Birmingham, 1-4 October 2013 (poster)**
 - **Medicine 2.0 World Congress, London, 23-24 September 2013 (podium)**
www.medicine20congress.com/ocs/index.php/med/med2013/paper/view/1725
 - **International Society of Pharmacokinetics and Outcomes Research, Berlin 5-7 November 2012 (poster)**
www.ispor.org/research_pdfs/42/pdf/PSU24.pdf
 - **BMJ Evidence Live, University of Oxford, 25 March 2013 (poster)**
www.evidencelive.org/posters/2013/equivalence-of-remote-electronic-and-paper-collection-of-patient-reported-outcome-measu
 - South West Orthopaedic Club, Truro, 9 November 2012 (poster)

6. Publications and reference list

1. Roberts N, Mujica-Mota R, Williams D
The cost of improving hip replacement follow-up in the UK. Musculoskeletal Care, August 2015 [see [link](#)]
2. Dexter C, Bradley B, Williams DH
Online follow-up after total hip replacement: a first case
British Medical Journal Case Reports, January 2013 [see [link](#)]
3. Roberts N, Bradley, Williams D
Adding a reminder Short Message Service (SMS) before and Tablet Computer during clinic improves electronic Patient Reported Outcome Measures (ePROMs) collection
Annals of the Royal College of Surgeons of England, July 2014:96(5):348-351(4)
[see [link](#)]
4. Griffiths-Jones W, Norton M, Fern ED, Williams DH
The equivalence of remote electronic and paper collection of Patient Reported Outcome Measures (PROMs): a crossover trial. Journal of Arthroplasty, November 2014, 29(11), 2136-2139 [see [link](#)]

7. **Health Foundation Blog:** see [link](#)

8. **How-to Manual:** in progress

Appendix 2: Real-time web-based PROMs

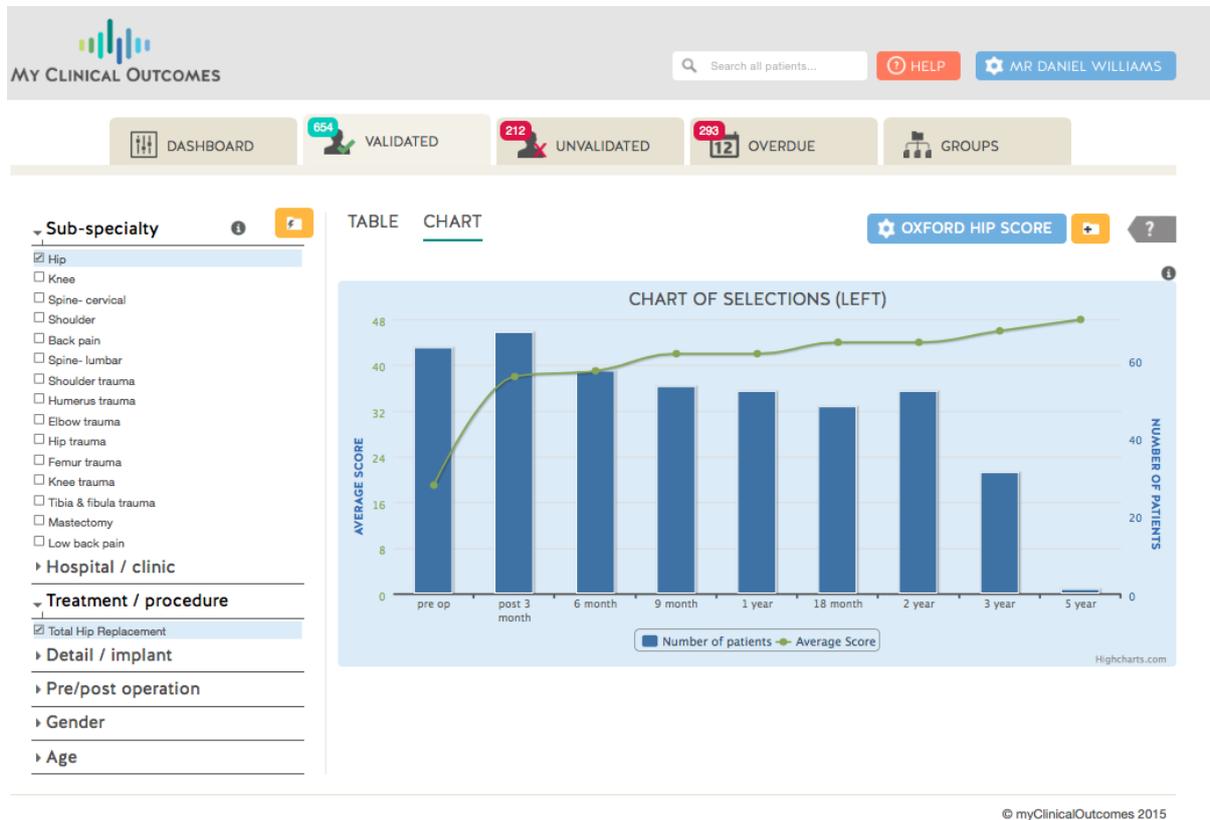


Figure 2: web based PROMs, the surgeon dashboard