The effectiveness and impact of patient-controlled records:
A report on Patients Know Best

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Abstract

Digitally enabling patients is a primary theme to many organisational and governmental initiatives. Central to these are patient access and interaction with their health records. Patients Know Best (PKB) is the world's first patient-controlled system. It is the most widely used system giving patients control over sharing for their clinical record.

This paper explores the impact and effectiveness of this approach and highlights that adoption is superior (up to 97% vs 20%) when professionals and patients collaborate around a central record. Online communication is one of the most widely used features (92% of users and 140,000 message sent via PKB); clinical outcomes are improved and cost-savings indicate that for every £1 spent on PKB returns £3 in cost-savings from research conducted at Luton and Dunstable NHS Foundation Trust (Johnson, Lithgo and Price, 2013). It is suggested that just at a primary care level, over 13.6m extra GP appointments could be offered by implementing technology solutions like PKB, and provide significant cost-savings in reducing waiting times and non-attendances (NHS England, 2014).

Over the last 5 years there has been a surge in interest around personal health records (PHRs), citizen-owned data and the sharing of information between professionals, patients and carers. It is now central to many government's key healthcare policies, including the National Health Service in England. The Five Year Forward View, NHS England (2014), sets out an ambitious target that all citizens should be able to access their medical information and be informed by this data, leading to improved self-management and a range of online health services that ultimately helps reduce the shortfall in NHS funding.

However, many of these initiatives have led to separate digital programmes, such as:
- integrated digital care records (IDCRs)
- interoperability projects using data sharing functionality, such as Health Information Exchanges (HIEs)
- patient portals and GP Access to records

None of these focus on patient ownership and sharing of their health and wellbeing data. This fragmented approach has resulted in citizen led approaches being delivered at the end of a digital roadmap, rather than leading the transformation programme. It has also seen the reporting of mixed results around the adoption and usefulness of these approaches (Royal College of Physicians, 2016).

This paper aims to explore the impact of these fragmented approaches (Figure 1) in comparison to a fully integrated patient-controlled and citizen-led approach. In doing so, we define citizen-led in the following way:

	Health Information Exchange (HIE)	Patient Portal	Shared Care Record (IDCR)	Personal Health Record (PHR)	Patient-controlled electronic health record
Secure (e.g. behind N3 network)	✓	✓	✓	✗	✓
Not tied to an organisation	✗	✗	✗	✓	✓
Independent (works without need for other systems, e.g. EPR)	✓	✗	✓	✓	✓
Works across borders	✗	✗	✗	✓	✓
Structured and coded data	✓	✓	✗	✗	✓
Clinical integrations and medical data	✓	✓	✓	✗	✓
Patient generated data	✗	✓ ✗	✗	✓	✓
No installation/infrastructure	✗	✗	✗	✓	✓
Tools for patient to manage care	✗	✓	✗	✓	✓
Everyone can edit and contribute	✗	✓	✗	✗	✓
Consent driven by patient	✗	✗	✗	✓	✓
Secondary permissions for data usage	✗	✗	✗	✗	✓

Figure 1: Different features of information sharing and patient-centric approaches

1. Ownership, rather than access, over information
2. Dynamic and granular consent for information sharing with separate permissions for secondary usages of data that are under the direct control of the patient at all times (with appropriate safeguards in place)
3. Ability to aggregate and consolidate health and social care related information from different sources in a single longitudinal record
4. Collaboration and self-management tools for professionals, carers and patients

We focus on the Patients Know Best (PKB) system as the world's first patient-controlled medical record and the only solution to satisfy the four key criteria listed above, and explore the impact in comparison to other systems and/or a service that lacks digital maturity.

PKB is designed to empower patients to manage their care, and help clinicians share information and engage with patients in new and powerful ways. It is the most integrated patient portal and information exchange system, being deployed in over 200 sites across 7 countries and translated into 19 languages. The effectiveness of PKB is based in its function both as a patient portal, allowing patients and their carers to view, create and share information and health data, whilst simultaneously acting as a health information exchange, so professionals can collaborate, share and discuss patients' personalized healthcare data across the network.

This report will break down the effectiveness of a patient-controlled record into four main domains: 1) Adoption and usage of patient-controlled records; 2) Improving patient

experience; 3) Improving clinical efficiency, and 4) Delivering financial impact

Patient adoption and usage of patient controlled records

1. Adoption

The international context for personal health records and patient portals has seen a mixed response from patients, in terms of adoption and usage of these types of systems. For example, Kaiser Permanente (KP) in the US reports an average of 90,315 visits to its tethered patient portal a day, but this number is a threefold increase since 2012 (from its launch in 2004). This demonstrates the demand and tipping point in scaling access to personalized healthcare data for patient users. However, KP's portal does not provide health information exchange competencies which provide access to other care providers throughout the ecosystem. Comparatively in the US, the HealtheVet system used in San Francisco at the VA Medical Centre sees patient use rates at around 15 times a year, and does not provide the functionality to allow patients to contribute their own content on the website (Osovskaya, 2016). A review of PHR use in Primary Care in the US reports that a patient portal, described as an interactive preventive health record, was offered to 112,893 patients in 2014 and 28,910 created an account for themselves (Krist et al, 2014).

Nationally prescribed systems also have a wide range of adoption and usage data: Denmark has reported 1.4million unique visits (c.25% of Denmark's population) a month to its national health portal (Castro, 2009); 9 regions in Sweden have given all their citizens a Personal Health Record (Falan, 2016) and in 2008 it is reported the Swedish patient portal (1177.se) received 8 million visits a month and near universal professional usage of EHRs (Castro, 2009). In France, less than 1% of the population use the French Electronic Health Record (Osovskaya, 2016). It is reported that in Australia there have been 5,312 GP Practices out of 8,625 Practices sign up to *My Health Record,* with 300 GP clinics using it weekly (Cowan, 2016). The national drive to get all Australian citizens a record has seen estimates that between October 2015 to February 2016, 10,900 patient users accessed the system at least once a week and a total of 74,805 summaries had been uploaded (national population is over 22.5million).

To date, we can see that patient portals and PHR effectiveness have been described in terms of users and visits. For all of these systems, the current literature shows complex interpretation of effectiveness that includes a two-way definition of adoption by both professionals and patients; and usage metrics described in terms of unique visitors, visits and usage over weeks and months. The challenge with using such absolutes as indicators of effectiveness here is that firstly, it renders them incomparable; and secondly, poorly indicate the value to users and the ecosystem: as citizen health status or control improve (the goal of all these systems) frequency of visits by citizens to an online health record are likely to decline and therefore 'visits' is an unhelpful longitudinal measure of success.

Number of visits to PCEHR systems will not tell you about availability of information for clinical quality and effectiveness was available to professional users when they logged in; or whether the right tools with up to date information were available to patients when they needed it to manage their health conditions. In the same way financial services technology uses adoption rates, functionality and channel choices of users as descriptors of success (Khatri, 2014); metrics of effectiveness in citizen- led digital health solutions need to consider the value of the technical service that is being provided (Figure 1: Different features of information sharing
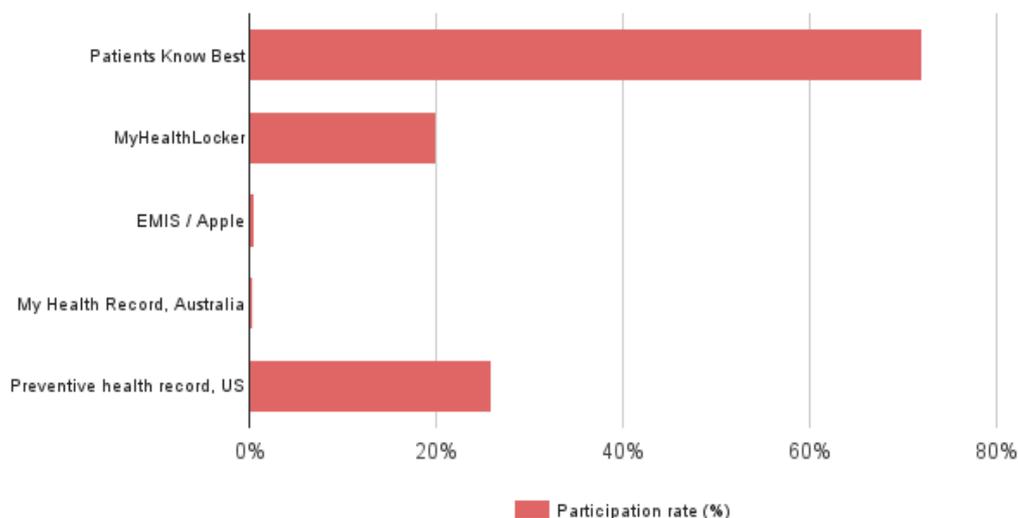
Figure 2: Participation rate for PHRs versus PCEHRs

and patient-centric approaches) as well as the usage. The number of users who were offered a PCEHR and went on to use that account ('Participation Rate') tells you whether the functionality it afforded them was valuable and worth having. Whether the software enhanced the experience of their care will be discussed in the next section.

Participation rate describes the number of online records created for users (patients and/ or professionals) vs the number of users who actively use the online record (beyond initially registering interest). Participation rate gives us a benchmark whereby all systems can be evaluated equally in terms of their value and usefulness to citizens and professionals. MyHealthLocker and EMIS Apple have a reported participation rate of 20% (Royal College of Physicians, 2016) and c.0.01% (Best, 2016) respectively; nationally prescribed systems have poorly reported participation rates, with the Australian and French systems having between 0.3% and 1% of users actively engaging (Cowan, 2016; Osovskaya, 2016), and likely higher but unreported rates in Sweden and Denmark; and

a US Primary Care PHR reported participation rate of 26% (Krist et al, 2014). In comparison to patient portals and PHRs; the functionality, adoption and usage of patient controlled records is far superior which implies something of their value to their users (Figure 2: Participation rate for PHRs versus PCEHRs).

PKB launched in 2008 and provides integrated health information exchange technical competencies that many other systems lack (see Figure 1). PKB has a participation rate of between 48% to 97% (Johnson et al, 2013) which is significantly higher than the majority of systems globally.

PKB's high participation rate is due to the fact that it is useful to both professionals and patients and they can actively collaborate around the record, rather than a system being built for one particular group at the exclusion of the other. Professionals are given PKB software as a service to use with their patients, and their online presence and endorsement at the time of patient sign-up to PKB accounts helps to give patient users the confidence and

incentives to complete registration for their own account and use their PKB record. The registration process is simple, and allows users to select their own passwords and security questions.

Concerns about adoption and utilisation of health technology has often assumed a "digital divide" in those who have access to technology and those who do not, with the concern that certain demographics of patients will be excluded from the advantages health technology offers. Latest research shows global mobile phone penetration at 95% (Wilhelm, 2001) so the important issues to consider in exploiting the advantages of health technology, is not a question of access, but of who is connecting, how and with what skills (Hilbert, 2011).

In a survey conducted by University of Cumbria on the use of PKB at Luton & Dunstable Hospital (Johnson, Lithgo and Price, 2013), the following demographics of the patient IBD community and willingness to use technology was seen (Figures 3-6), and is comparable to the populations of other long term conditions who may benefit from health technology and contradicts a lot of misplaced concern about internet and technology use in the older generations.

2. Usage

Usage can be used to describe the digital maturity of a service using health technology. Frequency of visits is less informative than the how, when and what of use activity. As we have seen, the 'digital divide' is a less a question of age and access, but whether health technology increases the 'bandwidth' of citizens by improving communication capacity of patients to manage their health. This asks the question is the technology intuitive to use and does it improve experience and outcomes through access to personalized healthcare data *and* the ability to communicate and process

that information with trusted healthcare professionals?
PKB has good rates for usability for patients. In a study done by Cancer Research UK on the usability and ease of use of PKB, patients rated PKB at 76 (average industry score 68).

A survey done by a team at Great Ormond Street (GOSH) showed favourable responses from patients and families on the impact of PKB in improving their communication with different team members (Figure 7). The survey also asked patients which parts of the information available in PKB they used the most (Figure 8) and the number of virtual communications made to different team members (Figure 9).

The usability of PKB by families, patients and professionals in this this high complexity specialist team at GOSH, demonstrates its value at an extreme end of the spectrum. In fact, the efficiencies experienced by PKB for communication between families and the team, seen here by the high communication rates of the Consultants and specialist nurses (Figure 9: Contacts made to team members via PKB over 18 months), and the self-care discussions that have been generated over whether appointments were warranted and the results being reported in the PKB record (Table 9: data used by families) actually led the team to coin the phrase "I'll PKB it" meaning I will record it/ send it/ discuss it on PKB.

The majority of sites using PKB are NHS services and our latest usage data reports (example data extracts as of week 11-18th July 2016) show regular PKB website use of over 1,500 unique visitors a week, with c.4,000 visits a week (range 2,090- 4,180) spending an average of 9 minutes 39 seconds on the system each visit. Currently we tend to see 132 patients to every professional using the system, however professionals spend almost 4 times as much time on the system than patients

Gamet, K., Al-Ubaydli, M., Humphreys L. & Boerner, D. (2016) The effectiveness and impact of patient-controlled records

(on average patients spend 18 minutes per
session to professionals 1 hour 20 mins).

Male   **29** (53.7%)
Female   **25** (46.3%)

Figure 3: Gender

18-24 years old   **2** (3.7%)
25-34 years old   **10** (18.5%)
35-44 years old   **12** (22.2%)
45-54 years old   **8** (14.8%)
55-64 years old   **6** (11.1%)
65-74 years old   **13** (24.1%)
75 years or older   **3** (5.6%)

Figure 4: Age

1. English / Welsh / Scottish / Northern Irish / British   **44** (81.5%)
4. Any other White background   **1** (1.9%)
9. Indian   **3** (5.6%)
10. Pakistani   **5** (9.3%)
11. Bangladeshi   **1** (1.9%)

Figure 5: Ethnicity

Very familiar   **37** (66.1%)
Fairly familiar   **13** (23.2%)
Slightly familiar   **4** (7.1%)
Not at all familiar   **1** (1.8%)
Prefer not to say   **1** (1.8%)
Other   **0**

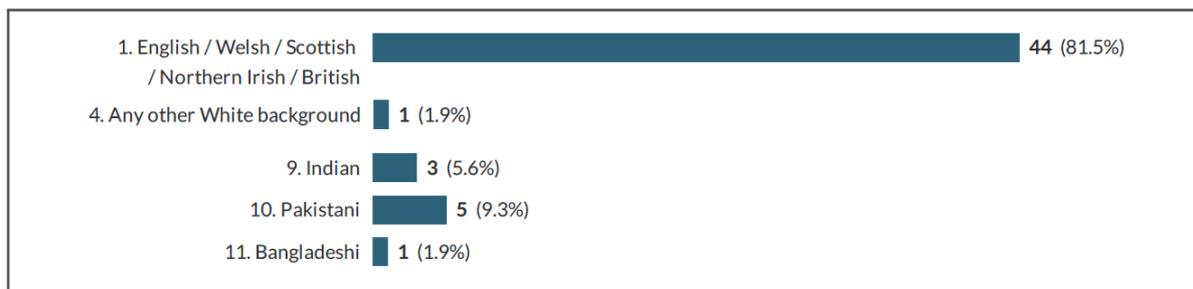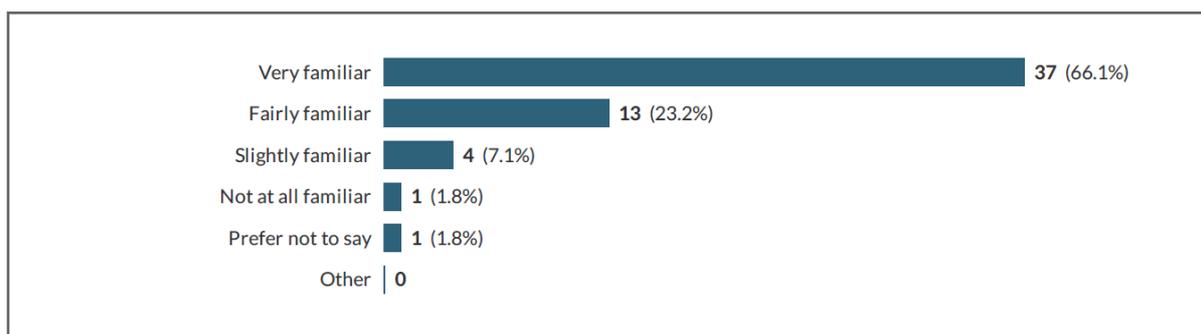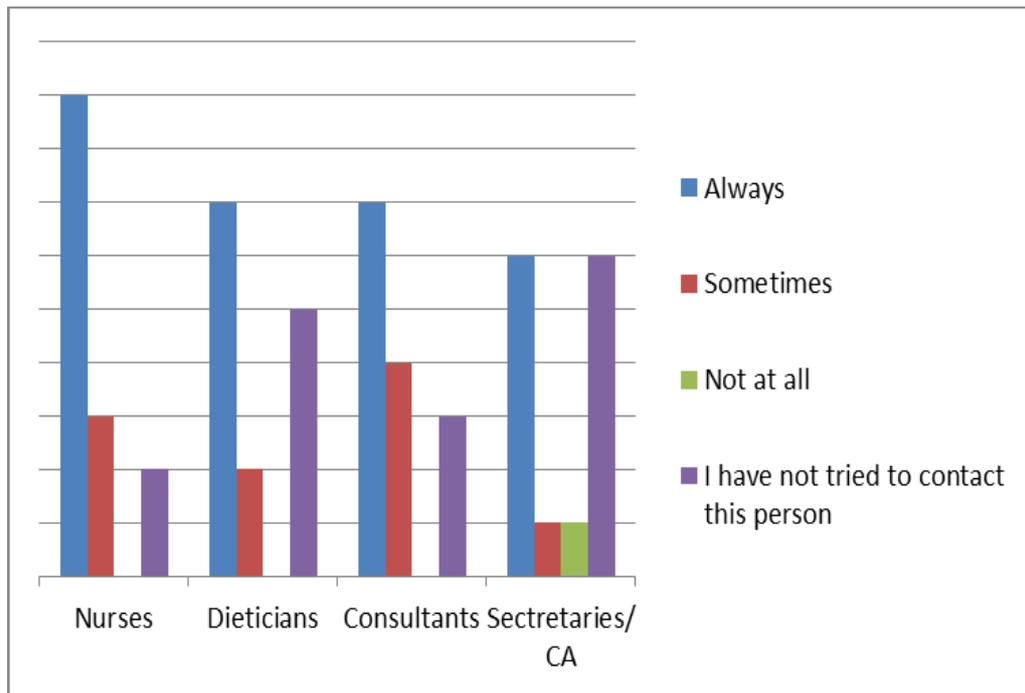*Figure 6:* Familiarity with using computers and internet technology prior to PKB

Figure 7: GOSH patient and family survey: "Does PKB improve communication with your clinical team?"
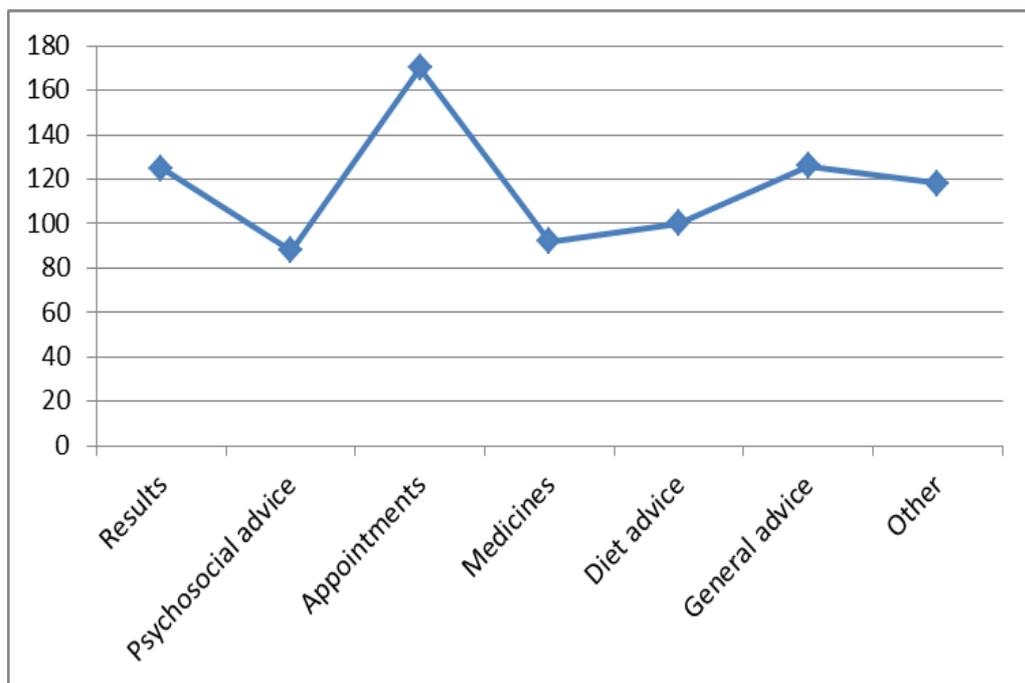

Figure 8: Patient survey on the number of times different features in the PKB record were accessed by families using PKB at GOSH
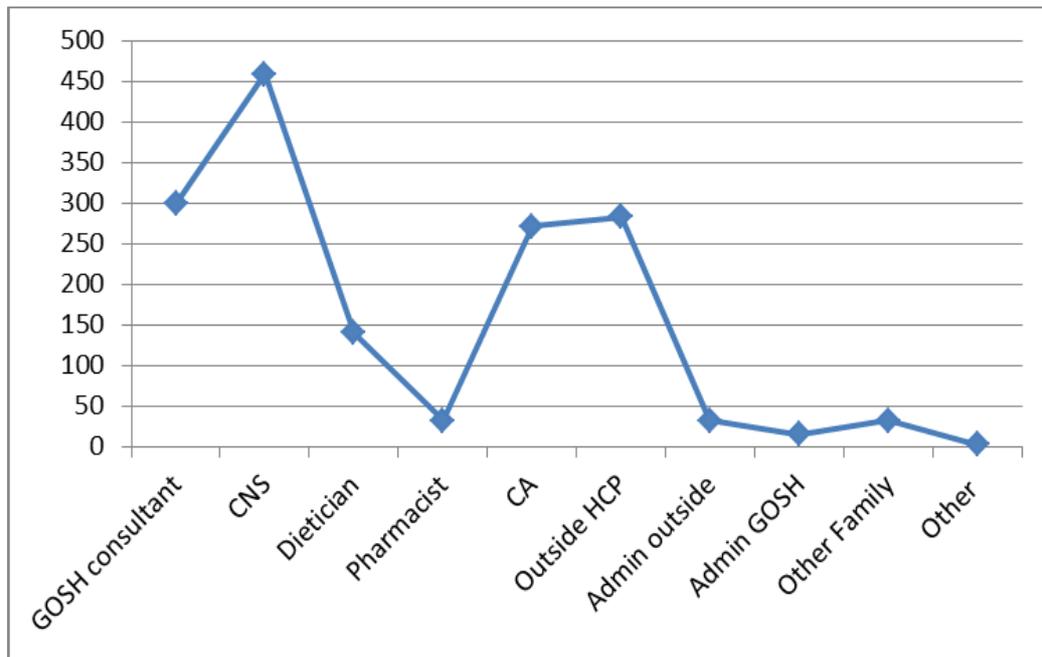
Figure 9: The number of contacts to team members via the PKB account over 18 months
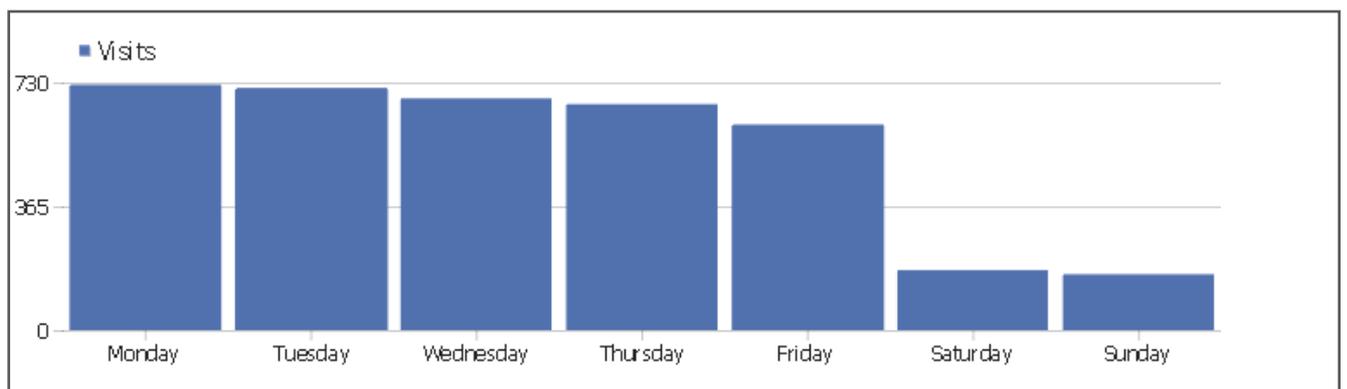

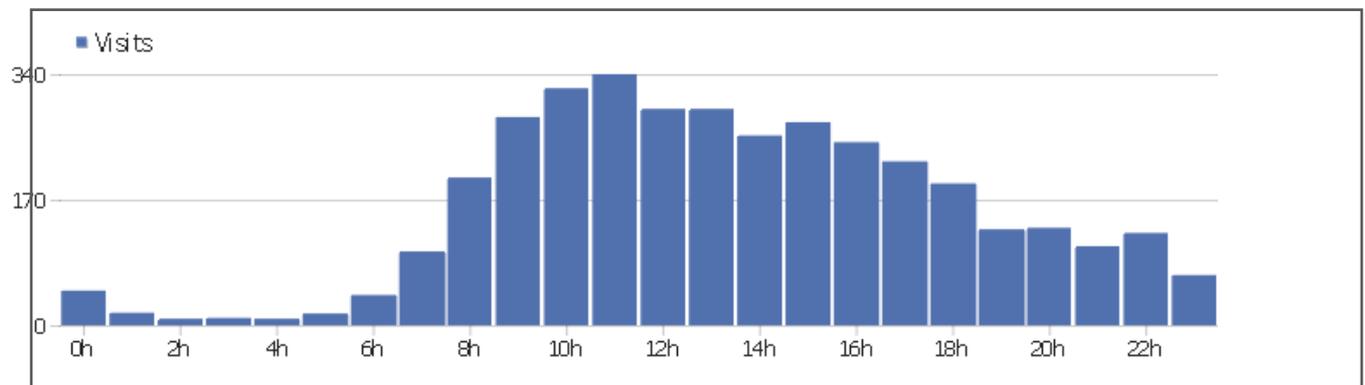Figure 10: Typical PKB system use by days of the week

Figure 11: PKB use by time of day

Typically use of the system reflects the working week, but interestingly there is significant activity both on Saturdays and Sundays. Over a quarter (29%) of Monday's activity is seen on Saturday, with the majority of the system use done by patients updating their records and sending messages. Professionals are also logging on to the system on the weekend, and appear to be using the time to remotely catch up with work. Typical session times on PKB on a Monday are 21 minutes (patients) and 29 minutes (professionals), whereas on a weekend, session times are longer for both patients and professionals, with 9 minutes more spent per session on average on PKB on the weekend by patients, and 25 minutes more by professionals. That is an increase in time spent on the system of 52% compared with a weekday.

There is clearly demand to use this health technology on the weekend from both patients and professionals, and it may be that activity levels for both professionals and patients could be higher with the right tariff (to increase professional online resource) and incentives in place (an expectation from the patients that a professional will be available to communicate with) to enable a 7-day week of virtual support.

Breaking PKB usage down further, we can see that PKB supports an extended working day for NHS professionals with activity well established over a 24-hour period between 0700 and 0000.

The peak in PKB website use between 1000 and 1100 would indicate activity by professional and patient users within their existing working/ life schedules (logging into PKB when the priority activity of the day's work is underway) and would also suggest the importance of the system to its users, being performed at the beginning of their day.

Patients Know Best allows users to securely message each other, record measurements, report results from investigations, keep a journal, records encounters with the healthcare system, upload and share files and compile and share virtual consultations, surveys and care plans between professionals and patients. By far the most used feature in PKB is secure messaging, with over 140,000 messages sent between teams of professionals, patients and carers using PKB; with an average of 58 messages sent a week per team. To date, patients have added 4,108 entries to their online journals and 149,900 symptoms to their records.

Patients with Type 1 Diabetes Mellitus have also responded favourably to the experience of using PKB. In a study conducted at Sandwell General Hospital in 2016, 121 patients with a mean age of 45 years were surveyed for their experience of using PKB after 6 months. 73% found it easy/ very easy to register, 60% found it easy/very easy to use.

Their use of the system after just 6 months demonstrated a high level of comfort with this type of health technology with results from the survey showing 92% had used secure messaging, 64% had viewed blood test results online, 70% had received clinical correspondence, 16% had skype consultation (and 54% said they planned to use it in the future), 12% had added a tracker or wearable device to the account (46% said they planned to use one in the future) and 32% had added/ stored health related measurements.

Health Technology and virtual support of this kind shown by PKB's functionality in the diabetes community also has the potential to reduce barriers to treatment for some populations and improve health outcomes over normal care (Harris et al, 2015; Petrovski et al, 2015).

Improving Patient Experience

Central to the experience of PKB is the control patients have of their accounts. This means they can be health data content creators, rather than just consumers, which can help transform their participation and engagement in care.

Delphi Medical Care is an independent provider of services for substance misuse patients. Delphi's co-founder, Dr John Richmond describes the patient experience of using PKB:

"Our patients are particularly disempowered. They're often perceived as immoral rather than ill, and that has a direct impact on their self-esteem and their recovery. By giving them their medical notes and involving them in their care, patients understand that they have an illness – just like any other. This is vital in helping them reframe any negative thoughts they might have about themselves."

The transparency of communication between multiple teams, and that ability to contribute is a really important part of managing life with a complex (or multiple) long term condition(s), and is a feature of PKB, Jason Murtagh who uses PKB for his Visceral Myopathy, really appreciates:

With PKB, everyone is kept in the loop and we can bounce ideas off each other – and I can join in the discussion too. Potentially, using PKB is going to minimise the time I have to spend going to consultations and meetings. I'm already spending less time having to explain background information and what's been going on since my last consultation because we're all up to speed.

The ability to communicate through PKB in a manner that suits the patients and in real-time is often repeated by patients as a real benefit of the system. We see users accessing the system via smartphones/ tablets and desktops in a

ratio of 1: 1.25, from all across the globe. Here, Dr Zoe Warwick describes the service she was able to provide to an HIV patient on Anti-Retroviral Therapy who messaged her while on holiday:

"I have a patient who noticed a rash while on holiday and contacted me thinking they were having an adverse reaction to their meds. They were on the verge of stopping their meds altogether and flying home. I asked them to immediately send me a photo of the rash over PKB and was able to tell them it was nothing to do with their HIV medication. Some simple skin cream cleared things up the next day and we avoided the whole situation from escalating."

Improving clinical efficiency

Ways in which professionals use PKB to improve their efficiency are wide ranging, so describing the impact of PKB succinctly is a challenge. However, all 178 sites using PKB use it to securely message and virtually consult with their patients.

Secure messaging technology like that in PKB, deliver numerous benefits for healthcare services by freeing up professional time with the right staff dealing with the right queries and questions; and allowing patients to self-manage and send information electronically without using up services and time in an unnecessary face to face appointments (Grainger, 2016).

A specific example of some improvements in clinical efficiency PKB has delivered can be seen in the work Luton & Dunstable Hospital (L&D) have done with their patients with Inflammatory Bowel Disease (IBD) in a project called IBD-SSHAMP (Johnson et al, 2013).

The team at L&D chose to use PKB to address the discontinuity in care of their patients

between Primary and Secondary Care that was affecting patient outcomes, experience and increasing work in Secondary Care. The main areas of concern were: Patients were being lost to follow up, maintenance therapy was not continued, GPs stopped prophylactic therapy, patients believed they did not have the condition anymore, patients felt "not wanted" and "unloved" and patients were re-referred with significant flares.

520 patients over a year were transferred (not discharged) from the Secondary Care team for specialist overview in the community through remote monitoring and support through PKB. Each patient was offered a twice yearly virtual appointment, had online access to specialist advice, home testing kits, digital careplans and symptom trackers via PKB.

Specific clinical efficiencies that were generated were better quality of care in line with national IBD standards, a reduction in the demand for outpatient appointments and colonoscopies resulting in reduced waiting lists, and a reduced workload for clinicians as a result of the automated testing and immunity and vaccination screening that could be delivered within PKB. Efficiencies generated in the wider healthcare ecosystem were a reduction in surgery, unnecessary X-Ray procedures, hospital admissions and GP visits, as well as an increase in patient satisfaction (Johnson et al, 2013).

Patients have also recognised and experienced the efficiencies that can be generated with a system such as PKB. In a survey conducted with Type 1 Diabetes Mellitus patients in Sandwell Hospital in 2016, the perceived impact of using PKB was rated by the patients. Time saving potential was rated between 91 and 95%, cost saving between 56% and 84% and the enhancement with their team was rated between 71% and 98% (the highest perceived benefit came from secure messaging).

Delivering Financial Impact and Value for Money

The case for the potential financial impact of digital technology in the NHS has been widely projected: it is estimated that £29 per patient savings in Primary Care could be achieved through a reduction in telephone calls, appointments and administration through the use of citizen-centric approaches to digital records (Grainger, 2016), This equates, in an average GP Practice of 20,000 patients, to a saving of £580,000 through a provision of a PCEHR, which in PKB's case, is provided at less than £2 per head of population.

Better self management and efficiency of (virtual) contact with healthcare professionals can also create savings. For example it is estimated 4% of patients could have avoided a contact at the GPs if self care support had been available (Grainger, 2016). When one considers that with over 340 million GP appointments per year (British Medical Association, 2014), this could free up over 13.6m consultations this is a significant reason for the widespread adoption of PCEHRs. This is further strengthened when one considers that 34 million could not get a GP appointment in 2014 due to lack of funding (Royal College of General Practitioners, 2014). Such projections are becoming a reality. A GP Practice in Buckingham have experienced 40 saved days a year since offering up patient access to test results online, which has reduced telephone contact with the Surgery for test results by 50% and enhanced self-care (Emishealth.com, 2016).

Avoidance of emergency or unplanned care also delivers financial impact to the system. Yeovil District Hospital and community teams' use of PKB was picked up in the Financial Times for its success in reducing A&E attendances for patients in the community with multiple long term conditions. This cohort of patients are 4% of the local population and consuming 50% of the health and social care

budget. Since PKB has been used by the integrated care teams, there has been a 42% reduction in A&E attendances in the past year (Neville, 2016).

Reducing bed days when in Secondary Care is another cash releasing benefit of PKB when each excessive bed day in Secondary Care is costed at £273 per patient (Department of

Cost	Savings
IBD - R / PMS = £4,000 PKB = £30,000 Calprotectin = £24,000 (2x/y) IBD Nurse = £30,000 Virtual out-patient appointments (OPAs) = £36,000 (2x800)	OPAs 800 x 2 x £115 = £184,000 Saved colonoscopies (£539) = £42,000 - £120,000 – ? Preventing hospital admissions – ? GP visits – ? Reduction in Surgery – ? Reductions in opportunistic infections
Total = £124,000	Total = > £226,000

Figure 12: Breakdown of costs and savings generated by IBD-SSHAMP

Health, 2013). Severn Major Trauma Operational Delivery Network in Bristol use PKB to support and expedite the discharge of patients after surgery for traumatic injuries; and Peterborough and Stamford Hospitals' adult and paediatric epilepsy services use PKB to avoid admitting patients for observation of epileptic fits for diagnosis. In fact the use of PKB by carers to record fits as they occur, uploading and sharing them with professionals has even led to better diagnosis accuracy, subsequent medication improvements and patient outcomes which improve clinical quality and release cash in the system.

PKB is also being used to create savings by allowing patients to self-register for assessment and treatment. In Torbay Hospital Physiotherapy Service, patients can self- refer themselves by signing up for a PKB account on the Torbay Physio website, completing an online consultation which will be followed up by a physiotherapist. Such systems have been reported to reduce the cost of treatment compared with GP or GP-suggested referral groups, and a study in Scotland has projected

self-referral for physiotherapy could save NHS Scotland approximately £2million per annum (Holdsworth et al, 2007).

Better remote management of chronic disease has also been demonstrated to save money. When PKB was embedded in the transformation of the IBD service at Luton & Dunstable Hospital, it was calculated that there was a gross saving of £102,000 per year (see Figure 12):

Conclusion

The adoption of patient-facing solutions and different information sharing approaches has seen a mixed set of results. One reason for this could be the type of system employed and whether the power of the health network is leveraged for the benefit of both patients and professionals. When a system is implemented that only addresses one user group then adoption and engagement is low, leading on to a poor experience. In contrast when a system is used to enhance collaboration between patient and professional, and has features and

functionality useful to all, then adoption is significantly greater.

The patient-controlled approach of PKB has demonstrated superior adoption, engagement, clinical benefit and financial impact. As the benefits are diffuse and often specific to a particular condition or cohort, future research needs to look at the generalisable outcomes of this type of digital patient empowerment.

Box-out 1: The Digital Patient Maturity Index.

The Digital Maturity Index is a benchmark used to evaluate organisational readiness for technology solutions. This is widely used in the UK and has now been extended to cover patient-facing solutions. The index has seven dimensions to assess the capabilities of patient portals (Graph 1). The DPMI has been used to evaluate the three main patient portals used in the U.S., but has not been applied to the UK.

Self-assessing PKB (Graph 1) reveals a score of 96, which is comparable to Kaiser Permanente's portal (score 97) and Ochsner Health System (score 92), and superior to Boston Children's Hospital (score: 66). PKB does not get a maximum score because it does not support billing, a US-centric feature, nor prescription refills, which hospital EHR vendors have not been forced to open as England's GP system vendors have been.

More significantly, the index does not measure integrated care across providers, let alone across health and social care. It also ignores patient ownership. None of the US portals allow integrated care with other providers and when a patient leaves provider – e.g. a change of job, leading to a change of insurer, leading to a loss of former provider – they do not get any of their past medical records in their new patient portal. Whilst the Digital Patient Maturity Index is a useful construct for benchmarking solutions, further work needs to take place to adapt it to be representative of patient ownership of information and the interactional nature of patient portals, rather than simply information sharing and transactions. PKB suggests that the DPMI be updated to reflect these essential features of integrated care and patient control.

Digital Patient Maturity Index for Patients Know Best — Score 96/100

#	Dimension						Score
7	Clinical benefits (5 points each, total 25 points)	Improved patient provider relationship	Decrease in medical errors	Reduction in hospital re-admissions	Improved patient engagement	Improved patient outcomes	25
6	Operational benefits (5 points each, total 15 points)	Decrease in administrative burden	Decrease in unnecessary clinical costs	Increase in clinical productivity			15
5	Adoption (% of population) (4 points each, total 24 points)	1 - 5%	5 - 10%	10 - 20%	20 - 30%	30 - 40%	50%+	N/A
5	Adoption (% of population) (4 points each, total 24 points)	1-100	100 - 300	300 - 500	500 - 1000	1000 - 2000	2000+	24
4	Multiple care settings (4 points)	Integration across multiple healthcare settings					4
3	Connect and share features (3 points each, total 9 points)	Communicate with provider	Control information consent	Share health information with peer group			9
2	Clinical moment features (3 points each, total 15 points)	Access lab/test results	Access medical record	View clinical notes and correspondence	Self-management support tools. Health journal and patient generated data	Contextual health information	15
1	Transactional features (2 points each, total 8 points)	Basic input of patient demographic data	Appointment booking	Prescription refills	Billing		4

Measuring quality, the Digital Patient Maturity Index (DPMI) for Patients Know Best

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