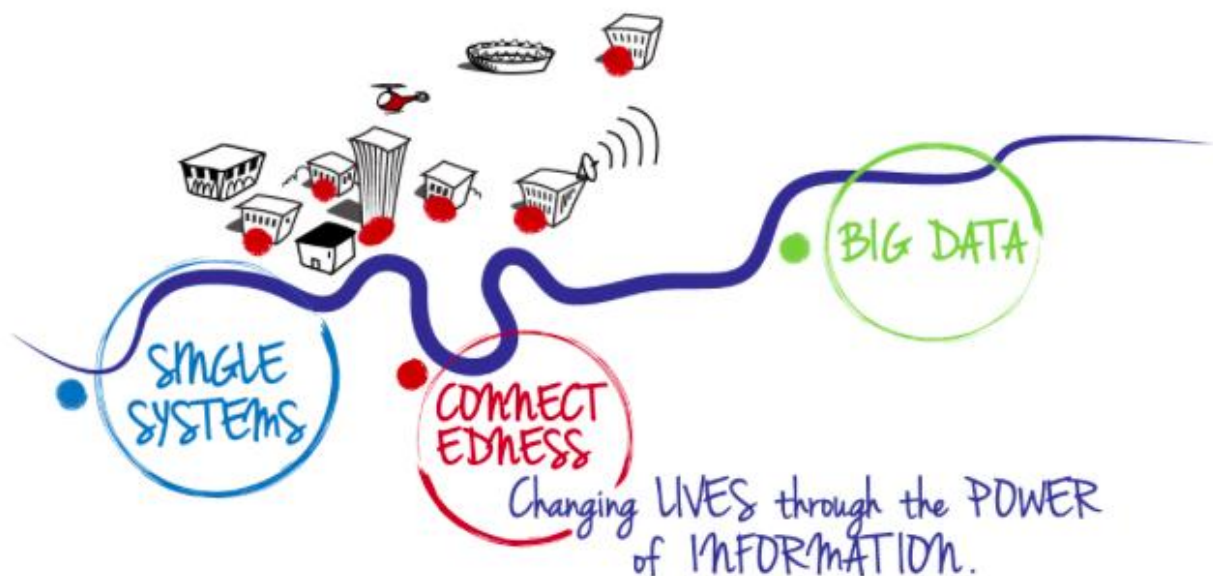


# Benefits Deep Dive into Cerner Millennium Implementation

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Barts Health NHS Trust



**Author: Sarah Overton (Benefits Lead, HSCIC)**

Co Author: Patrick Brady (Programme Manager, Barts Health NHS Trust)

Co Author: Alison Ellis (Benefits Analyst, HSCIC)

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# 1 Background

In recent years there has been an increased focus on the need to assess the benefits arising from major investments in IT systems within NHS. In many trusts, these IT systems have now been in use for a number of years and it is widely thought the systems have not delivered significant benefits. To evaluate this belief, a series of studies are being undertaken at a number of trusts to assess the way the systems have been adopted and the resulting benefits.

The most significant systems to have been implemented are the acute systems which generally include the Patient Administration System (PAS), A&E, Maternity, Theatre, Order Comms (test orders and results), Clinical Coding, Case Note Tracking and in some cases document management, providing the basis for an electronic patient record. Cerner Millennium is one of the acute systems that has been implemented.

Barts Health NHS Trust successfully made their Emergency Department at the Royal London Hospital a paperlite environment using Cerner Millennium during 2012, after first implementing the system at the trust in 2008. Given this noticeable success in using the system it was suggested by the trust to the Health and Social Care Information Centre (HSCIC) that they jointly undertake a detailed study (Deep Dive) into the successful use of the Cerner Millennium system in the Emergency Department and other parts of the trust.

It was anticipated that the information from the Deep Dive would then have six purposes:

- To help the trust to further engage its staff in the use of the system
- To help assess the value of the trust's original investment case and later business cases
- To help demonstrate to other trusts the potential of the system given what has been achieved at Barts Health NHS Trust
- To confirm to Barts Health NHS Trust what has been achieved but also what still remains to be achieved
- To help validate the information collected centrally about the benefits of acute systems
- To define a methodology for undertaking Deep Dives into implementations and understanding the value and benefits delivered to date

## 2 Executive Summary

### 2.1 Key Findings

- Significant benefits realised as a result of going ‘paperlite’ in the Emergency Department
- Elsewhere in the trust there are numerous ‘pockets’ of success, notably in the use of the system as a clinical tool but adoption is not widespread
- The success of pioneering users will be limited until there is more universal adoption of the system at which point the majority of the value from the investment can be realised
- There are significant inefficiencies and pitfalls of parallel running paper based processes alongside an electronic data system
- Senior clinical leadership and commitment to the system’s use has been an essential ingredient in the areas where success has been observed
- The main barriers to widespread adoption are IT issues, including network and infrastructure concerns, and the need for a greater focus on business change, particularly continuous system training for staff

Over a period of seven months the HSCIC has worked closely with Barts Health NHS Trust to assess the benefits that have arisen following the initial implementation of the Cerner Millennium solution in 2008 at the former Barts and The London hospital sites (BLT). The former BLT sites included St Bartholomew’s, The Royal London, The London Chest and Mile End. Since then upgrades have taken place and various parts of the hospitals have adopted paperlite (minimal paper) processes, or in some cases paperless processes, helping to maximise their use of the system.

Observing use in all parts of the hospitals would not have been possible within the remit of this study. With the help of the trust’s Clinical Information Officers, we decided to focus on the following five areas to identify the main benefits that have been realised through the system’s implementation:

- Emergency Department
- Outpatients
- Patient Safety Improvements
- Research
- Recent Developments

Without a baseline from which to measure progress we adopted an approach of working with another hospital site within the trust at Whipps Cross. During the time of this report, this hospital generally represented the position of BLT in 2008 prior to the implementation of the Cerner Millennium solution, referred to as the Care Record Service (CRS) at the trust.

The methodology adopted for this project is outlined in more detail in the following section. In summary, we performed largely new and detailed techniques to uncover evidence of benefits to ensure we were correctly attributing value to CRS. Most notably we 'observed' staff using systems at the former BLT sites and Whipps Cross whilst performing their roles. Through our observations we captured the processes involving system related tasks and also information such as timings, roles, consistencies and variations. We also looked for inefficiencies arising from, for example, duplication, workarounds and hindrances on performance at Whipps Cross that were potentially mitigated by using CRS at the former BLT hospitals. This provided in most situations a 'rich' picture of the benefits that had been realised.

In summary, we made the following key findings in each of the study areas:

### 2.1.1 Emergency Department

We commenced our study in the Emergency Department (ED) knowing that benefits had been realised as a result of adopting the system and then becoming a paperlite environment in 2012. However, our observations revealed just how much has been achieved by the Royal London ED Team. The benefits of maximising the use of CRS in the ED department by going 'paperlite' were multiple and significant.

Having one source of reliable patient information, current and historical, accessible to concurrent users on CRS, overcame many of the issues associated with only having a single paper based CAS (Casualty) card to share. These included not having access to any patient history unless a previous CAS card could be recalled, and everyone treating the patient requiring the same piece of paper to review the patient's treatment needs or record their notes. CAS cards were frequently 'un-locatable' when required. The traditional whiteboard on the wall attempted to assist with this dependency as many are involved in a patient's care in ED, from the consultant to the phlebotomist to the porter. However, the challenges of running a traditional whiteboard alongside a computer system were clear during our observations, and are noted in this report.

The electronic whiteboard greatly improved the work of the Royal London ED department. It directed the team's work; enabled staff to perform their roles more efficiently because it was clear what was required of them and provided the information to complete their tasks; and also enhanced teamwork. The electronic whiteboard was more detailed but clearer with consistent and legible symbols and abbreviations. Being easier to maintain, the electronic whiteboard was also more accurate in its reflection of status.

CRS helped the management team as well as the clinicians on the floor of the ED department. Tracking and investigating 4 hour breaches has been greatly simplified. New reports allow the department as a whole to assess their performance and consider improvements. Peaks in activity levels within the various parts of the department were also easier to identify, and even anticipate, allowing a flexing of resources to better cope.

Other noteworthy benefits were a significant reduction in the time spent looking for paper based information; less time was lost duplicating tasks such as data entry onto multiple



systems or forms; and improved tracking of patients in the department resulted in less time looking for them. The only negatives were concerns over the performance of the IT infrastructure and a question as to the number of PCs in the Cubicles area, both of which should be looked at by the trust.

## 2.1.2 Outpatients

Next we looked to the Outpatients area covering Referral Management, Records Management, Clinic Management and the Outpatient Clinics themselves. Our search for benefits was harder, especially in the area of Clinic Management; however we still made the following key findings in this more administrative area.

CRS provides users with the opportunity to code their activity using SNOMED coding. We evidenced not only an uplift in coding performed by clinicians but also an increase in the depth of coding. The trust has witnessed an increase in the number of diagnosis per coded episode and an increase in the average income received for each finished consultant episode (FCE). The YTD average income received per coded episode was £1270. Between April to November 2013 this figure increased by an average of 11.8% bringing the average income received over that period per coded episode to £1409. Given the Trust experienced between 23,000 and 26,750 finished consultant episodes a month between April and November 2013, this increase soon becomes significant.

The main benefit of CRS to the Referral Management area was the opportunity it provided to run a more efficient and flexible centralised booking team. Before clinics would have had their own booking clerks. The centralisation of referral bookings provides the patient with single number 'one stop shop' for all their appointment needs which can flex to meet peaks in demand or cover leave.

Clinic management in particular felt the benefits of CRS were limited due to CRS's need for more information to be entered and the inclusion of drop down boxes and mandatory data fields for example. It was felt this made their use of the system more time consuming than before. However, these dis-benefits need to be considered alongside the benefits of 1) the increased data on the system, some of which is reportable, e.g. ethnicity, next of kin and 2) the increase in data quality with less free text fields. Furthermore, the automatic validation of the NHS Number against the spine (the NHS' secure national database) leads to far fewer duplicate records and effort to merge them.

Use of case note tracking in CRS has significantly reduced the number of missing paper records, as has the decreased need to pull paper records from multiple Records Management libraries outside of outpatient appointments. Moreover, those paper records that are missing are easier to track with information about the patient's episodes of care on CRS. The significant benefits of paper records no longer needing to be pulled/located, prepped, delivered to and collected from clinics/clinicians will only be realised when paper records are no longer required due to the volume of patient data on CRS.

The benefits were more plentiful when looking at the clinics and the use of CRS by doctors. We observed doctors briefing themselves with the patient data centralised in CRS in a few minutes prior to each appointment. The ordering process was slicker and some consultants were completing their own post appointment letters to the GP/patient within 2 to 3 minutes using prepopulated templates on the system. This allowed the letter to be available to the patient either before leaving clinic or the following day which patients felt was of significant value. There was also an immediate record on the system of the appointment's outcome.



This is a significant improvement upon the more frequent practice of the consultant's dictation being typed up and then returned to the consultant for checking, sometimes weeks later.

During our observations it was noted again that the performance of the IT infrastructure prohibited the consultants working at full capacity and caused a level of frustration that will limit others' enthusiasm to adopt CRS in similar ways.

### **2.1.3 Patient Safety Improvements**

We encountered several examples of patients receiving safer and improved care where treating clinicians had easy access to the patient's electronic record, allowing them to refer to and update the record directly. We therefore decided to bring these service improvements under one heading.

#### **Sickle Cell Disorder**

Firstly, we repeated a 2012 audit undertaken to confirm that the availability of electronic protocols, in Sickle Cell Disorder (SCD) patients' electronic records, allowed ED clinicians to more speedily and correctly treat those suffering a SCD crisis. The audit also appears to confirm that a more rapid response to a SCD crisis, and the associated excruciating levels of pain, reduces the post crisis length of stay in hospital.

#### **Haemophilia**

Secondly, Haemophilia patients cared for at the Royal London have very comprehensive electronic records that are available to all treating clinicians within the trust. With more information on CRS about their condition, as well as drugs to control it, Haemophiliacs receive the most appropriate treatment faster minimising the impact of the bleed. Any complications such as risk of infection also help to protect other patients. The information contained on CRS enables the Haemophilia team to work efficiently and effectively together. Information on the system is easier to gather, store and reference and with more information known about patients' circumstances, clinicians are better able to support patients with their condition.

#### **Infection Control**

Thirdly, having Infection Control notes on CRS rather than stored in amongst a set of paper notes means they are readily available to any clinician treating the patient around the hospital, improving the ability to control the spread of infection. The Infection Control team are better able to support each other in answering queries from clinicians caring for infectious patients due to immediately accessible and legible notes as well as the patient's microbiological results and general history. The system also enables faster tracking of patients frequently dispersed throughout the hospital.

#### **Care of the Elderly**

Fourthly, and similarly to the last point above, CRS assists clinicians from the Care of the Elderly team in managing the treatment of a high number of dispersed patients for whom they have responsibilities and also enables them to provide advice whilst remote from the patient. Having easy access to an elderly person's up to date diagnosis and medications is invaluable, both in an emergency scenario and more generally. The history of test results and treatments now available on the system is instrumental when deciding the best course

of treatment and the helpful presentation of this type of information greatly eases its use in this busy department.

The nurse led Fast Response Team successfully and swiftly works to avoid admissions to hospital. Their working processes are fully supported by CRS, from the check in process to being able to determine the best course of action based on the information available in the system and the presenting condition. The consultant responsible for the clinic can also oversee remotely what is happening in clinic and intervene if necessary.

#### **2.1.4 Research**

Whilst speaking to the Neurology team at The Royal London, the change CRS is bringing in the area of research became clear. The trust is building a source of electronic data that it can increasingly interrogate to understand more about its local patient population, causative factors and disease modifying treatments. Electronic patient data enables the most appropriate patients to be selected for trials increasing the value of the research and equalising the opportunity for patients to be involved in trials, amongst other benefits. The Clinical Trials module 'PowerTrials' is currently being piloted in the trust and this will allow trial information to be captured alongside routinely captured data which will provide a number of further benefits. Finally it is felt that CRS is beneficial by providing a secure means of storing patient data rather than standalone databases and paper records.

#### **2.1.5 Recent Developments**

During our observations we noted areas where staff had started to use the system in innovative and important ways but the processes did not yet have the longevity or broad enough application to include them in the previous sections of the report.

Three significant discoveries were as follows:

##### **Going Paperless**

The Colorectal team implemented paperless working in October 2013. All their patients' data is now being captured electronically in CRS, from their arrival in ED or an outpatient's appointment through to surgery, being an inpatient and eventual discharge. Key benefits so far include 1) removing the administrative burden of pulling, prepping and 'portering' paper records for clinic, 2) achieving a more efficient production of the outpatient letter available for despatch during clinic and 3) generally having more information available throughout the patient's care leads to faster and better informed treatment decisions.

##### **Health Information Exchange**

The Health Information Exchange between NHS Barts Health's hospitals and local GPs is allowing the hospital to see information on the GP's record together with hospital records from other Barts Health sites. This is allowing clinicians to treat patients much more effectively, especially those in an emergency care situation. Furthermore, the new system also has significant potential for breaking down barriers between GPs and other community clinicians and the hospital teams.

##### **Investigating Complaints and Serious Incidents**

CRS has also started to be used to help investigate complaints and service incidents at all levels. In its most basic form, CRS helps track the health records required and identifies the

correct patient. It can also provide a very helpful time line of events with the associated details and documentation. Faster access to information should help resolve complaints sooner which would avoid half of the complaints received. Approximately half of the complaints received relate to the time taken to resolve complaints.

## 2.1.6 Conclusion

In conclusion, we have witnessed examples of the successful use of CRS at the former Barts and The London hospitals and significant benefits have been realised, particularly in the ED Department which has fully adopted the system. Within the trust the system is being used as an effective clinical tool and therefore the collection of data for improved planning; performance improvement; research etc. has been a by-product of the system's use rather than its purpose.

Effective use of the system is not widespread however, despite its implementation over five years ago, strong clinical leadership in the use of IT systems, and an IT department that would be the envy of many hospitals. The majority of the investment in the system's implementation is yet to be returned but it should be noted the value still remains to be realised. The system is implemented ready to be more fully exploited.

The potential reasons that we observed for the system not being used more widely are not unique to the trust. Where the system has been used successfully, its users have accepted the system's limitations and have made the tool work for them. In ED, for example, staff identified the system's shortcomings but also how they could overcome them. Asking future system users to anticipate their use of the new system and how current processes could be improved through the system's use is a sensible approach.

Staff need to be fully guided through this process and full business change support should be provided during the adoption of the new processes arising from the system's implementation, including initial and follow up training. This is an area where we saw opportunities for improvement given the size of the investment. Temporary or unsuccessful adoption of improved working processes enabled by the new system will prevent the main benefits from being realised and the target return on investment will not be achieved.

There is a wave of momentum to exploit when implementing business change. When this wave ends, the ability to enthuse staff and effect change is much harder. The trust therefore has a challenge to regain a change momentum in the use of the system after so many years of use. With further investment and new functionality on the horizon this may prove an ideal opportunity to make significant strides forward. The most significant benefits of the system will not be realised until its use is embraced more universally and the need to maintain paper processes alongside those on the system is removed.

However, such a departure from the security of paper will require by many an improvement in current IT issues and an increased level of confidence in its reliability. Unfortunately, we all too frequently saw the system performing slowly and long screen refreshes which had a marked impact on the efficiency of the doctors using the system. Furthermore, we also witnessed a complete inability to access the system and treat patients. Events like these are not completely unavoidable in the use of IT systems but they can be minimised and an increased dependency on systems will require an improved ability to rapidly support users finding themselves without access to the information they need.

## 3 Introduction

### 3.1 Overview of Trust

Barts Health NHS Trust was created on 1 April 2012 from a merger of three former acute hospital trusts: Barts and the London NHS Trust (BLT), Newham University Hospital NHS Trust (NUH) and Whipps Cross University Hospital NHS Trust. This has created the largest NHS Trust in the UK serving a population of 2.5 million in east London and beyond, with an infrastructure of more than 2,000 beds, a turnover in excess of £1.25 billion and a workforce of over 15,000 employees.

The care provided by Barts Health ranges from community services in Tower Hamlets, local acute care to inner and outer North East London boroughs and specialist services at a pan London and national level. Specialist and tertiary services include being a Major Trauma Centre, Cardiac Centre of Excellence and Hyper Acute Stroke Centre. The scale of the trust's activities is notable. In 2012/2013 the three legacy trusts treated a significant number of patients across a variety of settings which included; 435,000 attendances in A&E, 237,000 inpatient and day case admissions, 15,000 births, 1.3m outpatient attendances and 400,000 contacts in a range of community settings.

The North East London population served by the trust is relatively young, diverse and culturally rich. East London has a legacy of historical deprivation and displays some of the worst health outcomes and health inequalities in the country. The health profile and health needs vary significantly between, and within, individual boroughs, with a distinct difference between the Inner and Outer London boroughs.

The trust consists of six local hospital sites: Mile End Hospital, The London Chest Hospital, The Royal London Hospital, Newham University Hospital, St Bartholomew's Hospital and Whipps Cross University Hospital.

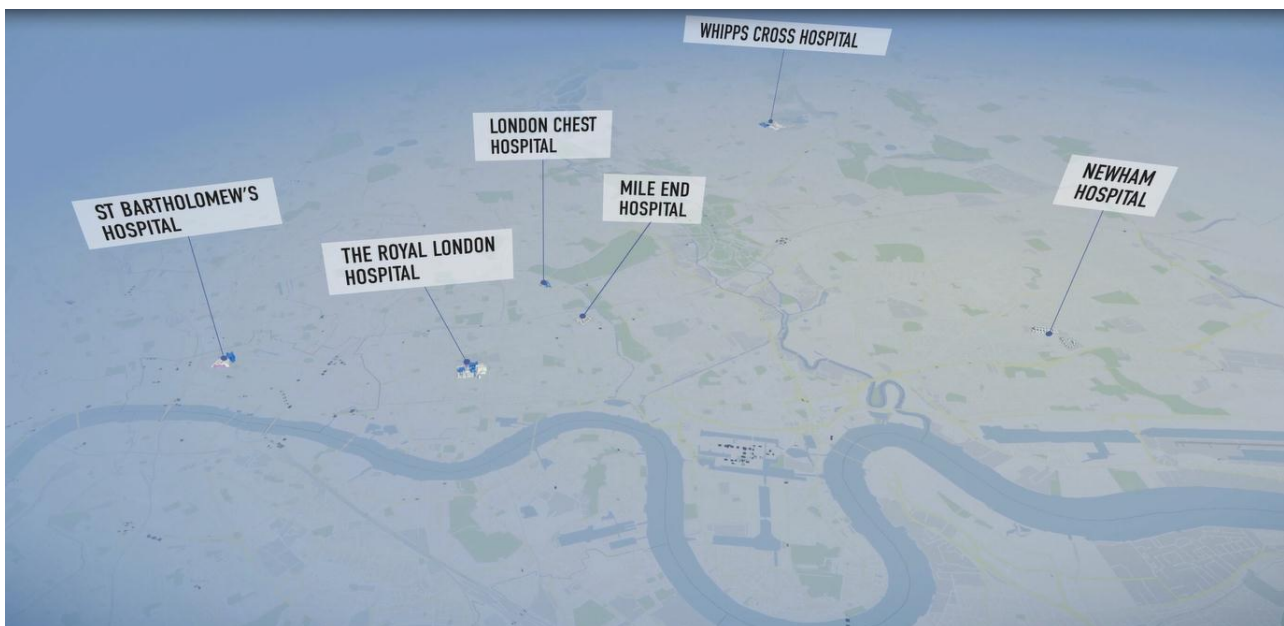


Figure 1: Trust's Hospital Sites

Services provided at the hospital sites include:

### 3.1.1 Former Barts and The London (BLT)

**The Royal London Hospital, Whitechapel:** A major acute hospital with a comprehensive range of secondary services including emergency care, surgery, children's health, women's health and maternity services together with specialist services including a Major Trauma Centre, a Hyper Acute Stroke Unit (HASU) and neurosciences. The site is benefitting from major capital investment - the new Royal London Hospital in 2012 with the final phase of the redevelopment due for completion in 2014.

**St. Bartholomew's ('Barts') Hospital, City of London:** A specialist hospital providing cancer, cardiovascular, fertility and sexual health services. The site is mid-way through a major capital development with the opening of the Barts Cancer Centre in 2010 and the development of a new Cardiovascular Centre in 2014 for services currently provided at The London Chest Hospital.

**The London Chest Hospital, Bethnal Green:** A specialist hospital providing services for health and lung conditions, including the trust's Heart Attack centre, together with services for patients with allergies and cystic fibrosis. The services currently provided on this site will move to Barts in 2014.

**Mile End Hospital:** Formerly owned by Tower Hamlets PCT, this site is the base for many of the Tower Hamlets community health services as well a number of outpatient clinics and services for older people.

The hospitals are home to many international experts and world-class specialties with a portfolio of specialist services includes leading cancer, cardiac, gastroenterology, trauma and emergency care centres, as well as one of Britain's biggest children's hospitals

### 3.1.2 Newham University Hospital (NUH)

**Newham University Hospital, Plaistow:** provides general acute services from Newham General Hospital (Plaistow). In addition, some Outpatient services are based at the Shrewsbury Road Health Centre (Forest Gate) and the Appleby Centre (Canning Town).

NUH primarily serve Newham's 240,000+ population but also provide services to the residents of Redbridge, Waltham Forest, Barking and Havering, City and Hackney and Tower Hamlets. The hospital offers a range of local services including a 24 hour Emergency Department, an Urgent Care Centre, a modern purpose built outpatient facility and Care of the Elderly unit. The hospital also houses the local stroke and TIA (Transient Ischaemic Attack) centre. The new maternity facilities opened in 2011 offers a much improved, high quality, modern and vibrant environment for mothers-to-be.

### 3.1.3 Whipps Cross Hospital (WCH)

**Whipps Cross University Hospital, Walthamstow** has been caring for the people of East London for over 100 years. The hospital serves a diverse local population of more than 350,000 people from Waltham Forest, Redbridge, and Epping Forest and further afield. The area has a wide variation in levels of deprivation and health needs, ranging from the most



deprived 5 per cent to amongst the most affluent 30 per cent of electoral wards in England. The trust had a turnover of £244million in 2010/11 and currently employs 3,400 staff.

Whipps Cross provides a full range of general inpatient, outpatient and day care services, as well as maternity services and a 24-hour Emergency Department and Urgent Care Centre. The trust has also built a strong reputation as a centre of excellence for various specialist services, including urology, ENT (Ears, Nose and Throat), audiology, cardiology, colorectal surgery, cancer care and acute stroke care. Many of these services are provided to local people who would otherwise need to travel further to access them.

## 3.2 History of implementation

Legacy Barts and The London had an aging (20 year plus) in-house designed and built Patient Administration System (PAS), A&E, and Orders and Results system. In addition it had limited maternity and theatre functionality. The in-house systems were expensive to maintain requiring a team of skilled programmers. Being in close proximity to the City of London it proved to be an on-going struggle to recruit and retain programmers due to the higher salaries and career opportunities available in the City of London. In addition the existing hardware environment was reaching the end of its natural life, resulting in frequent outages, which would require significant investment to correct, investment that the trust could not meet.

The Cerner Millennium Electronic Health Record (called CRS within the trust) was introduced (went live) on 6th April 2008. Cerner Millennium was implemented across all sites at BLT as a single deployment, including Tower Hamlets PCT facilities, now transferred to Barts Health. The functionality deployed included PAS (including correspondence), A&E, Maternity, Theatre Scheduling (Peri-operative documentation of surgical cases went live in December 2012), Case note tracking, Clinical Coding and Orders and Results.

## 3.3 The System Today

Since 2008 the trust has successfully re-configured Cerner Millennium as part of the New Hospital Programme utilising much of the improved functionality made available through the renegotiation of the Cerner contract. Today the CRS is central to the trust's Electronic Health Strategy, the focus of which is the development of a longitudinal paperless patient health record. This is based on three key principles 1) Single System - where all patient data can be recorded in a constant and coherent format, that is easily shareable and open to analysis, 2) Connectedness - where the trust's Electronic Health Record (EHR) data is available in real-time to primary care, community care and mental health clinical professionals thereby enabling joined up healthcare and 3) Big Data, the sharing of data enables the creation of central data repositories from which structured analysis is possible across a wide spectrum of circumstances, e.g. patient outcomes, satisfaction, benefits and service improvement, performance monitoring, demand projections, genomics and research. In 2012 the Electronic Health Record code base was upgraded which has directly supported the expansion of real-time recording and hence the transition to paperlite and paperless working. This trend is continuing as more specialties are adopting paperlite and paperless workflows based upon the benefits now being realised from the work of the early adopters. This trend is set to continue as the trust commences an extensive expansion programme which will deliver new more flexible clinical functionality which builds on the solid foundation of today. The prime objective of the expansion is the creation by 2016 of a single patient record for all Barts Health patients.

## 3.4 Approach to Deep Dive

### 3.4.1 Challenges

The task of the Deep Dive into benefits arising from the Cerner Millennium implementation at the trust was always going to be challenging for a number of reasons:

- 1) Prior to the system's implementation, there was no baseline information collected from which to measure improvement. Indeed, there were also no subsequent measurements taken post implementation.
- 2) The system was implemented over 5 years ago and we frequently found few who had a detailed recollection of what working processes were like before. Indeed we found in the Emergency Department even after 12 months many had forgotten the difficulties their colleagues at Whipps Cross were encountering with an older system.
- 3) The breadth of the system's use is very wide and diverse across multiple departments within the large teaching hospital.

To overcome the above we adopted the following approach:

- 1) With no baseline or subsequent post implementation measurements we needed confidence that any reported improvements and value-add activities, (be they increasing economy, efficiency or effectiveness), were stemming from the use of the system. This required us to observe staff using the system.
- 2) We ran studies at the Royal London and then at Whipps Cross which at the time of the studies did not have the Cerner Millennium system. Whipps Cross was in many cases representative of the Royal London prior to the Cerner Millennium deployment and where we found this was not the case we altered our approach.
- 3) Where a comparison could not be made with Whipps Cross, we sought the experiences and opinions of longer serving staff and patients but used this information carefully and in combination with other evidence.
- 4) We pinpointed the most successful uses of the system with the help of clinical leaders and focused on these areas. Even this reduced scope presented a significant piece of work given the challenges above. We knew this would not provide us with a complete understanding of the value the system has delivered to date across the trust. However, it provided us with information about the highest 'value-add' benefits that have been realised and has created a standard for others to emulate if possible.



### 3.4.2 Methodology

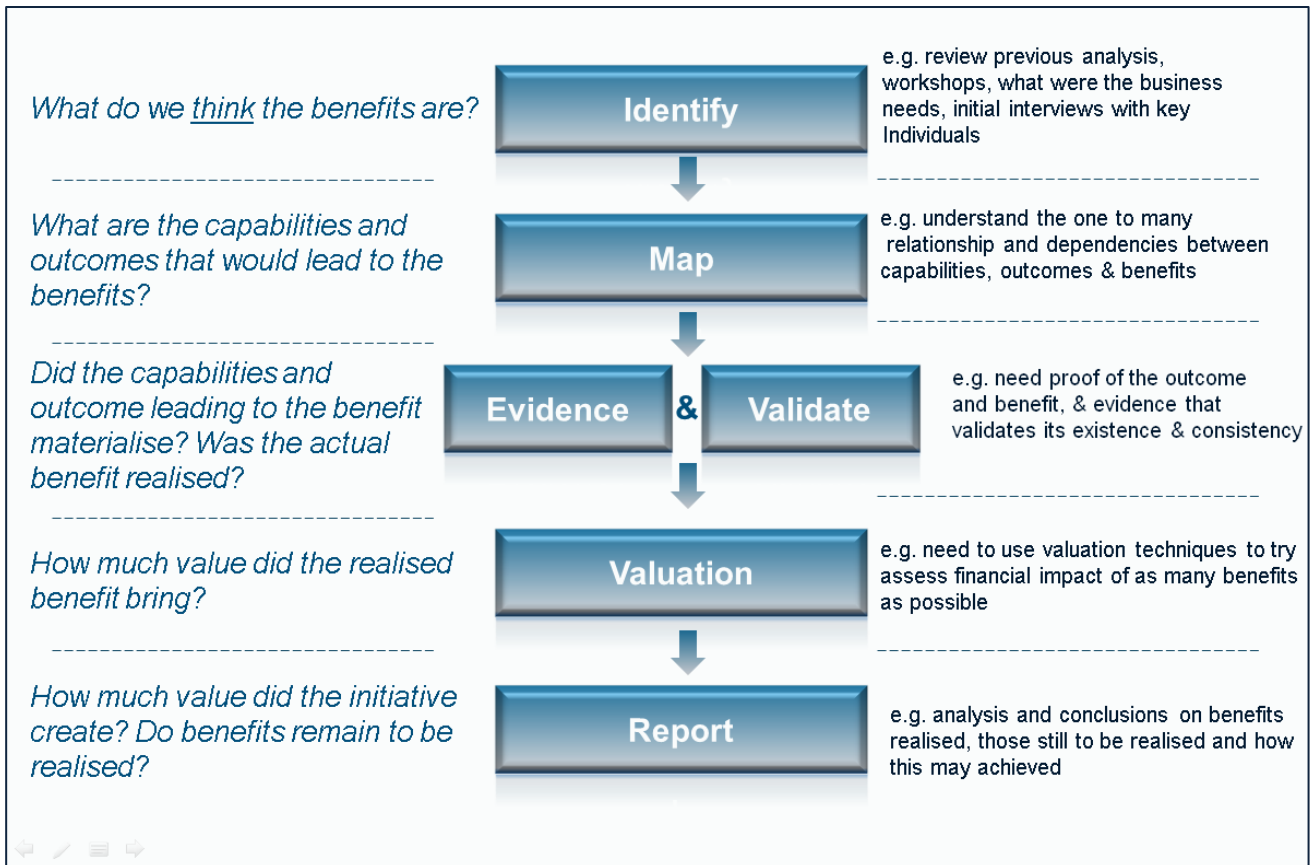


Figure 2: Methodology Diagram

The above diagram summarises the methodology we used for the Deep Dive at Barts Health NHS Trust. Other points to highlight for its future use are as follows:

- We worked directly with clinical and admin teams and focused on their current use of the system in their day to day work and processes.
- We spoke to management and staff.
- Our techniques for gathering the evidence to validate the benefits included observations (including timing processes); time sheets; interviewing; paper, online and postal surveys with staff, GPs and patients; audits of medical records; system and corporate data.

### 3.4.3 Principles and Assumptions

When undertaking our work, we followed the principles and assumptions below:

#### Principles

- When undertaking observations look to include a variety of different scenarios to help ensure the benefit has wide applicability
- Ensure a comparable observation is undertaken at Whipps Cross by attending the equivalent clinic, observing the equivalent role and note any variances that may have a bearing

- Look beyond the immediate use of the system for any knock-on benefits in other processes
- When relying on commentary as evidence, ensure there is multiple sources supporting the same benefit
- Focus on the main benefits rather than all the potential benefits. These invariably will be the ones answering clinical, patient or business needs.

### Assumptions

- The report is detailed enough to support its main objectives. More summarised versions and the need to meet other objectives can be fulfilled by taking the information in this report for other purposes.
- It is not anticipated this report will be read front to back but instead individual case studies will be used by the relevant people or the key findings sections will be read by those requiring a more summarised view.

### 3.4.4 Key Findings

The methodology used has been created for the purpose of this and future Deep Dives. Given the different approach we have used, we have made the following key findings and consider them important to share

- What people told us anecdotally in workshops frequently did not represent what we saw in our observations, especially with regards to time saved or time taken to complete tasks
- Similarly management tended to have an overinflated view of the benefits realised where aspiration sometimes became confused with reality.
- We attempted to bring the patient's voice to bear. This was most successfully achieved by paper based surveys in the hospital or interviewing patients when they were attending routine procedures. However, the responses tended to be overly positive and there was a fear amongst the team that people lost their voice somewhat whilst in the care of the hospital. Where we could we tried to mitigate this by encouraging patients to be as honest as possible and reassuring them as to the anonymity of their answers.
- By taking a much closer look at the realisation of benefits through the techniques used in the Deep Dive we were also able to understand why anticipated benefits have not been realised. We have therefore been able to include these barriers and ways to overcome them in this report.
- When people talk about the realisation of benefits it is very important that they understand that there are capabilities and outcomes that are required for benefits to be realised. Tracking the benefit itself is not always enough to understand whether a benefit has been truly realised with longevity and maximum effect.
- Equally we discovered a number of unanticipated or emergent benefits, and sometimes dis-benefits, that are important to identify and understand in order to assess the overall success of the system's implementation. Indeed, many of the planned benefits have not yet materialised.

## 4 Case Study 1 – Emergency Department

### 4.1 Key Findings

- The benefits of maximising the use of CRS in the ED department by going 'paperlite' were multiple and significant
- Having one source of reliable current and historical information about the patient, accessible to concurrent users, overcame the issues associated with only having a single CAS card to share
- The electronic whiteboard greatly improved the work of the department. It directed the team, enabled staff to perform their roles more efficiently and enhanced teamwork. It is clearer, more reliable and easier to maintain. It represents a significant improvement upon the often haphazard practice of maintaining a traditional whiteboard alongside a computer system
- Staff are able to respond faster and more appropriately to patients' needs with access to their history on CRS, including any current care plan
- CRS significantly reduces the overhead incurred when investigating breaches and provides managers and staff with the information they need to manage the department more effectively
- Information entered onto the system is easily locatable and the frequent experience of mislaying paper based information is overcome using CRS
- There is reduced duplication of tasks as data only needs to be entered once into one system and workarounds to convert paper based information into an electronic format are avoided
- The system helps manage the flow of patients vs. resourcing in ED by clearly showing the activity levels in each part of the department
- Handovers were faster and more structured at the Royal London with all the required information on the system
- Further use of the system may be hindered by performance and infrastructure concerns captured in staff surveys

## 4.2 Introduction

### 4.2.1 Going 'Paperlite'

Before Cerner Millennium in 2008, ED at the Royal London had a very basic computer system. All reporting was done on paper resulting in piles of paper notes and sheets of paper on every desk surface. The department spent its time 'paper-chasing'. There was invariably no access to the patient's historic paper record, with only the CAS card being available (the record created for patients on arrival and updated during their attendance).

In 2010 the first action taken by ED was to discontinue creating paper Discharge Summaries. The decision to migrate to a paper lite workflow was taken in January 2012, starting with the Paediatrics ED department then continuing with Adults later in the year. Now all new doctors on the ward are instructed not to write on paper and to enter information into the system instead. The only remaining sources of paper are ECGs, some blood results and prescribing along with Trauma.

The department adopted a 'find a problem – find a solution' mentality across its entire staff during the roll out. Nurses in ED created all the forms they needed and the department made the system work for them. Barts Health has a partnership with BT (Local Service Provider) and Cerner where there is a two-way flow of information. As a result the trust has been able to work with them to implement minor fixes and changes that were needed.

In order to assess the benefits of the paperlite processes at the Royal London, we undertook 4 hour observations in the following areas of the department at both the Royal London and Whipps Cross hospitals. We undertook the observations between 10am to 2pm and the departments were relatively quiet at these times so we were able to ask the staff questions and comprehend working practices.

- Cubicles Nurse
- Cubicles Doctor
- Board Nurse/Nurse Coordinator (responsible for whiteboard)
- Minor Injuries
- Reception

To gather evidence for our analysis of benefits we also undertook a staff survey at both sites; undertook a GP survey in Tower Hamlets and Waltham Forest; interviewed key members of staff and asked some of them to complete timesheets focused on specific tasks.

It should be noted that Whipps Cross implemented the Royal London ED solution in October 2013 and are now benefitting from many of the benefits outlined below thus overcoming many of the shortcomings we observed.

## 4.3 Benefits Observed

The benefits of the clinical team at Royal London having easy access to one instance of clear and reliable patient information at the click of a button were multiple and significant during our onsite observations.

This was seen clearly when we compared the Royal London and Whipps Cross sites. Whilst the Royal London had a single source of current and historical information held against the patient on a system with concurrent users, the Whipps Cross team had only a single set of paper notes, created on the patient’s arrival to refer to, and update.

Furthermore, the information in the system displayed on the electronic whiteboard drove the team at the Royal London whereas at Whipps Cross the duopoly of system and paper based processes resulted in notable confusion and inefficiencies in the team’s performance as the following narrative demonstrates.

### 4.3.1 Access to Patient Information

#### Electronic Whiteboard

The existence of an electronic whiteboard at the Royal London drove many of the benefits we witnessed. As the survey result below indicates the Royal London staff overwhelmingly feel managing patient care is easier with the electronic, as opposed to a traditional, whiteboard.

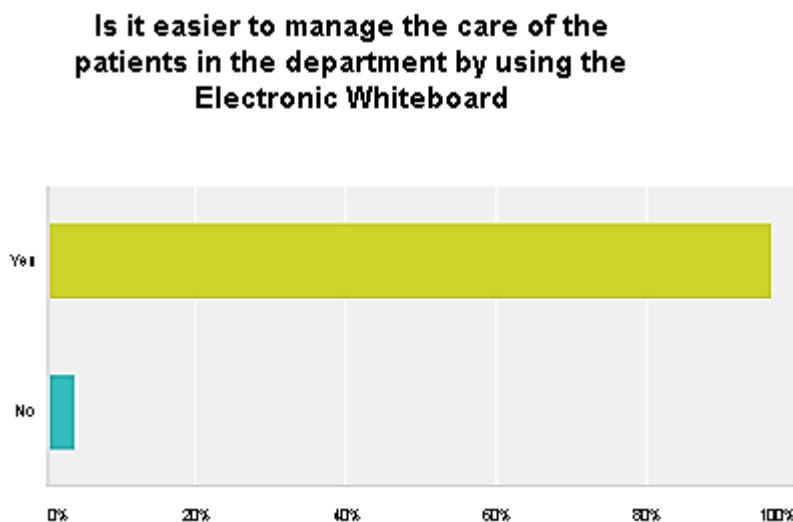


Figure 3: Survey - Electronic Whiteboard Preference

Why is this? Running a whiteboard alongside a computer system as happened at the Whipps Cross site generated confusion if there was any discrepancy between the two sets of information. We witnessed this happening on a regular basis during our observations. There was also the obvious inefficiency of inputting data into an electronic system and onto paper and the effort to keep them synchronised. Using solely the electronic system at the Royal London for all but a few tasks avoided these issues.





Figure 4: Electronic Whiteboard

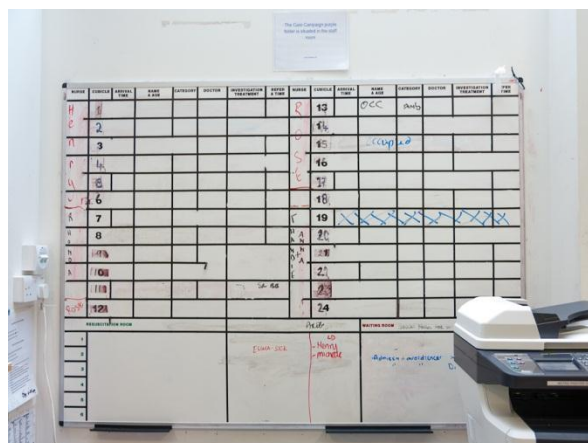


Figure 5: Traditional Whiteboard

Further problems observed at Whipps Cross using the existing ED system and traditional whiteboard, which were mitigated by the new CRS system at the Royal London, were as follows. Some staff were taking their steer from the whiteboard and updating, or helping to update, the board, including those without access to the system such as porters. Whilst others were driven more from what was on the computer system and entered data directly onto the system, generally the doctors. As a result the nurse board coordinator had to work hard to keep the two in sync.

However, inevitable discrepancies given the fast pace of the department generated queries for the nurse board coordinator to answer and as a result she then lost time to add to and synchronise the data and so the issue started to compound itself. On one occasion a colleague made an update to the board but wiped out the wrong patient. This then required the board nurse's help to try to recall the details to reinstate the patient, again detracting her from her 'updating' role.

On two occasions when the nurse board coordinator was using the CAS card to review a patient in order to update the system and board, we witnessed the card being taken from her desk, or literally out of her hand in one instance, as she turned to answer a query. This did not need to happen at the Royal London because the team were not dependent on sharing one CAS card to review and update information. At the Royal London the information is on the computer system and is therefore accessible to many for reference and updating.



Figure 6: Use of paper record with electronic data

It is understandable specialist doctors, visiting patients in ED at Whipps Cross, were requested to review the CAS card at the nurse board coordinator's desk. However, this entailed them having to duplicate the data in note form, taking around 5 minutes depending on the complexity of the case, often onto a piece of paper that came to hand. At the Royal London this information would have been available at the patient's bedside on a screen, or even before arriving in the department.

As time went on without fully managing to review and update the system and whiteboard, the time required to check, update and synchronise grew. At one point 11 people surrounded the nurse board coordinator’s desk needing to ask a question and a consultant had to revisit a patient to confirm details about their status. Another telling moment concerning the clarity of the information available at Whipps Cross was when the porters were attempting to decipher the whiteboard information. They were seen blocking out part of the information on the whiteboard with their hands trying to see something that would help identify the patient and their status/portering needs.

If staff had had more certainty and clarity around the information at their disposal they would have asked fewer questions. A staff survey indicated, whilst at Whipps Cross just over half the respondents had less than 60% confidence in the patient information being up to date, this number fell to 16% of staff at the Royal London. Indeed, at the Royal London, the nurse coordinator was queried significantly less as people took their lead from the information on the system.

***How confident are you that the information in the patient's notes is the latest information about that patient?***

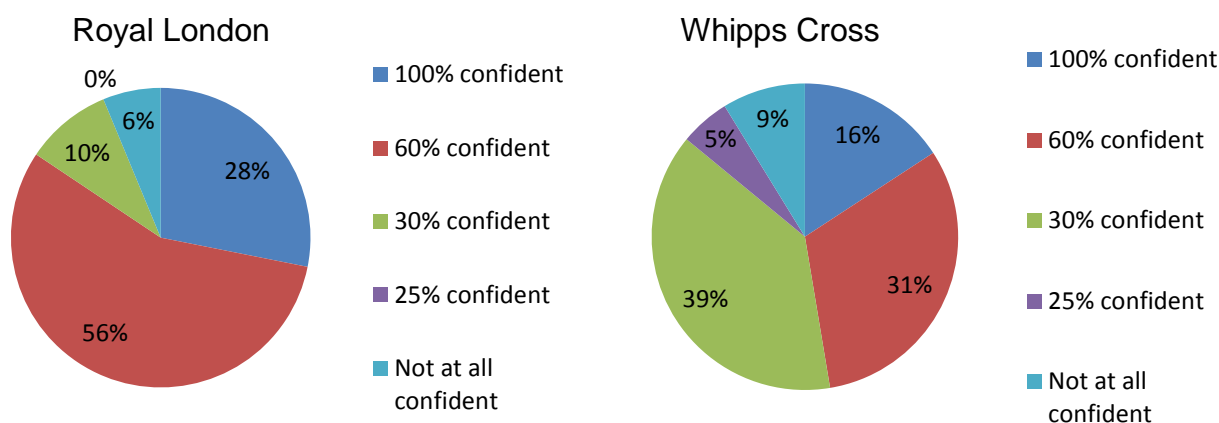


Figure 7: Confidence in patient information

The team working with the electronic whiteboard benefits from the board being automatically updated by the CRS system as steps in the patient’s treatment are completed, for example when a patient is discharged. Having a consistent method of annotating the ‘board’ with a clearly defined set of symbols also maintains clarity. This avoided the inconsistent use of recognised symbols and also the use of any less well recognised forms of short hand, both of which were observed at Whipps Cross and contributed to confusion. For example, the existing shorthand on the whiteboard at Whipps Cross did not accommodate the ‘refusal of bloods’ by one patient. They were therefore shown as complete but of course this was not the case. The bloods icon at the Royal London **does** need to be clicked on to show bloods are no longer required but visible additional notes can easily be added to accommodate a scenario such as this.

**Patient History**

Also notable is the amount of information available to clinicians to make decisions. This will be a recurring theme in the report but for the clinicians in ED this means being able to view a



patient's history of care at the hospital in a few clicks including observations, test results, X-rays or scans, complications, known allergies, history and previous attendances all in one place on the system. Information regarding treatment elsewhere is also visible if this has been shared with the hospital and put onto the system.

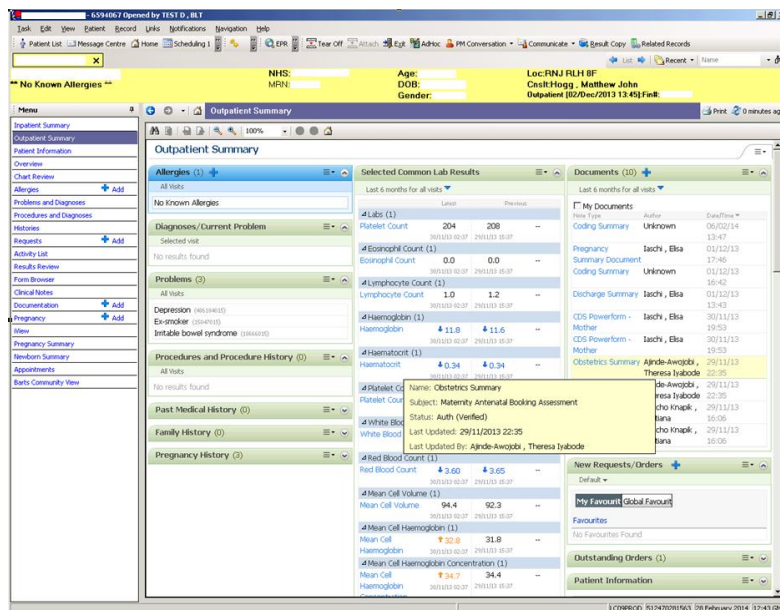


Figure 8: Outpatient summary screen on CRS

The lack of gaps in the data and improved levels of supporting information leads to not only better decisions because choices are not having to be made without a fuller picture but also decisions which are more robust and can be made much faster. This is particularly important in an emergency scenario where decisions need to be made quickly. Again, this is evidenced by those patients with chronic conditions.

During our observation a man attended the Royal London ED with very abnormal ECG readings. The team could immediately see he had had previous treatment at Barts for his heart and was fitted with a pace maker so the ED team were able to liaise with the Cardiology team for immediate assistance on what to do. Previous hospital attendances were not visible to the ED team at Whipps Cross and previous ED attendances could only be determined by locating a scanned copy of the CAS card on the document management system which not everyone had access to. We did not see this done during our observations although we were told it was possible by a few individuals in the department.

### Patient's Care Plan

In an emergency, ED staff are also able to access specific information about a patient's treatment plan. This could include, for example, how to manage a Dementia patient, the amount of pain relief (morphine based) to administer to a Sickle Cell Disorder patient or the drugs to give to a Haemophiliac patient to slow a bleed. As Dr Karim Ahmad, Consultant in Emergency Medicine commented "...access to the sickle cell patient protocols is very valuable and we use them on a daily basis. They allow for an individualised response to each patient and as they are so accessible [this results in] faster access to pain relief for the patient. They also help us manage complex patients, for example those with behavioural problems and possibly opiate addiction....all staff are immediately aware of treatment plans." The other examples mentioned above will be discussed in more detail later in the report.

The benefits of having the patient record visible in ED at the Royal London can also avoid duplicating recent tests and provides the clinicians with a much broader understanding of not only the patient’s condition but also their circumstances. Historical patient information helps discharge patients sooner because the consultant knows what ‘normal’ is for the patient and can be comfortable their condition is not a serious exacerbation. They can also be assured ‘home’ arrangements are suitable. Both these benefits will be considered in more detail later in the report. It should not be surprisingly therefore that over 97% of ED staff answering our survey agreed "Having access to historical notes is very helpful for making a decision".

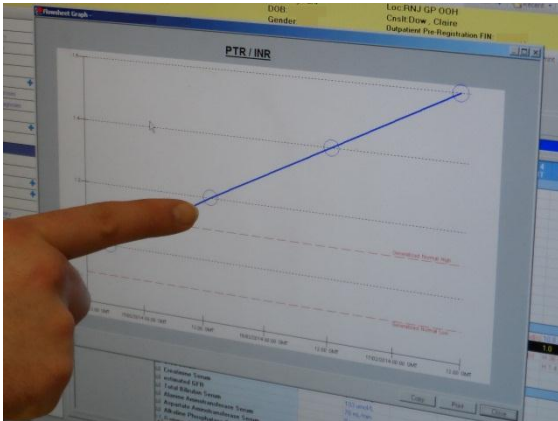


Figure 9: Historic information available on CRS

***“Over 97% of ED staff answering our survey agreed "Having access to historical notes is very helpful for making a decision"”***

### Less Paper Chasing

Another striking observation at the Whipps Cross site, which we saw significantly less of at Royal London, was the almost constant hunting for information, particularly the CAS card. As one survey respondent commented “Paper copies get misplaced in a busy ED”. We witnessed one doctor trying to find the CAS card for 18 minutes during which time they were not able to provide patient care. This was not the fault of the staff but the effect of the notes being required by several different people at the same time and therefore being taken away from the trolley for the required task, e.g. for observations to be taken or drugs administered. The trolley was riffled through by a clinician on average every 6 minutes over the course of an hour and frequently to no avail and their hunt continued elsewhere. We also saw discharging being delayed by missing notes for up to 25 minutes. There was also a practice of performing a short discharge when a patient had returned to ED but they had not been discharged on the system, normally due to missing notes. This would allow them to be ‘attended’ again on the system.



Figure 10: Pigeon holes at Royal London



Figure 11: Sling trolley at Whipps Cross

***“Paper copies get misplaced in a busy ED”***

At the Royal London, the only remaining paper comprised the yellow drugs chart (as seen in the photograph on the left above). Similar problems with clinicians searching for the chart were experienced but to a much lesser extent. The paper was invariably in only one of two places, (the pigeon holes labelled with the cubicle numbers or with the patient in the cubicle.) A temporarily mislaid form was only observed three times during our 4 hour observation at the Royal London.

### 4.3.2 Patient Flow Management

#### Patients' Location

The search in ED at Whipps Cross was not only limited to paper. It was confusing sometimes for staff as to the whereabouts of patients because they were in X-ray, had been moved from emergency assessment area to the Majors area or indeed they had been discharged. One example of this involved a receptionist searching for a patient for 20 minutes, whom, it transpired, had been discharged. On the same morning, staff were questioning each other about a patient whom no one could clearly recall and the cubicles were again searched. In another incident confusion was caused by two patients being the wrong way round on the whiteboard.

Again this confusion did not arise at the Royal London because the patient's discharge would have been clearly visible on the system as well as their onward location, e.g. ward, home. On three occasions we saw a phone call inquiring as to the whereabouts of patients and the nurse board coordinator was able to look in the system and give an immediate response for any patient in any part of ED. The system at the Royal London also clearly indicated when patients were at X-ray, for example, although it should be noted this status was dependent on the icon being updated on the screen by the nurse coordinator with the click of a button.

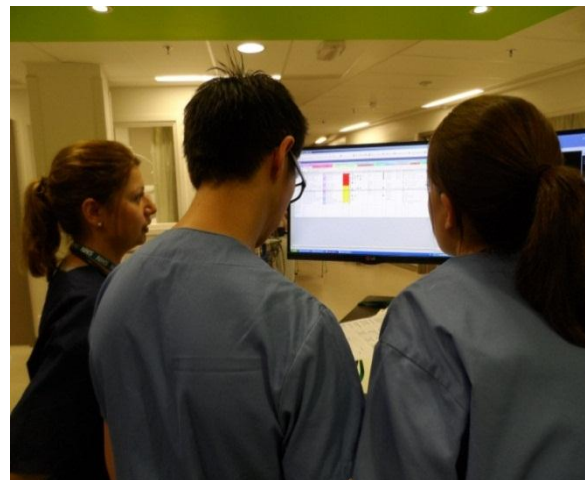


Figure 12: Electronic whiteboard in use



Figure 13: Royal London site

The system's ability to show an accurate location for the patients at the Royal London was not only useful for the immediate team in the department, but specialists coming to the department could more easily locate their patient and check whether test results were back etc. even before visiting the ED. Given the size of the Royal London hospital this can save a significant amount of time for registrars and consultants. It is estimated that a consultant travelling from a ward to ED could take up to 10 minutes given the size of the site and number of floors in the new hospital and lift system.



## Activity Levels

Furthermore, matrons and nurse coordinators can clearly see patients by area and therefore across the department, and if needs be the matron can do this quickly without stepping out onto the floor. Not only can the nurse board coordinator or matron assess the best resourcing arrangement for her or his immediate area e.g. Initial Assessment, Emergency Assessment or Majors, but they can also reallocate staff to a particularly busy area of the department or anticipate a high number of patients moving through their area ahead of time by seeing whether patients are due, pending or arrived. This flexing of resourcing was seen across doctors and nurses at the Royal London site to good effect as Emergency Assessment and Resus became busy with an influx of patients and staff were moved from Majors to help. In the staff survey, a clinician commented “It is exceptionally difficult to manage the flow through the department without it [CRS system].” At Whipps Cross a similar process existed but consisted of the coordinator nurse moving around the department on a regular basis recording the number of patients in each area on a clipboard.

## Staff Handovers

The amount of time the patient has been in ED was visible on the system at both sites, as was the time prior to breaching which was colour coded. The difference at Royal London was that the stage of the patient’s treatment was quicker to ascertain, by the matron on her rounds for example. Indeed, handovers as shifts changed or as patients moved between areas of the department, were much slicker as the clinicians referred to the information on the system which provided a focus and structure to the handover as well as record to be easily referred back to if necessary.



Figure 14: Effective briefing of patients’ status

In the same way, staff were more effective in briefing the matron as she reviewed the patients and their status on her rounds. Handovers at Whipps Cross were taking over 4 minutes (when not interrupted by a colleague, phone or patient which was rare), whereas at the Royal London site there were closer to 2 minutes. Although the time saving may not seem that significant, handovers happen frequently and the shorter handover was less prone to be interrupted because it was completed more quickly.

This also appeared to enable staff at the Royal London to be one step ahead of their colleagues at Whipps Cross in terms of trying to mitigate breaches. That said during our observations at both sites, which were of equal length and during the same part of the day, the breaches were higher at Royal London. However, there are a multitude of reasons for breaches, even just during our observations, so extreme caution should be exercised when trying to use this metric to differentiate between sites and the successful, or not, use of CRS. One differentiator is the Royal London treats far more trauma cases than Whipps Cross which by their very nature can be much more complex.

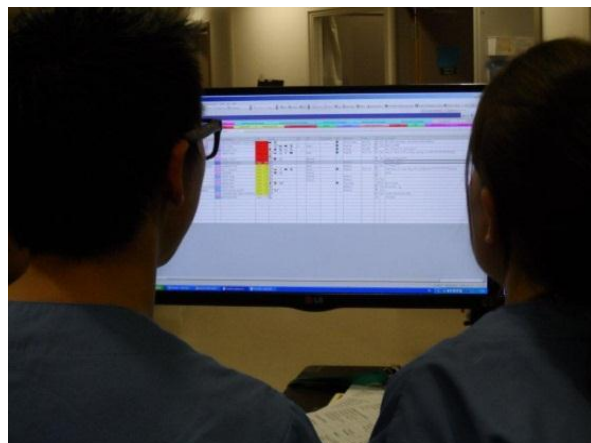


Figure 15: Viewing breach status

## Discharging Patients

Finally, there are several benefits around the discharge process. Instead of the lengthy administrative discharge process at Whipps Cross which took nearly 10 minutes once the CAS card had been finalised by doctors with their notes, the process at the Royal London takes minutes. This is largely because the doctors now have to enter notes onto the system as they treat patients. This information is then used by them to create a discharge note within 4 to 5 minutes. The nurse coordinator then takes approximately 1 minute to discharge the patient on the system which leaves the administrators with a click of a button. This seemed to avoid discharges being delayed at the Royal London because the notes were not complete. We saw this happen three times at Whipps Cross during our 4 hour observation period.

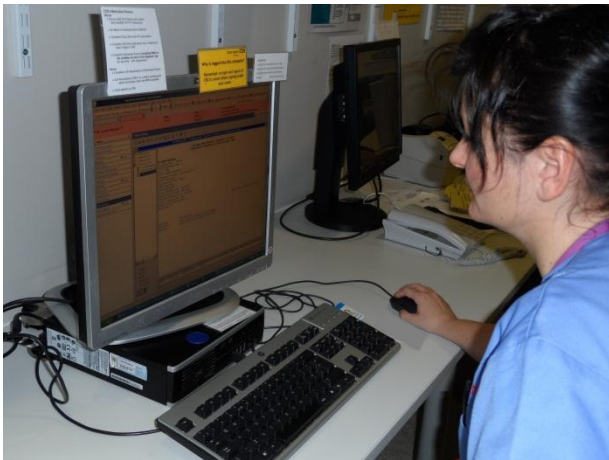


Figure 16: Electronic information immediately available

We anticipated that there would also be an onward benefit for GPs in that they would receive the discharge letter sooner or that the content would be improved. However, we surveyed GPs surrounding the Royal London and Whipps Cross sites and their responses consistently complained about the speed of arrival and insufficient content. It is therefore suggested the trust should investigate this potential gap in benefits as there is an increased level of electronic information immediately available to send to GPs in the form of a letter as soon as the patient is discharged.

## 4.3.3 Minimising Duplication

### Checking in and Discharging Patients

Another notable benefit observed in the Emergency Department at the Royal London site compared to the Whipps Cross site was the removal of duplicated tasks. This included logging and entering data onto multiple systems in reception to register patients, and discharging them on three separate systems, plus ensuring the consistency of the information entered across all three. For administrative staff, this doubled the time required to complete the check in and discharge task activities, equating to an extra 10 minutes per patient on average. Whipps Cross see on average over 13,000 patients a month, the equivalent figure at the Royal London is approximately 12,500 patients.

### Forms and Lists

Form completion, e.g. to request tests, transport home, ambulance transfers and the creation of lists, e.g. patient admission lists, lists of orders made, list of patients going home by ambulance, were still very much in evidence at Whipps Cross. In the case of an ambulance request, this form had to be completed and faxed from a fax machine located down the corridor at Whipps Cross before being added to a requests list, which took 9 minutes during our observations. Forms and particularly lists were rarely seen at the Royal London.

## Ordering Tests

The actual time taken to complete the paper form for ordering a blood test did not differ significantly from the time taken to create the order on the computer system, 60-90 seconds for a paper order, 30-60 seconds for an electronic order. There are approximately 360 tests ordered from ED per day. However, there was a clear time saving for the Royal London when multiple blood tests were ordered from different pathology specialities for the same patient as it avoided the same information being entered a number of times. Furthermore the forms do not need physically distributing at the Royal London as this was also completed by the system through its connectivity with other systems, for example, the pathology system and PACS.



Figure 17: Nurse ordering test on computer

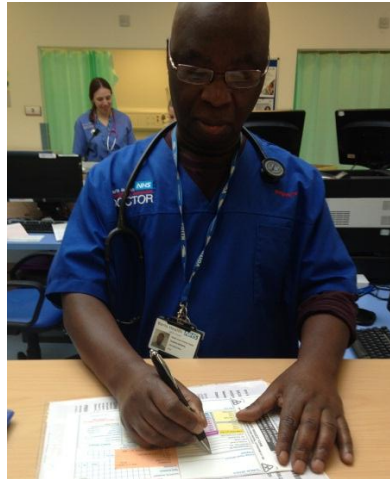


Figure 18: Nurse writing order at Whipps Cross

The ability to track the completion of tests is also simplified by the CRS system, as their progress and completion can be checked within CRS rather than contacting pathology or logging onto the pathology system. There is an alert against the patient as soon as the results are available in CRS and the results are clearly visible on the front page of the patient's record. At Whipps Cross ED doctors and nurses had to wait for the results to arrive on paper. We did not observe test result slips going astray at Whipps Cross during our observations, but the electronic transfer of the results from pathology or PACS into CRS does mitigate the potential of this happening.

Furthermore, in one scenario the bloods had to be retaken because they become lost in transit to pathology and by the time the results absence was noted and the samples located stuck in the chute, they had expired. Not only did the bloods have to be retaken but a breach was then inevitable. The request automatically arriving ahead of the bloods at the Royal London may well have resulted in their loss being recognised and rectified sooner.



Alerts	Name	Race	Sex	Age	HFN	Length of Stay	Consultant	Medical Service	GP
☆	Harbin, Rita					28.8 Days	Trueta, Prasad	Trauma and Orthopaedics	Macklin, Sean Christopher
☆	McKintosh, James Edward					27.2 Days	Trueta, Prasad	Neurology	Adnan, Muhammad
☆	Elanoubi, Habbabouk Ibrahim					28.4 Days	Trueta, Prasad	Neurology	ROBINSON VA, Thomas
☆	Lang, Junsul Leonard					32.2 Days	Trueta, Prasad	Neurology	Chari, Manish
☆	Chang, Leo Hui-Hang					30.3 Days	Trueta, Prasad	Neurology	Pandey, Jyotsna
☆	Harbin, Rita					30.3 Days	Trueta, Prasad	Neurology	Mahajan, Tarak
☆	Shahin, Khalid					30.3 Days	Trueta, Prasad	ENT	Bhatnagar, Indira Swarna
☆	Wadley, John Patrick					30.3 Days	Trueta, Prasad	ENT	Stone, Simon Lester
☆	Sikri, Michael George					30.3 Days	Trueta, Prasad	ENT	Jagatheeswaran, Madhav
☆	Ed, Jonathan Garfield					30.3 Days	Trueta, Prasad	ENT	Somji, Chandu Kavita
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Williams, Sam
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Murphy, Eimear
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Chenoweth, Alex
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Highton, Cathy Ruth
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	USP, Fabio Augusto Milan
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Patel, Vinod Inval
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Leakin, Michael Sean
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	THE SPRINGFIELD HEALTH CENTRE - Pooled List
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	ROLLARD PONY SURGERY - Pooled List
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Cole, Andrew Lee
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Linnam, Martin Robert
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Brown, Bernard
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Randhawa, Raju Singh
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Reade, Peter Mark
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Not Known - No Registered GP
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Chak, Shiba
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Martin, Peter Kevin
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Quinn, Fionnuala
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Lee, Jonathan
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Khalid, Ibtisam Ghafar
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Not Registered GP
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Callaghan, Michael Stuart David
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Highton, Cathy Ruth
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Kar, Anil Vag
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Lyle, Robert Douglas Head
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Alexander, Anika Katarina
☆	Elanoubi, Habbabouk Ibrahim					30.3 Days	Trueta, Prasad	ENT	Dr. Hamed

Figure 19: Alerts showing test results are available

### ‘Workarounds’

Inefficient ‘workarounds’ were eradicated at the Royal London through their use of CRS. The most notable of these ‘workarounds’ was photocopying the CAS card on discharge so the copies could then be scanned into the system. This practice took reception staff on average 3 minutes per patient. Given Whipps Cross see on average 13000+ patients per month, this soon becomes a costly workaround. This exercise would also need to be repeated if the CAS card was updated in anyway with results or further discharge information and this was not an infrequent occurrence. We saw this happen at least twice during our 4 hour observation period. We also witnessed an example of the notes leaving ED to go to AAU (Acute Admissions Unit) without being completed and having to be retrieved, updated and rescanned, wasting c. 1 hour of people’s time. These issues were avoided at the Royal London due to the workflow and patient information being on the system.



Figure 20: Photocopying CAS card

### Wrong door....

The final example when considering the duplication of tasks was the treatment of a patient with a serious complaint at the Whipps Cross site who should have been attending an inpatient appointment the day of our observation, but whom arrived in ED instead. The patient was treated for approximately 2 hours in ED, including undergoing tests and investigations. At the Royal London site with CRS it is highly unlikely this would have happened because patient attendances are clearly on the front page of the patient’s record and the inpatient appointment that day would have been clearly visible. Whilst not a frequent



event, this episode again highlights the benefits of having the patient’s record accessible to ED staff.

### 4.3.4 Non Clinical Processes

#### Breach Management

One area where significant time has been saved as a result of using CRS in ED is around breach management. Without CRS at the Royal London, the episodes of care in ED that exceeded 4 hours were identified and reviewed by a doctor, grade 8a manager and grade 8a matron every day for 2 to 3 hours per day. Now the CRS system captures the breach reason from the doctor as the patient is discharged or admitted, the review of paper notes is no longer required. The same process is now covered by a grade 5 spending 1.5 hours maximum compiling a report and the consultant and matron reviewing the report in 15 to 30 minutes depending on the number of breaches.

Royal London				Validated by			Type 1 Performance
				Tony Luther with breach reasons recorded at time of			83.73%
				RLH TYPE 1	RLH TYPE 3	SBH TYPE 3	
Date:	04/02/2014	Attendances:	338	91	27		
Times of trauma calls:	04:27; 04:44; 04:45; 05:09; 10:23; 12:57; 15:06; 16:33; 18:02; 19:31; 21:48	Admissions:					9
		Breaches:	55				55
Notes 00:00 to 08:00	consultant in charge: Simon Walsh nurse in charge: Site Manager:	Shift comments on issues relating to ED/Streaming/WIC:	Attendances x 53 Breaches x 16 Trauma x 4 Ambulances x 19 Admissions x 18			Breach Analysis: 51% beds 13% a&e 5% clinical 27% specialty 2% imaging 2% mental health  24% Non-admitted breaches  29% patient breach arriving before 08:00 15% patient breach arriving after 17:00	
Notes 08:00 to 14:00	consultant in charge: heri/Adam Woodgate nurse in charge: Site Manager:	Shift comments on issues relating to ED/Streaming/WIC:	Attendances x 154 Breaches x 21 Trauma x 2 Ambulances x 27 Admissions x 26				
Notes 14:00 to 20:00	consultant in charge: Gareth Grier nurse in charge: Site Manager:	Shift comments on issues relating to ED/Streaming/WIC:	Attendances x 171 Breaches x 12 Trauma x 4 Ambulances x 38 Admissions x 28				
consultant in charge: Karim Ahmad nurse in charge: Site Manager:		Shift comments on issues relating to ED/Streaming/WIC:	Attendances x 78 Breaches x 6 Trauma x 1 Ambulances x 29 Admissions x 19				
Greater than 4hr trolley waits from DTA			13				

Figure 21: Breach Report

If they wish to check on a breach they can easily do this by referring to the system where events are chronologically listed, unlike in the paper notes. Time and date stamping in the CRS also means that there is an audit trail on all actions across the hospital which tends to be more accurate than looking at the time information is written into the patient record. For example, if the breach reason is a delayed CT scan, it is possible to quickly see when it was ordered, completed and reported. Before, it would have taken hours to gather this information. Indeed, following a busy weekend, 160 breaches needed to be looked at first thing on Monday morning and with so many breaches to investigate this would have taken until mid-afternoon.

#### Daily Performance Dashboard

The clinical time saved around breach management has been diverted back to patient care. The managerial and administrative time saved has been used to produce more valuable reports and analysis to provide information to the Clinical Commissioning Groups (CCG) and Department of Health (DH) but also to consider with colleagues how the department can work better. Asked whether this had made him more strategic, Tony Luther, ED Service Manager said “because we are in the winter period which is very busy, we are still reacting to circumstances, but I do have access to more data, and am able to get the information I need

fairly quickly, which gives me more control and can work out with colleagues what we can do differently.”

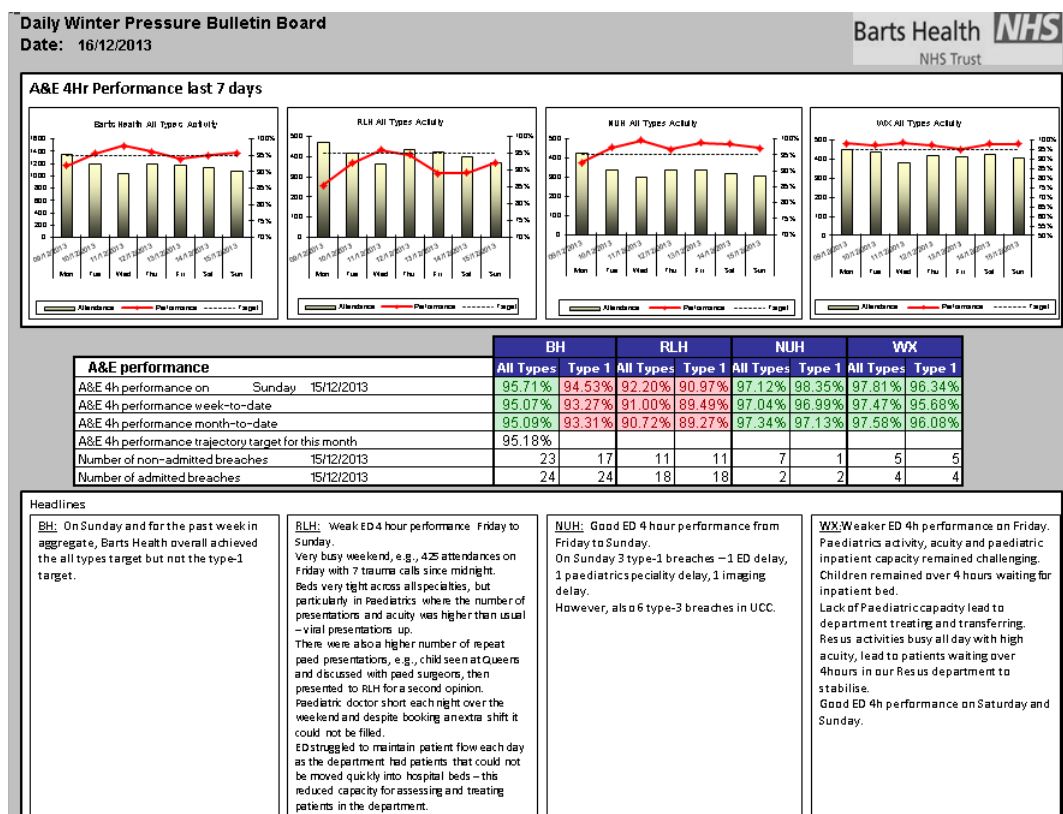


Figure 22: Daily Performance Dashboard

For example, the daily performance dashboard has been created showing an activity graph for the day by departmental area, attendances, peaks and dips in activity and where breaches occurred for example. Staff can then see the problem areas for themselves from the information that is displayed each day in the department and take action to reconsider the workflow, for example, and generally try to make improvements. The former ED system would not have been able to extract this information, especially on a quick daily basis and the information would not have been broken down by area which is key. Tony Luther, ED Service Manager, said “being able to feed back to staff the previous day’s situation and have a graphic picture is a real bonus, the staff now have information to help resolve any problems which is a real benefit, part of my job is to give them that information, as they are on the front line and can have the answers.”

### Resource Management

ED management can see from the computer screen how busy the department is becoming and given the size of the department and its separate treatment rooms, this overview is important in accurately and quickly gauging what is happening and how to most efficiently use the staff available. There is a danger of walking out onto the floor and seeing a small fire to put out not realising there is a much bigger one which is not visible around the corner. The system therefore supports managers in intervening where their help is most urgently required.

The computer system is also used during daily meetings to give an up to the minute picture of what is happening on the floor of ED and the rest of the hospital to help improve the movement of patients through the system. It also allows management to deal with

complaints much more effectively because they have more information at their fingertips on what has happened but also they can hopefully diffuse a complaint before it comes more serious by acting quickly and with reliable information.

## 4.4 Conclusion and Improvements

### 4.4.1 Conclusions

When we commenced our observations at both sites we could not have anticipated the number of differences we would see between the paperlite process supported by the use of CRS at Royal London and the paper based process using an older computer system at Whipps Cross. The benefits of a good computer system used well at the Royal London were very noticeable, as has been demonstrated and bulleted in the key findings. Not fully captured above though is the obvious impact more reliable and readily available information had on the team's ability to work well together. With less confusion, and indeed frustration on occasions, we saw much more discussion amongst the team of doctors and nurses on what was best for the patient. Staff members were also seen to better support each other and it appeared a more controlled and relatively calmer environment. In this environment, staff also seemed to have more time to answer patient/patients' relatives enquiries and requests. At Whipps Cross, for example, it took 45 minutes to organise a commode for a patient as the department became busy. No similar incident was observed at the Royal London during our onsite observations.

Following our initial studies in the Whipps Cross's ED Department, Cerner Millennium was implemented and we repeated our observations a month later. Although Whipps Cross ED are not yet realising many of the benefits above because the rest of the hospital is yet to adopt CRS and it was still a relatively new system to the ED, we could see the Emergency Department overcoming many of the challenges highlighted in this report and starting to benefit from the system. Furthermore, it confirmed to us that it was the system that was making a difference between the two sites rather than another factor.

### 4.4.2 Improvements

So what is next for the CRS implementation in the Emergency Department at the Royal London? Clinical Director of Emergency Medicine, Malik Ramahdan has said. "Paperless is the easy bit - the next step for us is device connectivity, incorporating data from bedside medical devices" He also believes Cerner Millennium needs to be more mobile, so staff can use it on tablets and smartphones. One of the nurse coordinators at the Royal London also expressed the desire to have an interactive map of the department showing cubicles and their occupants.

Possible improvements we noted during our observations at the Royal London, was the provision of more computers in the cubicles area as we witnessed a queue for their use and potentially information not being entered immediately onto the system as there was not the time to wait for a computer to become available.

At Whipps Cross, there appeared to be sufficient computers but those in the cubicles were still not operational six weeks post Go Live. Walkabout phones would have allowed staff to answer calls as they moved around the department, preventing delays in securing beds for admitted patients. A senior nurse at Whipps Cross commented that 'telephone tag' was a significant inefficiency with obvious impact on the patient flow. Indeed, in contrast, at the

Royal London we saw the nurse coordinator secure a bed with a ward using a walkabout phone as she delivered a drug to a nurse in a cubicle down the corridor.

Finally, we noted at Whipps Cross that the ambulance crews have to wait sometimes c.10-15minutes to speak to a doctor who then enters the information onto the system whilst speaking to the ambulance crew, which again takes several minutes. If possible, it may save time for the ambulance crew to enter the information they can about the patient into the system on arrival, speeding up the handover process and freeing up the ambulance crews to leave sooner.



Figure 23: Ambulance handover

Thought also needs to be given at both sites about speeding up access for specialists visiting the department. A registrar complained to us about having to wait for 30 minutes in ED at Royal London for the system to boot up so he could enter the information he needed to about the patient. His frustration was then compounded by his electronic notes being printed off for the ward when the patient was admitted.

Indeed, infrastructure concerns were also noted on several survey responses. One nurse commented “CRS is a useful system but it is often slow and often does not work at all which is a major problem when a department is utterly reliant on it.” Another commented “When it works it is incomparably better than paper notes, which are a total anachronism”.

## 5 Case Study 2 – Outpatients

### 5.1 Key Findings

- An uplift in more fully coded episodes of care achieved by clinicians coding on CRS has secured additional income for the trust in the millions
- The main benefit of adopting CRS in Referrals Management was the ability to run a more efficient and flexible fully centralised booking team
- Automatic validation of the NHS number against PDS helps avoid the creation of duplicate records and the effort required to resolve them
- There are far fewer ‘missing’ paper patient records and those that are missing are easier to locate due to case note tracking and having access to CRS
- Prepped patient notes are available in a timelier manner prior to the Outpatient Clinic
- Significant benefits will be realised once paper records no longer need to be pulled/located, prepped and delivered to and collected from clinics
- The centralisation of patient data in CRS allows doctors to be well briefed for the consultations in a few minutes
- CRS streamlines the ordering process saving up to 1.5 minutes per order compared to paper based processes. Approximately 2,500 pathology orders are made every day in Outpatient clinics
- Doctors can produce their clinic letters in CRS in 2 to 3 minutes using templates compared to 10-15 minutes, (plus checking and amendment time), when medical secretaries type up their dictation
- Doctors creating their own letters can allow a record of the appointment to be promptly shared with the patient, GP and the rest of the hospital
- The benefits of CRS for those working in clinic management are limited when compared to other areas. CRS’s need for more information to be entered and the use of drop down boxes and mandatory data fields make processes more time consuming and are considered by some to be dis-benefits
- It will be hard to convince other outpatient clinics to adopt paperless or paperlite working unless IT issues can be resolved



## 5.2 Introduction

When looking at the use of CRS in the Outpatients area we decided to follow the patient journey, starting with the referral and ending with the appointment in clinic. The areas we analysed are listed below in the order they are covered in this section.

- Referrals Management
- Records Management
- Clinic Management
- Outpatient Clinics – reception and clinic appointments

Our focus therefore moved from the use of CRS as a clinical system in the Emergency Department to one used for more administrative purposes. We maintained the approach of undertaking observations and interviewing staff throughout the areas above. We also took the opportunity to involve patients in our study through the use of paper based surveys which they completed whilst waiting for their appointments.

The clinics we observed at the Royal London were those using the system to good effect. We then tried to observe the nearest equivalent clinic at Whipps Cross in an attempt to make the comparison reliable. We observed ten clinics in total.

## 5.3 Benefits Observed

### 5.3.1 Referrals

#### Centralised Appointments Booking

One of the most significant improvements in the referrals area using CRS, centres around running a centralised booking service using the system. The implementation of CRS provided the opportunity to centralise the function, especially given the integrated nature of the system and the information it made available to those booking appointments. All referrals are channelled to one location, and patients can contact a single number at the hospital to arrange or cancel their appointments. This can be convenient if they have to book several appointments for different clinics as the number acts as a 'one stop' shop. As one Royal London patient commented in their survey response, 'it was quick and helpful'. It is also an efficient use of resources from a trust's perspective, allowing staff to be pooled and flexed to meet demand peaks and to provide cover for absent colleagues.



Figure 24: Centralised referrals team

*'it was quick and helpful'.*

There is an argument to suggest that the personal touch of a consultant's dedicated appointments clerk is lost with a centralised booking service. However, we found where this arrangement is used at Whipps Cross, and patients are dependent on speaking to one individual, holiday cover can be limited and patients can wait until the clerk returns to arrange their appointments. This can be problematic as well as frustrating, especially when coordinating multiple appointments and tests.

Furthermore, the patient survey results demonstrate patients being slightly happier with the service provided by the Royal London than at Whipps Cross, although the level of patient satisfaction across both sites is notably high. For example, at the Royal London only 7% felt that it was not quick and easy to make outpatients appointment, whereas 21% felt this way at Whipps Cross. Similarly, only 5% felt that advice and support was not available when making a booking whereas this figure increased to 11% at Whipps Cross. One patient responded positively about their experience of booking several appointments through the centralised booking service but did comment contact was required with the medical secretary to bring a post-operative appointment forwards to meet their particular needs.

### **Survey response: It is quick and easy to make outpatient appointments**

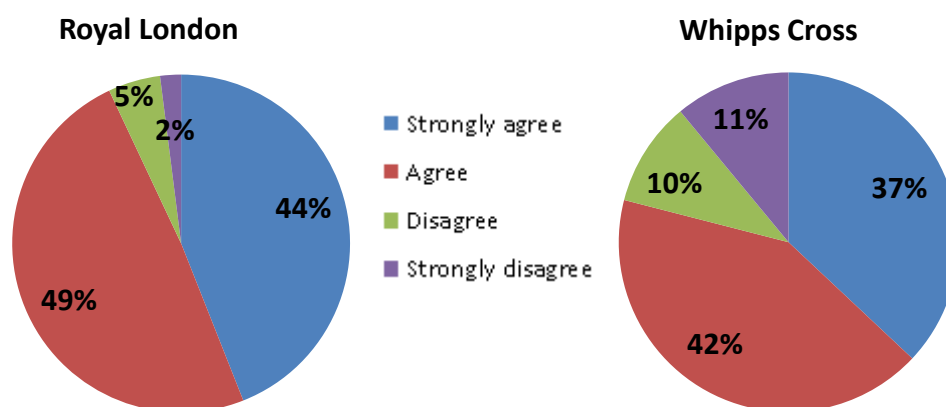


Figure 25: Survey - outpatient appointments

### **Data Cleanliness**

There are several ways in which CRS helps to maintain the cleanliness of the data in the system, starting at the point of referral. At the former Barts and the London (BLT) sites, CRS automatically validates patients against the spine for their NHS number which to a large extent stops duplicate records being created. In comparison, Whipps Cross at the time of writing this report has c. 40,000 duplicate records. Part of the problem is an on-going issue with the Choose and Book system at Whipps Cross which is creating a new record for an existing patient where their NHS number is not flagged as traced on the McKesson PAS. This happens less at the former BLT sites because automatic validation against PDS reduces the need to trace NHS numbers for patients. The number of duplicate records at Whipps Cross is therefore remaining high despite concerted efforts to resolve the duplicates prior to migrating data to the new CRS system in the Spring.

Duplicate records are problematic because a second or even third record of information is often not considered when analysing the patient's history. For example, during an Outpatient



clinic we observed a consultant unable to find a patient's important MRI scan on PACS at Whipps Cross. His hunt took several minutes and was unsuccessful. Later investigations revealed the MRI scan was recorded against a duplicate hospital number which therefore caused an important piece of clinical information to be unavailable for the consultation.



Figure 26: Records to be merged

Records therefore need to be merged under one identifier, preferably the NHS number. The effort associated with merging records is also significant and can range from 10 minutes to an entire day per record. With a team of 4 or 5 at Whipps Cross, they managed to de-duplicate 1847 records during the course of January doing purely electronic mergers which avoided their duplicate issue growing in size. The team of 3.5 WTE managing the records for the former BLT sites are de-duplicating approximately 400 records a month but are performing both paper and electronic mergers.

The majority of the duplicates at the former BLT sites will be legacy duplicates created prior to CRS although poor practice when searching for patients on CRS can result in a small number of duplicates still being created.

Using the correct NHS number is also important because the standard CCG contract for clinical services states in schedule B that 99% of acute and mental health datasets should have a validated NHS number. Use of the NHS number is pivotal when integrating information about the patient across NHS services. Where the number of breaches in the month exceeds 1% (5% for A&E), £10 will be charged for each breach above that threshold.

More general data cleanliness is also an important consideration when upgrading a system and migrating data, otherwise the cost of migration becomes prohibitive given the clean-up that is required. Without data migration, patient history can become archived in a separate system. This data is then less accessible and less usable with the more current data about the patient, which is particularly disadvantageous for patients with chronic conditions, especially those stemming from childhood.

The CRS system has been commented upon as being more restrictive and requiring more information for each step across the Outpatient processes, e.g. having to select options from drop down boxes rather than inputting a code, or having to enter ethnic origin for outpatient appointments because it adds another step to the process. These are potential dis-benefits of the CRS system. However, most system users appreciate the importance of data quality, especially when they have to clean up inaccuracies as part of their role. The benefit of the extra data that is being collected also appears to be generally understood.

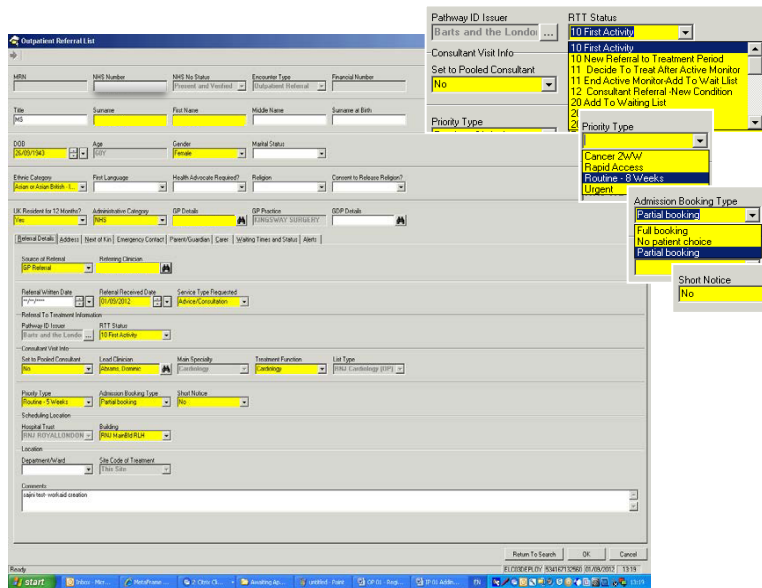


Figure 27: Drop down options lists in CRS

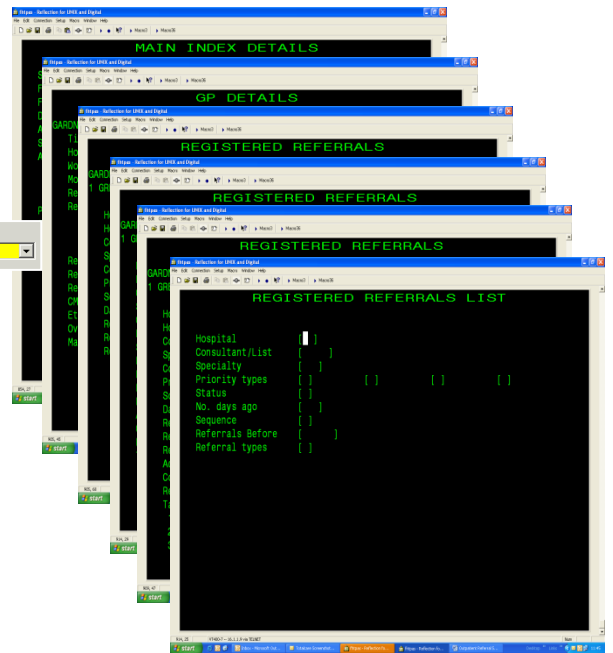


Figure 28: Coding screen in McKesson PAS

### 5.3.2 Records Management

At the beginning of our analysis in the Outpatients area, we initially thought we would not see any benefits of the CRS system in Records Management because the team at Royal London still had to pull and prep notes in the same way as at Whipps Cross. However, this was an incorrect assumption.

Within Records Management there are three main roles – ‘Pullers’, ‘Missings’ and ‘Preppers’. ‘Pullers’ pull the notes from the cabinets, ‘Missings’ search around the hospital for missing records not in the library, and ‘Preppers’ prepare the notes for the clinic.

#### Missing Records

At Whipps Cross a team of 3 to 4 individuals pull approximately 1200 records a day. The number of missing records can be up to 25%, requiring 4 members of staff searching for records for approximately 3 hours a day, seeking anything from 240 to 300 records that are not in the main filing area. Notes would be easier to find if the other departments "tracked" the notes properly and we were informed they are often with the consultants’ secretaries for typing.

The ‘missing’ activity at the former Barts and The London sites (BLT) is significantly less largely due to barcode tracking within CRS. The tracking allows the Records staff to easily locate 97-98% of records. Furthermore, the system also helps the Query clerks at former BLT sites (‘Puller’ and ‘Missings’ roles combined) to understand the size of any missing files she/he is looking for and tells her/him who the patient last saw and when, recent procedures etc., all vital information when tracking down a missing file.



Figure 29: Bar code record tracker

Furthermore, with so much of patients' recent care now available on CRS in several instances, the paper based record in its entirety moves around the hospital much less. The paper notes pulled for Outpatient clinics are returned straight to Records Management at the end of the clinic. Increasingly, Outpatient letters to GPs are written/dictated during clinic and therefore the paper patient record does not need to be kept from storage in the consultant's office post clinic. A query clerk at Barts estimated that without CRS and a form of tracking it could take her up to 5 to 6 hours to find the notes for a clinic of around 40 patients, whereas with CRS and its tracking the same process generally takes c. 25 mins.

### Pulling and Prepping Records

As well as searching for notes, the Records Management team also pull and prep the paper based notes for clinic at both sites. It was noticeable that these activities were running much closer to the start of the clinic at Whipps Cross than at the Royal London, and others would be involved in the notes preparation on the morning of the clinic to ensure they were ready in time, including medical secretaries, nurses and even the consultants. A medical secretary was observed coming to clinic with result print outs to be added to the notes and the nurse then stuck them in. In a similar way, the referral letters were added to patients' files by the receptionist, taking c.15 minutes. A consultant was observed combining two sets of notes in clinic which had arrived separately wasting a couple of minutes of his time. This team effort is probably symptomatic of the pressure on Records Management team given the challenge of managing such vast amounts of paper, a large proportion of which is classified as 'missing'. We also observed on average one missing set of notes per clinic at Whipps Cross whereas this was only observed once across all clinics at the Royal London.



Figure 30: Pulling records for clinic

At the Royal London, the results are available in the CRS system and the patient file for clinic can consist of just the referral letter. However, generally notes are still prepped but the notes are with the 'Preppers' several days before the clinic and the notes normally arrive in clinic the day before, providing the doctors with the opportunity to prepare for their clinic if required. This opportunity does not generally appear to exist at Whipps Cross.

For one clinic at the Royal London the notes are no longer pulled and only a clinic outcome form is provided to the doctors. If other clinics were able to follow suit, we would see quite dramatic savings in Record Management and against the cost of delivering all the paper notes to the various clinics around the hospital. However, whilst a blue folder is still created and the referral letter inserted, the amount of prep and delivery effort, although reduced, will still exist.

### 5.3.3 Clinic Management

#### Dis-benefits?

The benefits of the CRS system were less plentiful in the area of clinic management, indeed in some cases the processes took longer because the system requires more information and it is more restrictive. However, these apparent dis-benefits need to be seen in the context of

the value of the extra information that is being collated, e.g. ethnic origin, checking patient details, next of kin information etc. The restrictions on the users e.g. entering information before proceeding to another screen/menu; having to complete certain fields; restrictions on changes to a clinic or choosing from a drop down list of options, have a purpose in helping to maintain the validity and cleanliness of the data. The windows based system is also seen as slower compared to the key strokes of the old system. That said, windows applications can be driven by key strokes and as an operating system it remains more intuitive to those who do not use the system so intensely or are new users.

### Some Benefits

On a more positive note, CRS produces utilisation reports that consume c.one hour a week per clinic of a clerk's time at Whipps Cross. There are on average 591 clinics per week at Whipps Cross, 776 across former BLT sites. At the Royal London, the patient list view provides clinic management with a snap shot in time on how well clinics are running. Extra functionality around having multiple clinics within one umbrella clinic also facilitates this arrangement and makes it easier to run and manage. Furthermore, if additional services are required for Outpatient appointments, these can be easily registered at the time of the appointment through the system by ticking the relevant box, creating a record of the request.

### 5.3.4 Outpatient Clinics

We undertook observations in ten clinics across the Royal London and Whipps Cross sites. We observed a varied use of CRS at the Royal London and the impact of not having electronic patient notes at Whipps Cross. The observations below follow the general sequence of events during the appointments themselves.

#### Preparing for Appointments

Where we saw CRS used well at the Royal London, we saw clear benefits of using the system. Firstly, in the way the doctors were able to prepare for their next appointment. The patient's history, recent results, previous attendances, comorbidities, alerts, trending etc were all on the front screen of the patient's record. More detailed information was a click away. Any imaging could also be accessed with the click of a button and the document management system held the referral letter and any historical correspondence. In 1 to 2 minutes consultants and registrars were able to familiarise themselves with the patient and be prepared for the appointment.

At Whipps Cross consultants and registrars were more dependent on trying to locate information in the paper record. It was predictable that this was not always as fast as looking at the screen but we did not see a dramatic difference in the preparation times we recorded between the two sites. This was probably driven by the fact the doctors at both sites had roughly the same amount of time to prepare. It is therefore more important to consider the amount of quickly digestible information that was assimilated rather than the time the process took.



Figure 31: Consultant with patient using CRS

The preparedness of the doctor was significant. Some of the consultants we observed aimed to be as fully abreast as possible of the patient's details before seeing them. Others



preferred to ask the patient for information. We observed it was much quicker and in many ways more effective for the doctor to check the details he knew with the patient and then ask specific questions, rather than asking a more open question and having the patient explain why they had been referred and what had happened in the past, for example. When asked about their patient history, many patients gave long winded and unstructured answers that were difficult to follow and used up time that could have been used to consider the finer details of their complaint.

### Consultation and Ordering Tests

In speaking to the patient, we saw the doctors at the Royal London using the information on the system to good effect, showing the patient information about them on the screen. This was particularly powerful in an Orthopaedic clinic and talking through X-rays. In a Haematology clinic we observed the consultant showing patients their up-to-date weight charts in a graphical format which better engaged the patient. We did not see a comparable use of paper based information at Whipps Cross.

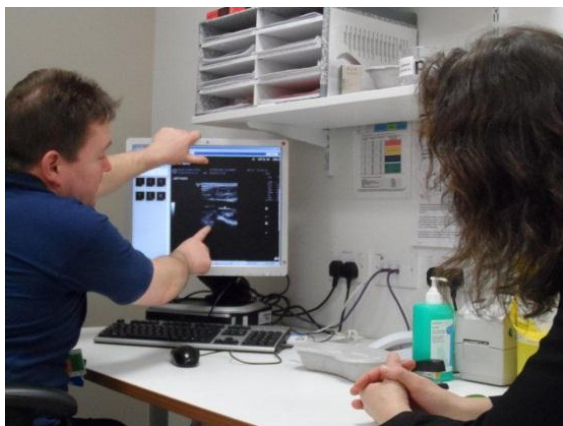


Figure 32: Nurse with patient viewing information on screen

Following a conversation with the patient, and sometimes an examination, the doctor generally proceeded to order tests and investigations. At Whipps Cross, the doctor wrote out the order and gave it to a nurse who then entered the request into a book. In total this process took just under 3 minutes (165 seconds). Furthermore, Pathology visits the clinics daily to collect order forms. At the Royal London the doctor took approximately 1 to 1.5 minutes to make an order on the system but there was no need to enter it into a book or for pathology to collect any forms. Furthermore, one consultant felt that if the computer was faster, the ordering process could be significantly faster.

These figures may seem small, but when it is considered over the course of 24 hours an average of 4,500 pathology tests alone are ordered at the former Barts and The London sites, 50% coming from Outpatients, such savings soon become significant. It should however be noted that the Royal London did have a form of electronic ordering prior to 2008 which would reduce the benefit above for those areas using the system.

### Outpatient Letter

The next marked benefit came after the appointment (sometimes during) when some of the consultants and registrars completed a largely system populated Outpatient letter template for the patient and their GP straight after the appointment. With the use of standardised text and a 'favourites' coding list, some of the Doctors observed were able to produce a concise letter in just over 2 minutes on average. This sometimes increased to 3 minutes for a more complex patient or unusual condition. It should be noted that these times could be reduced if minor improvements were made to the letter template within CRS so the consultant did not have to reformat and remove/amend the same irrelevant and erroneous information for every letter created.





Figure 33: Consultant dictating with wand

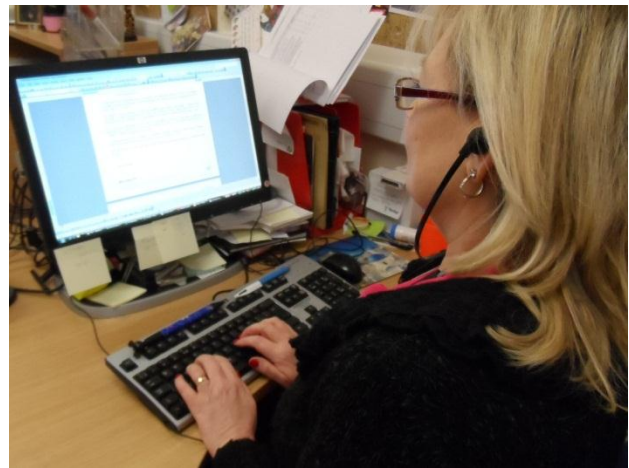


Figure 34: Medical secretary audio typing

Other consultants at the Royal London followed the practice at Whipps Cross of dictating their letters onto the system to be typed up by their medical secretary or by a third party. As would be expected, the dictation times at both sites were very similar - about 1 to 2 minutes to dictate and the same time again to check and correct if this was done by the consultant. If this was not done, the main disadvantage of dictating the letter as opposed to writing it was the need to review the letter once typed up by a secretary or third party provider. This could be many weeks later if outsourced to a third party. Furthermore, we then asked medical secretaries how long on average it took to type up an Outpatient letter from dictation and we were told c.10 minutes due to the need to replay sections within the application, check on the meaning of what is being expressed, spellings, formatting etc.

For the consultants typing their own letters into CRS at the Royal London, the letter could be sent to the GP and patient the same day, enabling the GP to better care for the patient in the community. Their letters were also more concise with clear template sections and bullet points, which it could be argued are a more efficient form of communication with the GP. Furthermore, having the outcome of the outpatient appointment immediately on the system avoids patients arriving elsewhere in the hospital before the information as to what is required is on the system, for example, at fracture or dressing clinics. This avoids the patient either having to return or wait for the clinic to contact the referring agent to find out why the patient has been referred.

## Coding

'Favourites' coding lists to speed up the selection of the appropriate procedure code at the Royal London and referred to above, also have the advantage that a consistent set of codes are used for conditions in a department. Snomed codes are numerous; sometimes many codes exist for very similar states of the same condition. A consistent use of codes will help with future audits and research. Having a quick list to choose from is also important because notes on an Outpatient encounter cannot be entered onto the system until the primary diagnosis code is entered. Some doctors find this frustrating, but mitigate the issue by making notes in, for example, Word first, and then cutting and pasting them into the record following the consultation and once the primary diagnosis code had been selected.



: Barts Health Overview  
 : Dashboard -> Data Quality -> Average Diagnosis per coded episode SPC Chart  
 : None Peer group : 1) Barts Health - Site Split at Low Level - Standard Peer  
 : Apr 2011 to Oct 2013 Peer group period : Apr 2011 to Oct 2013

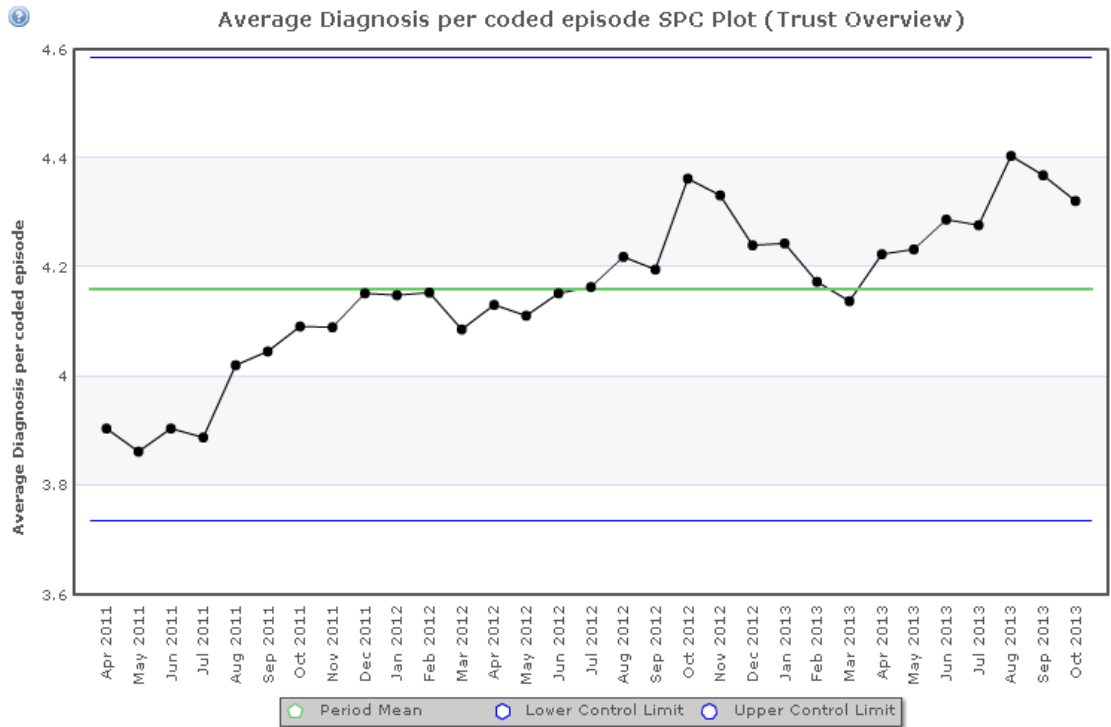


Figure 36: Average diagnosis per coded episode

### Barts Health IP coded FCEs vs Income

Income

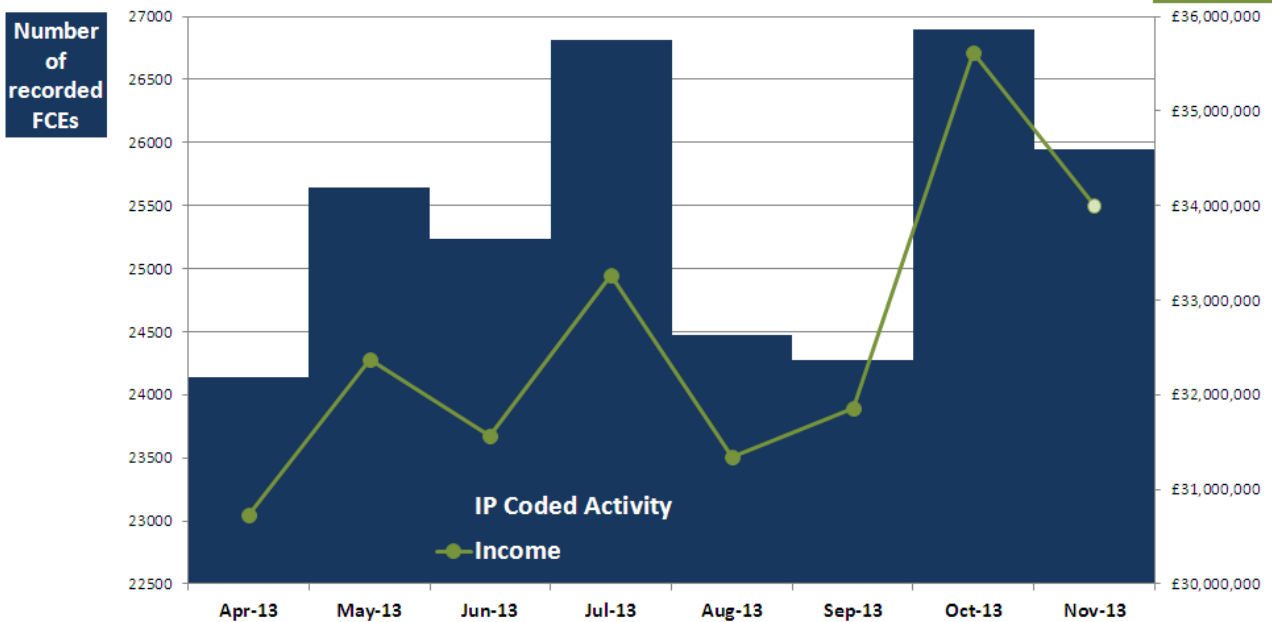


Figure 37: IP coded FCEs vs Income

## 5.4 Conclusion and Improvements

The efficiency and effectiveness benefits identified above and summarised in the key findings box at the start of this section are undoubtedly positive. However, in the case of the Outpatient clinics, only a fraction of clinics have decided to adopt a paperlite or paperless approach and store all new information on the system. The overall impact on the trust of the benefits realised is therefore low. That said, the potential benefits of moving away from paper notes, doctors producing same day clinic letters and coding more accurately are clear and significant.

To date success has been largely due to dedicated clinical leadership and a willingness to adapt the system to meet the need as opposed to expecting the system to be perfect. However, an imperfection that will hinder wider rollout is the performance of the IT infrastructure. During nearly every clinic observation at the Royal London we observed slow response times from the servers, sometimes as much as 10 seconds for the screen to refresh. When a consultant only has 2 minutes to review a patient's information, 10 second screen refreshes quickly become a problem. Worse still we observed a consultant unable to access any systems on his computer for the first 2½ hours of a clinic. When patient data is only stored on the computer system and it is not accessible, such difficulties clearly compromise patient care and become a potential clinical incident.

Furthermore, we also witnessed issues accessing the PACS system with images not being visible and learnt of an occasion when the doctor had to physically visit the X-ray department, two floors down, whilst seeing a patient to look at their image on the PACS workstation. Lastly, registrars moving around the hospital appear to be having issues accessing some applications, potentially due to network profile problems.

In Orthopaedics, we noted that X-rays are booked on the system the night before the clinic because they cannot be booked with X-ray more than 48 hours in advance. This was done in the doctors' own time at the end of the day. Furthermore, clinic appointments could only be booked 18 months ahead, so the parents of a child requiring check-ups at 5 years old and 8 years old, for example, would need to revisit their GP for a referral even though they had not been fully discharged from the hospital's care.

Other potential improvements that were noted during our observations and discussions in Outpatients were the need for more training, for doctors in particular. Also, training support for those teams trying to make good use of the system's potential; self check-in kiosks for outpatient appointments to avoid the sometimes lengthy check in process using CRS and sending clinic letters electronically to GP practices so that they can arrive on the day of the appointment if the consultant has written them during the clinic.

## 6 Case Study 3 – Improving Patient Safety

### 6.1 Key Findings

#### Sickle Cell Disorder

- Having the treatment protocols for Sickle Cell Disorder patients readily accessible on CRS allows ED staff to correctly and swiftly treat these patients during a crisis which is crucial for such a painful condition. It also appears to be reducing their post crisis length of stay.

#### Haemophilia

- With more information on CRS about their condition as well as drugs to control it, Haemophiliacs receive the most appropriate treatment faster minimising the impact of the bleed. Any complications, such as risk of infection, also help to protect other patients.
- The information contained on CRS helps the Haemophilia team work efficiently and effectively together. Information on the system is easier to store and reference and with more information known about patients, clinicians are better able to support them with their condition.

#### Infection Control

- Having Infection Control notes on CRS means they are readily available to any clinician treating the patient improving the ability to control the spread of infection.
- The Infection Control team are better able to support each other in answering queries from clinicians caring for infectious patients due to accessible and legible notes as well as the patient's microbiological results and general history. The system also enables faster tracking of patients.

#### Care of the Elderly

- CRS assists clinicians from the Care of the Elderly team in tracking the high number of dispersed patients they have to treat. Having easy access to an elderly person's up to date diagnosis and medications is invaluable. The history of test results now available on the system is equally important in their care and the presentation of information eases its use in this busy department.
- The Fast Response Team successfully and swiftly works to avoid admissions to hospital. Their working processes are fully supported by CRS and its ready and comprehensive information is essential.



## 6.2 Introduction

During our study we uncovered a number of good usages of the system which as well as helping the clinicians in their work also notably helped provide the patients with safer and improved care. As a result we decided to bring the four main examples we found into one section of the report under the title of “Improving Patient Safety”. That said, the benefits highlighted below will not be solely restricted to this theme because in our examination of the examples we found other types of benefit worthy of note.

Easy and faster access to clearly presented, co-located contemporaneous and historical patient notes from multiple systems, including details of existing and previous diagnosis and results, has resulted in significant benefits.

Firstly the availability of protocols in Sickle Cell Disorder patients' electronic records allows ED clinicians to more speedily give the correct pain relief and care to those suffering from this chronic condition and the excruciating pain it brings.

Secondly, Haemophilia patients cared for at the Royal London have very comprehensive electronic records that are available to all treating clinicians within the trust. This ensures that their condition is recognised and again that the correct drug is used to control the bleeding sooner.

Thirdly, the Infection Control team now hold their records on CRS so information about an infection is visible to all treating clinicians with the recommended advice.

Fourthly, those under The Care of the Elderly team can be safe in the knowledge that staff are aware of their condition, complications, on-going treatment and previous test results. CRS also helps The Care of the Elderly team track and care for outliers around the hospitals not on the main geriatric wards. Finally, the work of the Fast Response team in avoiding admissions is greatly supported by CRS.

As with the previous studies in the report, we used a combination of observations and interviews, and most notably we re-ran an audit and conducted a patient survey in the Sickle Cell Disorder area which involved reviewing the treatment of patients using electronic and paper notes with the help of Dr Paul Telfer.

## 6.3 Treatment of Sickle Cell Disorder (SCD)

### 6.3.1 Benefits Observed

The incidence of admissions of residents in England where one of the diagnoses relates to sickle cell disorders has risen substantially in recent years. From under 12,000 in the years to 1999/2000, the number more than doubled to 24,700 by 2009/10. It is a relatively common condition amongst the population of East London. Patients often experience acute episodes of pain, which require admission, with the average length of admission being 5.5 days. Early and effective intervention, including the timely introduction of prompt, safe and effective acute pain management, can lead to a shortening of the admission time or avoidance of admission.

This conclusion was supported by an audit undertaken over a year ago in ED at the Royal London to assess the use of patient information and SCD treatment protocols held on CRS

to help treat patients arriving in ED with acute pain. Other findings from the same audit also demonstrated further benefits of the information held on the system. As part of the Deep Dive, a decision was taken to re-run the audit using data from the same period as before covering the next year (September and October 2013) and this time at the Royal London and Whipps Cross. The Emergency Department at Whipps Cross without CRS did not have the same information (protocols) available to support them.

## 6.3.2 Findings of Audit

### Administering Analgesia

The common failings in the care of SCD patients are the time to provide effective pain relief and insufficient or excessive dosages. The aforementioned is obviously of much concern to the patient. The latter is serious due to the strength of analgesia being provided. Opioid pain killing drugs such as morphine, oxycodone and fentanyl are used for managing the severe pain of a Sickle Cell crisis. These need to be given at the correct dosage and frequency. Too little analgesia will result in inadequately controlled pain. Excessive dosing can be dangerous, and can result in respiratory suppression and decreased level of consciousness. Indeed, patients need continued regular assessment of respiratory rate, sedation score, oxygen levels and pain score when receiving pain relief.

Dr Paul Telfer commented, “An essential element of the care plan is the input in the Emergency Department, which is where the patient first arrives, often in severe pain. The first essential is that ED staff are aware that the patient has Sickle Cell Disease, so that they can be fast-tracked through and a standard acute care plan applied as soon as possible. Following ED management, SCD patients can then easily and quickly transfer to acute medical ward under Haematology supervision, and the care pathway applied seamlessly despite transfer between different sites in the hospital”.

The 2012 audit demonstrated that the patient information and protocols held on CRS had not only significantly increased the awareness of the patient’s condition but had also guided clinicians on the most appropriate treatment, accelerating its application. The audit demonstrated that at the Royal London, the first analgesia as per the protocol was received within 30 minutes in just under 50% of cases and within 1 hour in nearly all cases. This remained consistent between the 2012 and 2013 audits, although it can be noted that 40% are receiving analgesia within the first 20 minutes which is an increase of 10% on the 2012 audit. There was also a slight improvement in the time taken for the second analgesia with just over half of patients receiving the second analgesia within 1.5 to 2 hours compared to 40% in 2012.

Notably, having reviewed the analgesia related actions of the treating clinicians and the medical notes taken at the time, there was 11% increase, from 72% to 83% in adherence to the protocols’ guidelines on analgesia which may be reflected in the above figures.

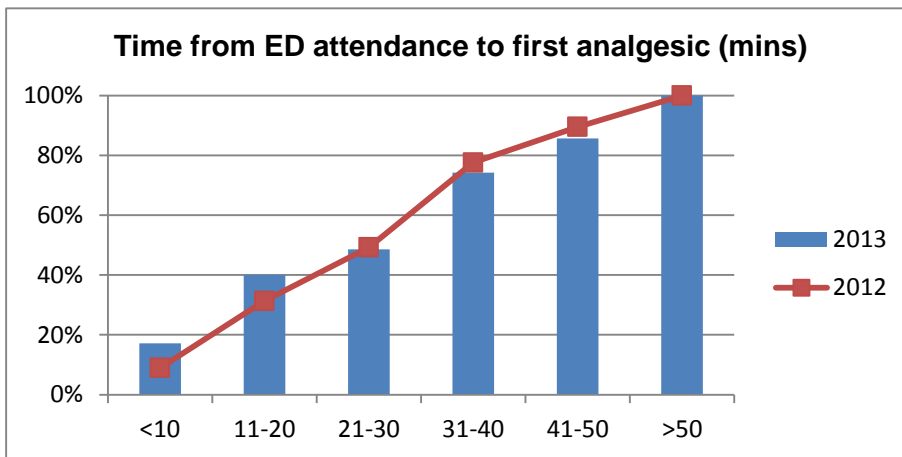


Figure 38: Time to First Analgesic

### 6.3.3 Observations

The number of recorded observations and pain scores recorded for the patients as suggested by the protocols available on the CRS were also analysed. At the Royal London we saw 1 or 2 pain scores taken in the first 6 hours for the vast majority of patients in 2012. By 2013 this had increased to 2 or 3 pain scores for most patients. We also saw an improvement in the number of observations taken over the same 6 hour period as the pie charts below demonstrate. This again is a good indication that wider use is being made of the protocols on CRS.

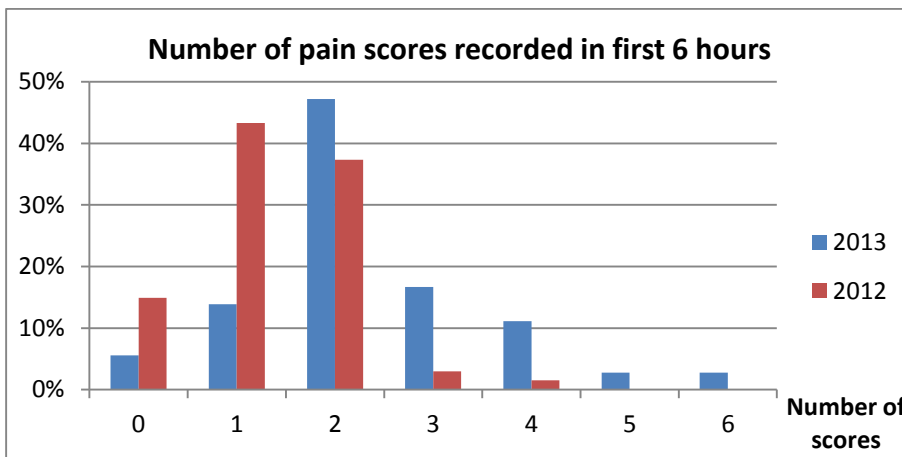


Figure 39: Percentage of patients vs pain scores captured in first 6 hours of care

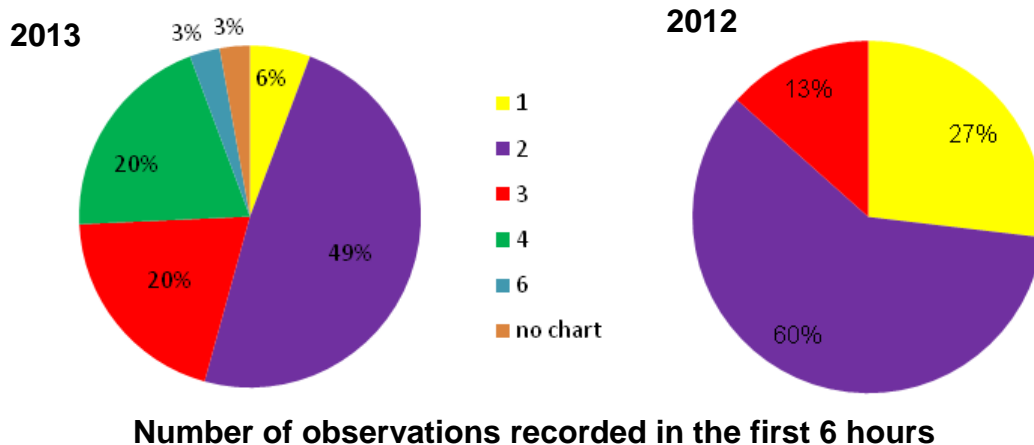


Figure 40: Observations taken in first 6 hours of care

### 6.3.4 Length of Stay

From the graphs below we can see there has been a further reduction in ‘length of stay’ that was first noted as a benefit of the protocols being available a year earlier. Just under half of SCD patients attending ED were subsequently discharged after 3 days in September and October 2013. The equivalent figure in September and October 2012 was nearer to 4.5 days. Notably, in September and October 2013, 3 patients were admitted but recovered sufficiently to be discharged in less than 24 hours. The reduction in length of stay at the Royal London may be explained by the protocols being used better compared to a year earlier when they first became available. Non elective admissions lasting 2 to 3 days cost £1476, with each excess day amounting to £264.<sup>1</sup>

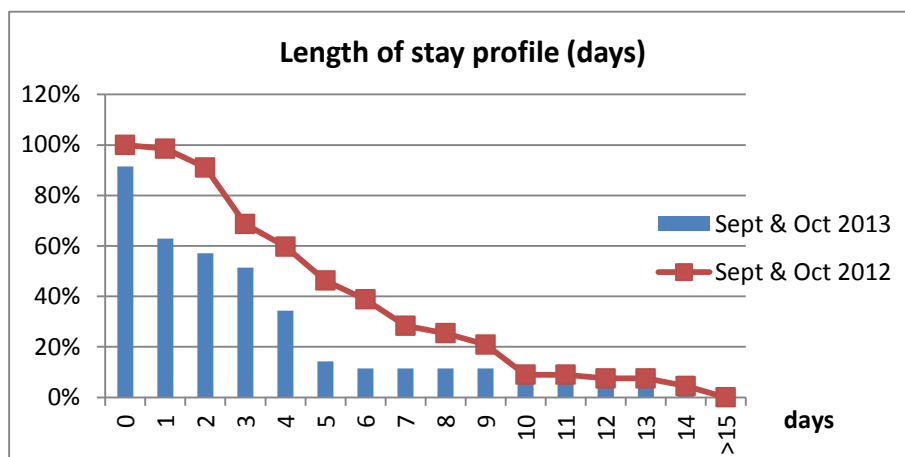


Figure 41: Percentage of patients remaining vs. length of stay

### 6.3.5 Readmission Rate

Finally we looked to understand more about readmission rates. Unfortunately, once they have encountered a serious attack, SCD patients are susceptible to further attacks. The audit results from the 2 years remain consistent with 50% of patients attending ED more than

<sup>1</sup> Department of Health Annual Report and Accounts 2011-12

once in the 9 week study period, 25-30% attending more than twice. This highlights the importance of ED and specialists quickly understanding past events and treatments by being able to access contemporaneous information and the care plan for the patient. It also highlights the fact that returning Sickie Cell patients should probably not be regarded as readmissions.

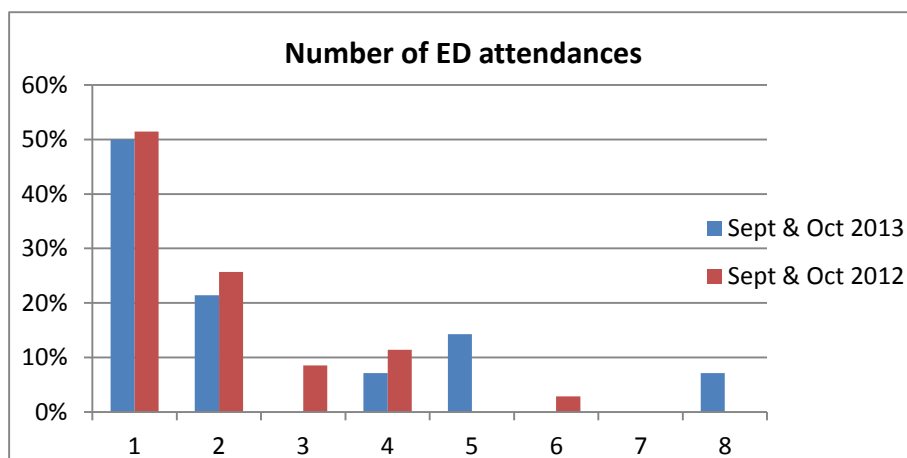


Figure 42: Percentage of patients vs. number of ED attendances

### 6.3.6 Audit Conclusions

The findings above clearly indicate that having the treatment protocols available to ED clinicians, significantly improves the treatment and the speed of treatment received by the SCD patients. This improvement has remained consistent over the 2 years since the introduction of the protocols, or has marginally improved for some areas analysed above.

This is because the ED staff can confidently proceed with the treatment of the patient without needing to wait for specialist intervention. One survey response from a Sickie Cell patient stated “I couldn’t really talk because of the pain, all I told them [ED staff] was my name and they seemed to know what to do. The speed of pain relief was fairly quick. I was admitted into a hospital bed within the first hour of me being there, same for seeing the specialist.” All respondents to our survey felt the service they received in ED following the use of the protocols was either ‘improved’ or ‘much improved’.

## 6.4 Treatment of Haemophilia

### 6.4.1 Benefits Observed

Haemophiliacs are another group of patients who clearly benefit from information about their condition being accessible in a medical emergency or if they find themselves being treated in another part of the hospital rather than in Haematology’s day unit or on its wards. As we have seen with other conditions, when a patient has known complications and is considered as ‘high risk’, it is also important they receive specialist attention as soon as possible.

### 6.4.2 Rapid and Appropriate Treatment

The front of a Haemophiliacs record is an impressive collection of significant information that can be easily digested and expanded still further with the use of hover buttons. The Haemophilia team have captured information on the patient’s electronic record since



2010/11. A patient's diagnosis, treatments, missing key activities, e.g. having a medical alert card, and any complications are all clearly visible on the front page allowing a haemophiliac's condition to be quickly recognised and the most effective and appropriate treatment given, similar to the SCD patients.

The screenshot shows the 'Inpatient Summary' page for a patient with 'Severe haemophilia A'. The page is organized into several sections:

- Header:** Patient information including NHS, MRN, Age, Sex, Loc, DOB, Gender, and Outpatient Pre-Registration FIN.
- Left Navigation Menu:** Includes Inpatient Summary, Outpatient Summary, Patient Information, Overview, Chart Review, Allergies, Problems and Diagnoses, Procedures and Diagnoses, Histories, Requests, Activity List, Results Review, Form Browser, Clinical Notes, Documentation, Pregnancy, Appointments, Pregnancy Summary, and Newborn Summary.
- Main Content Area:**
  - Allergies:** No results found.
  - Diagnoses/Current Problem:** No results found.
  - Problems:** FEIBA Immuno (46324010000001145), Haemophilia A with inhibitor (251342010), Hepatitis C antibody test positive (463955018), History of hepatitis B (404801000000115), Severe haemophilia A (407973011).
  - Procedures:** A detailed record for 'Severe haemophilia A' with an annotated display name 'Severe haemophilia A', onset date 'After 06/1991', and responsible provider 'Hart, Daniel Patrick'. Comments include: 'Inhibitor detected upon arrival from Pakistan (early 2009)', '05/11/2009 10:18 - Hart, Daniel Patrick', 'Treatment - FEIBA (consider rVlla if FEIBA ineffective)', '17/10/2012 15:35 - Williams, Heather', and 'Replacement IBD Card Issued'.
  - Selected Common Lab Results:** Cellular Pathology (1), Cytopathology Non-Gynaecology (1), Microbiology & Virology (11), Radiology (1), and Vital Signs.
  - Documents:** A list of documents including General Clinical Notes and General Messages, all authored by Hart, Daniel Patrick.
  - New Requests/Orders:** A list of orders including U&E, LFT, C-Reactive Protein Serum, FBC, Factor VIII (chromogenic), Inhibitor Assay (Bethesda), and Inhibitor Screen.

Figure 43: Front page of a Haemophiliac's record with hover buttons

Inappropriate treatments can carry the risk of limb loss or even loss of life if a bleed is not controlled correctly. Using the correct treatment also has a cost benefit. Haemophilia treatments are expensive costing between £600 and £1000, and it can be even more expensive to correct errors. On one occasion, only two treatments were given to a patient in ED, requiring him to return to the hospital to then have four further treatments. The need for further treatments extended his recovery time by a week and added £10,000 of costs to the episode of care. Furthermore, when a Haemophiliac exceeds 50 exposures to treatment then the potential for inhibitor development reduces.

Weight is also an important factor that is clearly recorded on CRS, allowing dosages to be accurately calculated rather than estimated. This ensures the patient receives the most effective treatment, waste is eliminated and harm minimised. Information about a patient's personal circumstances, profession, interests all help the clinician to better support their patient with their illness. Finally, Haemophilia doctors also find it helpful to be able to annotate the blood tests when ordering them on CRS, or to order more specific tests as opposed to those pooled options available on the manual order form.

### 6.4.3 Risk of Infection

It is also very important that all treating clinicians are aware of possible infection. Over 800 Haemophiliacs in UK are at risk from the infection variant CJD (vCJD). Hepatitis C is another possible infection amongst Haemophiliacs. If treating clinicians are aware of the risk, equipment used on 'at risk' patients can be safely disposed of preventing the spread of infection. Sterilisation alone cannot prevent the risk of infection from CJD. It also prevents expensive equipment from being used and then permanently quarantined or destroyed. A type of scope, for example, costs c.£15,000 to replace.

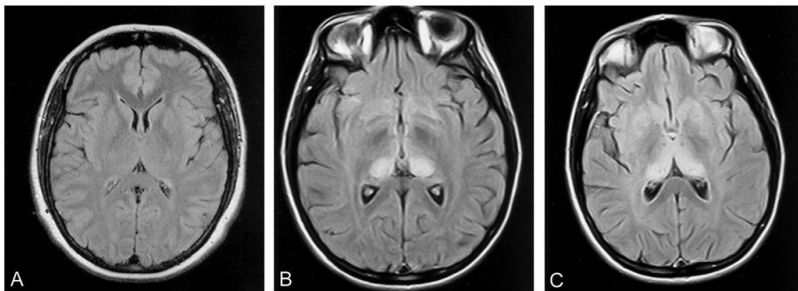


Figure 44: vCJD development in the brain

In a case in Wales in 2012, instruments used during surgery on a ‘high risk’ vCJD patient were then reused on another 38 patients, who immediately become at risk themselves. Furthermore, for the individuals involved, as well as the obvious concern of developing the incurable brain condition in the future, they are also required to declare their ‘at risk’ status, including to life insurance companies. The unwitting spread of infection risk is therefore a very serious matter and CRS clearly alerts clinicians to this risk.

#### 6.4.4 Effective Teamwork

As we saw in ED, handovers between Haemophilia staff members are more effective and focused when based on the information held in the system. The sister in the Haemophilia Day Unit estimated that a full patient review with a colleague takes approximately 5 minutes with CRS but before would have taken around 20 minutes because information in the patient’s paper notes was not always in chronological order and test results could be filed anywhere.

This benefit is enhanced by the fact the Haemophilia team is good at recording all patient interactions and information on the CRS system, which could be anything from a patient calling the team to ask a question to a nurse’s note about a patient’s care whilst in the hospital. Nurses’ notes can be used by consultants to make more informed decisions and consultants recording actions in the patient’s electronic record allows nurses to see exactly what needs to be done without further consultation. The doctors’ instructions given in this way are also clearly legible, more so than having to read handwriting. These developments made possible by CRS support a more efficient team working environment.



Figure 45: Patient care on ward

The ease of recording information in the patient record is notably assisted by ‘Message Centre’ which is a type of email system within CRS allowing anyone treating a patient to see messages appertaining to the patient and also automatically files correspondence about a patient in their record. This is also used to good effect when departments are liaising with each other about the care of a patient and facilitates the endorsement of test results.

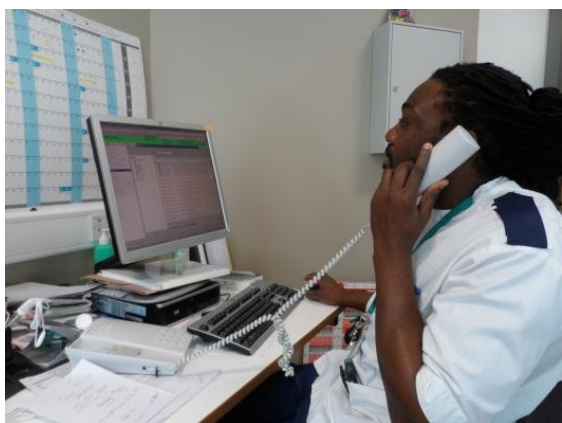


Figure 46: Team members able to review notes made about patients' care

With a contemporaneous and comprehensive source of information accessible to all team members wherever they are around the hospital, most patients can be assisted in some way by any member of the Haemophiliac clinical team rather than waiting for a response from the person immediately involved in their care. This should result in their care needs being fulfilled sooner.

CRS tracking information about all the steps in the treatment of a patient has further benefits.

Consultants are able to support their teams more effectively if they can see on the system, at a glance, what they are trying to do and what steps

have already been taken. This could include trying to accelerate the delivery of urgent test results as well as how best to treat a patient. Similarly, consultants can check their instructions have been followed for a specific patient. Accurate and legible information about past conversations also helps ensure that the patient receives what was intended for them by the consultant rather than what the patient may feel they need or there being a mis-interpretation of their planned care. For example, a birthing plan can be put on CRS detailing whether an epidural can be given or not during labour. For some haemophiliacs an epidural is possible, for others it is not.

### 6.4.5 Retrieving and Storing Patient Information

It is generally far quicker to store information in a patient record and to retrieve it. Before, with paper records, a letter from another clinician, for example, would have to be taken to the Day Unit whereupon the record would have been pulled and the information inserted, probably not to be looked at again due to its inaccessibility. Or, as one nurse acknowledged, "Episodes of care would have been written down on paper, but may not have made it into the notes as details were written on numerous bits of paper left on the secretary's desk". However, with CRS the information can be scanned or the salient points typed into the system and can easily be considered going forwards because the information is much more accessible and easier to locate.

Similarly, time is also saved by not having to pull the notes to review information within them, for example, in order to change a patient's medication between consultations. It is estimated travelling to the Day Unit and pulling the record for review or to insert information, and then returning it, saves at least 30 minutes if the record is easy to locate. The alternative is to request the record which takes 24-48 hours. From a straw poll across specialist nurses the need to seek out a record happens a couple of times per a week on average. There is also the high probability that information electronically captured or referred to now would not have been in the past due to the time pressures.



Figure 47: Team members able to access patient's record when needed

In a similar vein, rare patient events can now be coded appropriately on CRS and referred to in the future if another such event arises, rather than lost in paper notes, enabling doctors and nurses to better use their experiences.

## 6.4.6 Further Beneficial Uses of Data

Organisations such as 'UK Haemophilia Doctors Association' who check on the quality of patient care at the Royal London, have been very impressed by the Haemophilia team's use of the CRS system and the way it facilitates their quality checks.

Lastly, the activity on the system is a good way of capturing the work of the department which frequently consists of supporting other specialities in their treatment of Haemophiliac patients which can be overlooked in existing activity figures. This better informs future discussions about funding and planning.

## 6.5 Infection Control Team

### 6.5.1 Benefits Observed

As was seen in the Haemophilia Case Study, the system is good at supporting those teams caring for patients in beds around the hospital. This is therefore also true for the infection control team of five nurses at the Royal London site, who are charged with providing assistance to patients with infections and the clinicians treating them wherever they are located on the wards.

The infections covered include C.diff, MRSA, HIV, influenza and Norovirus along with the majority of tropical diseases. Infection control policies are now implemented trust-wide but only the team at the Royal London use Cerner Millennium to exclusively manage their patients. As a result, we undertook a study to compare the way the Royal London team work with the system and the way the Whipps Cross team work without the system to enable us to understand the benefits of CRS.

### 6.5.2 Awareness

The infection Control (IC) teams at both sites visit potentially infectious patients every day. This amounts to 28 plus patients at Whipps Cross. There are on average 100 patients under the care of the IC team at the Royal London but with the information on the system, only 20 or so patients are visited each day.

Before CRS at the Royal London, the nurses' assessment of the patient's condition and circumstances were entered onto the patient's paper case notes. Now patients identified with an infection are tagged on CRS by the infection control nurses and an alert is automatically setup. The patient's infection status is maintained electronically through the alert and the IC team directly record all relevant information about their patients and their condition on CRS, along with their results. That said, the IC team at Royal London tend to use the pathology system to view test results so they can filter the results by micro biology.

At Whipps Cross, whilst the infection control team do not have access to CRS, they do use an application called BedWeb which electronically stores all infection control notes against the patient's bed. If the patient moves beds, the IC information needs to be re-entered



against their new bed. Three IC nurses update BedWeb as well as having paper notes. Once the patient is discharged, their details are purged from BedWeb, hence the paper record. Clinicians are warned to look on BedWeb through an alert on the PAS which is created by IT on receipt of a list of patients from the IC nurses, which takes an hour a day to update. There is therefore a delay whilst this is undertaken and the infection control alert is sometimes pushed onto a second page of alerts on the PAS.

The Royal London IC Team stated that, “Using Millennium EHR has improved patient safety surrounding infectious patients as data is more readily available to clinicians and nursing staff thus they are better informed so the patients receive the most appropriate and effective treatment earlier”.

### 6.5.3 Providing Advice

Clinicians often consult with the team seeking advice on how best to manage particular patients.

Before CRS at the Royal London, unless the clinicians were lucky enough to be able to speak with the infection control nurse who had visited their patient, and she or he remembered enough details about the particular patient, the patient’s paper case notes had to be located, reviewed and the infection control note interpreted for the clinician. Depending on the location of the notes, which were in active use for inpatients, this could have taken several hours. In addition, there were sometimes issues around legibility of the written note and only initial advice was possible until there was an opportunity to discuss the patient with the original nurse or, if time did not permit, the patient was seen again.

Now all the relevant information about a patient’s condition can be referenced on CRS throughout the hospital. This also means all the infection control nurses have access to legible and current information about IC patients wherever they are around the hospital. When asked for advice the infection control nurses can now quickly help on behalf of their colleagues by checking the patient record on the system. This would be true for Whipps Cross colleagues using BedWeb. However, the Royal London nurses also have the advantage of being able to follow best practice by easily reviewing the microbiology results and validating all relevant information within the same system before providing advice in a couple of minutes.



Figure 48: Infection Control Nurse providing advice

***“This now enables us to work with the clinicians to confirm diagnosis and to implement suitable infection control measures much more efficiently”.***



The IC Team said, “This now enables us to work with the clinicians to confirm diagnosis and to implement suitable infection control measures much more efficiently”. Communication is therefore markedly improved between nursing staff and clinicians and delays in advice to clinicians have also been reduced. This enables infections to be better contained and isolated.

#### **6.5.4 Tracking Patients**

Tracking the location and medications of inpatients but also urgent care patients, e.g. those in ED, is essential to minimise the risk of cross infection. The Royal London IC Team said, “Using Millennium EHR has saved us a lot of time in tracking down the patient’s location. It could take us up to 2 hours per day [each] to locate our patients, now it’s virtually instantaneous. This is a real benefit”.

Having the most up to date information about a patient’s infection status on CRS is also important when trying to discharge patients. Beds can be blocked by those under the care of the infection control team because they cannot be discharged back to another facility with an infection, e.g. a care home.

#### **6.5.5 Further Benefits**

The improved data on CRS has directly led to improvements in the quality of diagnostic coding. IC’s episodes of care are now being more accurately assigned the correct HRG which increases the opportunity to secure additional income for the trust as we have seen elsewhere in this report.

Finally, should a patient require transfer to another hospital then it is now possible within a couple of minutes to provide detailed real-time information for the receiving organisation. Previously the team would need to locate the case notes and take time to extract the data required and capture this in a suitable communication format which could delay the transfer. The integrated nature of CRS offers a further benefit in that all results are included in the patient notes, thus making it easier for the infection control team to pull together their advice and reports for the receiving organisation.

#### **6.5.6 Possible Improvements**

The IC Team is using the system to the best of their abilities and has obviously made effective improvements in their processes and working practices.

As with other areas, we noted their request for additional training to ensure they are using the system as well as possible. Indeed, there were a couple of examples where it was felt the team could be using the system more effectively with further guidance. For example, creating tabs for infection control patients to which the patients were being manually added and also the length of time needed to produce a list of IC patients who were not being isolated.

As we have seen on the wards, those updating the system with patient notes are effectively duplicating their transcribing effort by creating paper notes whilst with the patient and then entering the notes onto the system. The use of handheld devices, and the necessary IT

infrastructure, are therefore suggested to speed the process of entering information onto CRS.

Lastly, the effect of some parts of the hospital using paper notes and some electronic notes was obvious during our time with the IC team at the Royal London. For ED who are used to working in and checking CRS, the IC notes are to hand and easy to access. However, there are still those on the wards for whom the paper notes are their main point of reference and therefore the infection control notes although easily accessible for many, appear less accessible for these individuals.

## 6.6 Care of the Elderly

### 6.6.1 Observed Benefits

#### Managing Dispersed Patients

Those caring for elderly patients at the Royal London are another group of clinicians who have to manage several outlying patients. On any one day the team can be managing up to 80 elderly patients at the Royal London site and up to 40 patients at Mile End. Of the 80 patients at the Royal London, 10 to 30 are outliers around the hospital depending on the time of year. CRS eases managing disparate patients because they can be tracked on the system using the MRN, avoiding physically searching the wards and looking at their admission books. Avoiding this search alone can save the consultant at least 2 hours of trawling the hospital wards. Furthermore, their records can be accessed from anywhere in the hospital and advice given to those clinicians immediately providing treatment to Care of the Elderly patients.

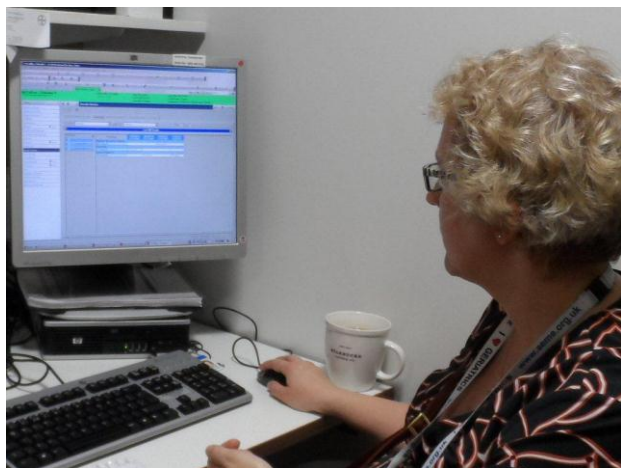


Figure 49: Remote review of patient's record by consultant

For example, the system saves doctors' time because they do not necessarily have to travel to the Mile End hospital to review a patient and instead can look at the patient's history and results on line with visuals provided by the treating clinician at Mile End. It is anticipated this could save at least 30 minutes of a consultant's time every day (7 days a week) and furthermore, the patient receives treatment faster because they do not have to wait for the consultant to arrive for a decision to be made.

### 6.6.2 Current Diagnosis

The ability to make swifter decisions is also notable in an emergency situation with the following benefits. An elderly patient, whose dementia is clearly recorded in their history, can be treated accordingly from the beginning of their treatment. This helps to avoid delirium, and as a result the patient has an improved recovery rate. Anxiety heightens delirium and reassurance and compassion are very important for Dementia patients as well as minimising the number of interventions. . Dr Claire Dow said "that in hospitals Dementia patients are classified as high risk because they often become extremely disorientated and

can be uncooperative because they are frightened by the change in surroundings, hence in the Emergency Department there is a tendency to over investigate”. Clinicians can also be made quickly aware of other problems which may impede communication with the patient, such as expressive dysphasia, and act accordingly.

It is not generally helpful for elderly patients, especially those with dementia, to be in hospital if they do not need to be. It has been estimated by consultants that 5 to 10% of elderly patients arriving in ED are now being discharged without being admitted because their presenting condition can be considered as ‘normal’ based on their history held on CRS and their ‘home’ arrangements are also available and confirmed as satisfactory.

### 6.6.3 Previous Test Results

Another example of the patient history on CRS being beneficial centres on past test results. On CRS there is now 5 years of historic patient data. It is possible to trend patient outcomes and test results over that period and compare them with those today. This makes it possible to track disease progression and the effects of various treatments. This allows the doctor to make much more informed decisions about the patient’s care plan.

For example, by studying increases in patient’s creatinine serum levels in a graphical format over a number of years, clinicians are able to ascertain the normal level for that individual patient and determine exactly how aggressive the treatment should be. Normal creatinine serum levels vary greatly between patients.

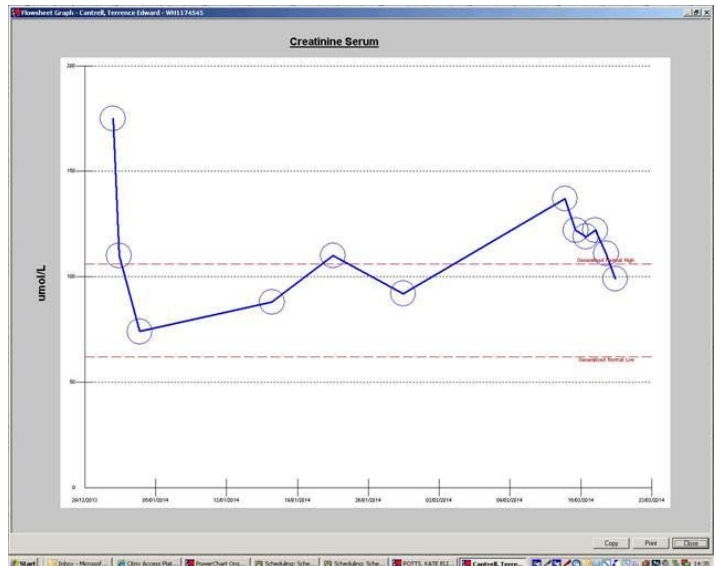


Figure 50: Creatinine serum levels on CRS

In another more specific example, a patient with Chronic Obstructive Pulmonary Disease (COPD) and a Deep Vein Thrombosis (DVT) was admitted and put on Warfarin, however doctors could not normalise her levels and she developed a blood clot. With the access to information going back some 5 years and with the information on the discharge summaries, a diagnosis of May-Thurner syndrome (MTS) was made. The historical information on CRS significantly expedited this diagnosis.

### 6.6.4 Current Medication

Medications such as Warfarin are recorded on CRS as they interact with other drugs. It is essential that treating clinicians are aware, as could be life threatening if, for example, the patient came into ED with a bleed. Not all drugs are put on CRS as they normally change too frequently, but Warfarin and other similar medications there are “starred” on the record, drawing the clinicians’ attention to it. In a recent,



Figure 51: Drug alerts clearly visible





5 months. This benefit has largely arisen due to the processes run by the Fast Response Team which are in turn supported by CRS. They are, for example, able to undertake tasks not routinely done on the wards and CRS provides the support tools and information that facilitates this.

Having access to a patient's history and notes on CRS enables nursing staff to see more clearly what is needed and where possible to determine the onward treatment plan for the patient, minimising the need for a doctor's intervention. This expedites treatment and saves precious consultant time. The consultant can also have an overview of what is happening remotely. Indeed during our observation period there was no obvious consultant intervention required.

The Fast Response Team are also able to monitor ED arrivals through CRS and transfer elderly patients into their care as soon as possible which accelerates them receiving the most appropriate treatments and the commencement of a care plan. The team check the patient in on the system and update it with notes so that if the patient's condition deteriorates, all the information is readily available and they can be admitted straightaway. Furthermore, when known patients are admitted they can be assigned back to their original consultant thus supporting continuity of care, which is particularly important for elderly patients with dementia.

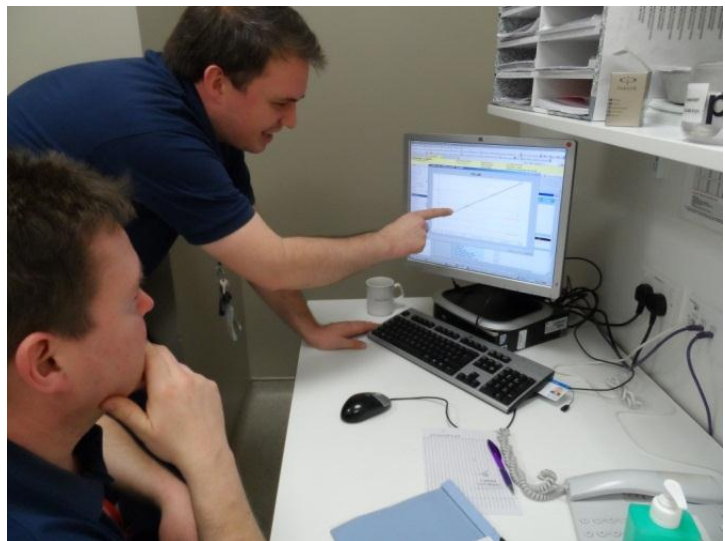


Figure 54: Fast response team using patient data

The system also supports the weekly reviews which take place with the Care of the Elderly team. This is because all the relevant information, e.g. diagnosis, history, medication, test results and imaging etc. is easily accessible within the patient record and can be pulled up on screen during the Multi-Disciplinary Team (MDT) meeting for all to consider. With the system 30 patients can be fully considered within an hour and the outcomes are entered onto the system. Before the same number of patients were considered but potentially without the same degree of consideration or information to support discussions, or alternatively this information would have been available but would have taken a considerable amount of time to assemble.

Indeed, we observed several other MDT sessions when CRS was used at St Bartholomew's and was not used at Whipps Cross. A key benefit of CRS when used was the 4 hours saved not having to collate all the information for each patient for the meeting. Three or 4 hours were still spent selecting the most appropriate PACS images and assembling them into a Power Point presentation. It would therefore be beneficial to understand whether this could be avoided by flagging the images required in the system. Furthermore, whereas at Whipps Cross the outcome was scribed onto a pink sheet which is occasionally mislaid from the paper record, the decision at the Royal London was entered in real time onto the system and resulting actions could then immediately follow.



## 7 Case Study 4 – Research

### 7.1 Key Findings

- 1) CRS has enabled the creation of ‘patient lists’ of people with specific conditions, treatments or procedures thereby facilitating the understanding and management of patients as well as helping to plan future demand on the trust’s resources.
- 2) Having electronic details about patients’ conditions has:
  - a. Allowed the identification of the most appropriate patients for research
  - b. Hastened the recruitment of the patients
  - c. Equalised the opportunity for inclusion in research
  - d. Attracted more funding due to improved research practices
- 3) The increased level of information being collected, including coding, as part of day to day practices, provides an increased level of data for research purposes, including the effect of disease modifying treatments and causative factors. The increased amount of accessible data is encouraging a “research mind set” amongst teams at the Royal London.
- 4) It is felt strongly that patient data used for research on CRS is more secure than when held in standalone databases and ‘checked out’ paper records in research areas.

### 7.2 Introduction

Up until the end of 2009 Neurology had no clear understanding of the number of patients with neuro-inflammatory conditions it treated per year or any means of analysing associated data to undertake studies or clinical trials. Of prime interest were patients diagnosed with Multiple Sclerosis (MS), a key research area at the Blizard Institute of Queen Mary’s Barts and The London School of Medicine and Dentistry, the medical college linked to Barts Health NHS Trust. The motivation to engage with CRS was driven by a combination of academic and clinical interests such as establishing the prevalence of MS in the ethnically diverse community of East London, to recruit ‘people with MS’ (pwMS) into clinical trials and to introduce improved management pathways to deliver better outcomes.

MS is an inflammatory and neurodegenerative disease that affects over 120,000 people in the UK. MS is the major cause of non-traumatic disability in young adults, and there is no cure. There are massive social and economic consequences to the development of MS. This disease reduces life expectancy on average by 6 years, following an average onset in the late twenties, but results in significant loss in quality of life for the affected individual and their carers. This accumulates as the disease progresses. Patients will need assistance from carers over many years.<sup>2</sup>

## 7.3 Benefits Observed

### 7.3.1 Creating a Database

The Neurology team led by Dr Klaus Schmierer decided a crucial first step was to create a database of patients with neuro-inflammatory conditions, particularly of patients with MS. The availability of the database has led not only to a greater understanding of the prevalence of MS in the local population but has also resulted in a step change in the way patients are recruited for trials. Whereas before patients attending clinic would be asked for their involvement in a trial, a dedicated recruitment coordinator is now in post and able to efficiently identify the most appropriate patients for the trial before contacting the patients seeking their involvement. For example, patients have to meet certain criteria to be considered for some disease modifying treatments being trialled. The recruitment coordinator's task is greatly facilitated by patient details now being electronic, in one place and accessible remotely, which makes them far easier to search through than when the information was stored in paper notes around the hospital. Indeed, in an example where researchers are still dependent on historic paper notes, it has taken 3 months to retrieve the data required for six patients identified as potential trial candidates.



Figure 55: Identifying patients for research in ED

Identifying the most appropriate patients for trials increases the quality of the research undertaken. It equalises the opportunity to be involved in a trial. Before, involvement was dependent on the luck of being at clinic when recruitment was occurring. Now recruitment is far more in line with the NHS constitution and its requirements for equal access to healthcare services. Identifying patients in a timelier manner can accelerate the start of the audit/research activities or allows time for additional patients to be recruited, again strengthening the research. Finally, the elevated quality of the research being

undertaken by the team has resulted in the department being able to attract more research funding, hence the recently appointed the recruitment coordinator.

The research team in the Emergency Department at the trust have similarly benefitted from being able to more easily pinpoint and recruit the most appropriate patients for their research, and in some situations, as the patients are being treating in ED. This means steps can be taken to capture more information than would ordinarily be recorded on the system.

<sup>2</sup> source comments from Dr Klaus Schmierer during Interview on 13<sup>th</sup> Sept 2013

This could include for example access to the blood gas machine results when analysing septic shock.

Like the Neurology team, the ED research team is being able to attract more funding as a result of the opportunities CRS provides. It is therefore recruiting more patients than was historically the case and running more trials. The trust now has one of the largest ED research centres in UK, running half a dozen trials and expanding from one to four whole time equivalents (WTE). Once all sites across Barts Health have the same ED system, the research team will not only be able to work even more effectively but the trust will have one of the biggest ED research populations under one Research and Development centre in Europe.

### 7.3.2 Analysing Data

Over the past three years the MS database has been steadily building up within CRS with contemporaneous and historical information, largely as part of normal clinical practices. CRS now provides a source for the auditing of patients with MS, for example, those on highly active disease modifying treatments. Ever since he initiated the database project, Dr Schmierer has been running his outpatient clinics by recording all his clinical notes in CRS. This allows him and his clinical colleagues access to notes from any trust PC as soon as the patient leaves his consultation room.

Dr Schmierer also said “I have encouraged the outpatient nursing staff to insert patient’s vital signs into the respective module on the EHR [CRS], which among other data speeds up the posting of requests (e.g. MRI, where “patient’s weight” becomes automatically populated once it has been recorded into vital signs)”.

Dr Schmierer continued, saying “Some of my colleagues are keen to change practice in this direction too as they become increasingly aware of the benefits and power of patient data collection, particularly when using SNOMED CT”. Indeed, a consistent coding approach, as we have seen elsewhere in the report, significantly assists research. We have also seen that the availability of data is encouraging a research mind-set amongst staff in the trust.

The availability of the “Explorer Menu” as part of the CRS heralds a breakthrough and it has immediately become a vital tool for end users to run quick data extractions for analysis. This has clearly highlighted the importance and usefulness of coded data collection to even the most cynical and paper-loving clinician. Dr Schmierer said “I believe provision of the Explorer Menu has been the single most important development to boost usage of CRS from the stage of innovators/early adopters to the majority, pulling the laggards along in their wake”.

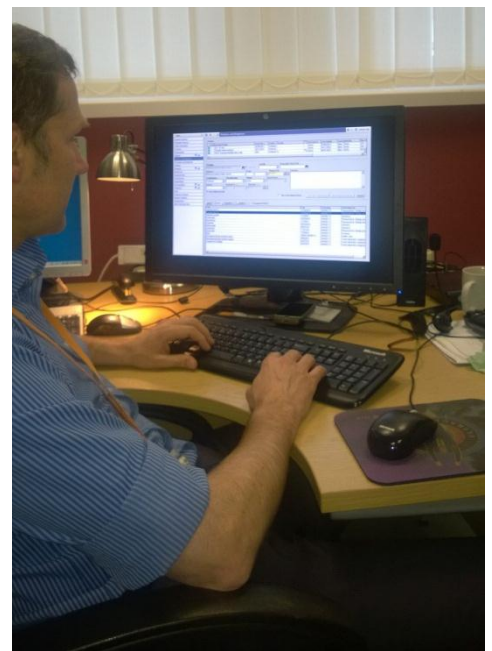
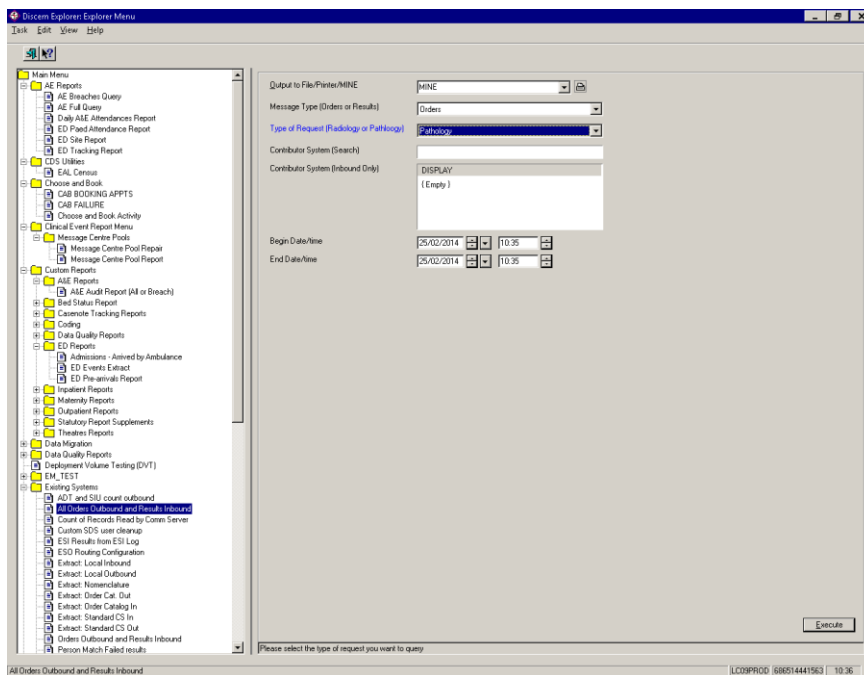


Figure 56: Analysing patient data



*“I believe provision of the Explorer Menu has been the single most important development to boost usage of CRS from the stage of innovators/early adopters to the majority, pulling the laggards along in their wake”.*

Figure 57: Explorer menu

### 7.3.3 Easier Audits

A further example of the value being gained from using CRS is a recent audit led by Drs Annie Davis and Klaus Schmierer into two different lumbar puncture systems; traumatic versus atraumatic needles and their effect on the incidence of post lumbar puncture headache (PLPHA) syndrome. PLPHA is a significant problem, affecting over one third of patients having the procedure. This condition is at best unpleasant for those affected, but can lead to many days of sick leave. An audit was set up where the procedure was documented as a clinical note in the patients’ electronic record. Patients were contacted post procedure by a nurse who would collect the relevant data and again entered this into CRS.

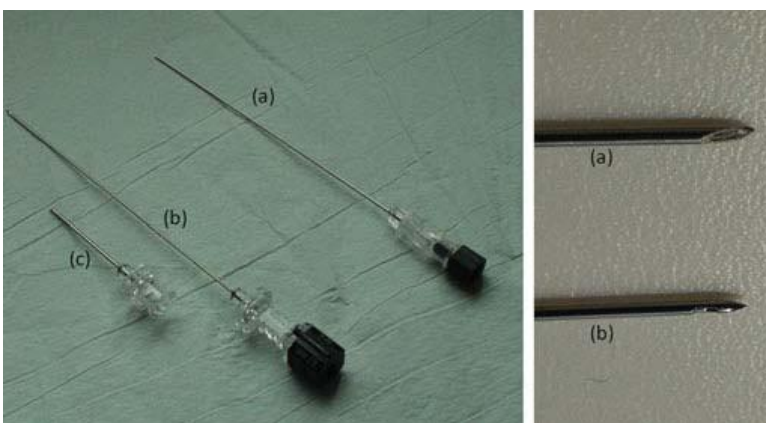


Figure 58: Needle design: (a) traumatic (Quincke©) and (b) atraumatic (Sprotte©) needle

Dr Schmierer said “Using CRS in this setting meant that the nurse, based some distance away from the PIU [Programmed Investigation Unit] where the Lumbar Punctures were carried out, had paperless access to the patient information in preparation for follow-up phone calls. The captured information immediately became part of the patients’ record and



at the same time easily accessible for analysis of the audit”. With doctors and nurses documenting patients’ progress in CRS, the system is extremely helpful for observation studies. Furthermore, the system sometimes captures information better than would have been the case on paper. For example, figures are now entered on the system whereas before on paper it was not uncommon to find up and down arrows used.

### 7.3.4 Patient Security

With only 30 national MS centres of excellence, it is critical that the patient’s record is managed efficiently and effectively and is eventually shareable between centres of excellence. This will increase the richness of the dataset being used and accelerate research outcomes. The department recognises that the integrated nature of CRS offers greater data security (ensuring patient confidentiality) as compared to the separate standalone database solutions or indeed piles of paper notes.



Figure 59: Piles of paper notes waiting collection

The availability of the data on CRS also makes inspections much easier, ensuring the quality of the research being undertaken. This saves the external agencies as well as the trust significant amounts of time preparing for and undertaking an inspection. The trust is also better able to comply, and demonstrate compliance, with trials legislation including in the area of patient consent.

## 7.4 Improvements

“PowerTrials” is a Cerner Millennium module which helps manage the whole trial process, aligning all trial activity with the patient record on CRS. The trust is currently piloting this tool with the medical college and several teams within the hospital are keen to commence using it for the following reasons.

“PowerTrials” flags the records of those patients participating in the trial so they can be easily identified. Drug trial protocols can now be built into the patient record using a power form thus trial results can be stored alongside the patient’s clinical record. This enables better interpretation of the trial results as these can be assessed in conjunction with the patient’s clinical history. Previously analysis required access to case notes alongside the trial results.

The ability to monitor patients on trials is now much easier as the effects of the trial can be assessed as part of routine appointments. As a result targeted intervention is possible should corrective action be required. It is also easier to monitor and report on the progress of all trials. This enables trial managers to know how well a trial is performing, manage time scales, resources, issues etc. Currently most reporting is done via spreadsheets where the trail leads have to regularly key in specific data which although enables effective monitoring, is very inefficient.



## 8 Case Study 5 – Recent Developments

### 8.1 Key Findings

#### Three discoveries of significant potential benefits

- 1) Colorectal team's paperless working with all their patients' data now being captured electronically in CRS, from their arrival in ED or an outpatient's appointment through to surgery, being an inpatient and eventual discharge. Key benefits so far include 1) removing the administrative burden of pulling paper records for clinic, 2) achieving a more efficient production of the outpatient letter available for despatch during clinic and 3) generally having more information available leading to faster and better informed treatment decisions
- 2) The Health Information Exchange between NHS Barts Health's hospitals and local GPs is allowing the hospital to see information on the GP's record together with hospital records from other Barts Health sites. This is allowing clinicians to treat patients much more effectively, especially those in an emergency care situation. Furthermore, the new system also has significant potential for breaking down barriers between GPs & other community clinicians and the hospital teams.
- 3) CRS has also started to be used to help investigate complaints and service incidents at all levels. In its most basic form, CRS helps track the health records required and identifies the correct patient. It can also provide a very helpful time line of events, the associated details and documentation. Faster access to information should help resolve complaints sooner which could avoid half of the complaints received. About fifty per cent of complaints received relate to the time taken to resolve complaints.

During the study we found several examples of where CRS was starting to be used in new and innovative ways to improve processes and to create benefit. Furthermore, this was not restricted to processes within the hospital but also between the hospital and the community. Below are three examples where we saw significant potential benefit and therefore we felt they should be included in this report.

### 8.2 Going Paperless

One clinical team at the Royal London went paperless during October 2013 as opposed to the paperlite approach adopted by the other departments we observed for this report. The Colorectal team led by surgeon Mr Shafi Ahmed, has decided there is enough data currently on the system to dispense with patients' paper notes. This applies to all interactions between the patient and hospital from visiting ED; attending an Outpatient's appointment;

having tests; undergoing an operation in the day unit to being admitted on a ward. As a team they now have patients with a completely electronic record for their most recent hospital episode of care.



Figure 60: Colorectal Team using Computer on Wheels (COW) on ward

Not pulling notes for Outpatient appointments has a clear benefit in terms of saving pulling and prepping effort and as we have seen this could be very significant. The Colorectal consultants are also dictating and finalising their GP letters between patients using system populated templates, with the intention of patients leaving clinic with their letter. A patient survey in this department indicated 89% of respondents felt it would be highly beneficial to leave their appointment with a letter summarising the outcomes of their appointment. The main reasons given were remembering what had been discussed and what was to happen next. Also one respondent felt it was important for their GP to know

about prescription changes as soon as possible. From a trust perspective it could significantly reduce recently increased postage costs, considering there are 21,500 outpatient appointments per week. Medical secretaries could also be given other tasks to complete. However, at the time of writing a printer issue is preventing this from happening. The letters are being posted to the patient and their GP but still on the day of the clinic.

Notably, all Colorectal inpatient data is being entered onto the system which means doctors and specialist nurses can see what is happening to their patients without necessarily going onto the ward, facilitating faster decision making. The Royal London is a large hospital and much time can be saved in this way. During our ward round with the team it was taking 2 to 3 minutes to move between patients in wards on different floors. On one occasion it took 7.5 minutes.

Despite these immediate benefits of going paperless, there is still room for improvement because nurses generally have to make notes on paper and then add them to the system. This is because they do not have handheld devices. Doctors' notes are entered directly onto a mobile desktop computer in the department during ward rounds. However, doctors have to revert to writing in paper notes when their patients are outliers on other wards not yet using CRS so comprehensively.

Indeed, only when large parts of the hospital follow the Colorectal team's lead on being paperless will the dis-benefit of running paper and system based processes in parallel be overcome. Furthermore, benefits based on reducing the storage and administration costs around paper patient notes will not be significantly impacted until there is no longer a need to pull them.

### 8.3 Health Information Exchange

Having up-to-date and accurate information available about the patient being seen, whether in a GP's consulting room, hospital, emergency department or in the community, is essential for delivering a safe and effective healthcare service.

Barts Health NHS Trust is currently working with local commissioners at Tower Hamlets CCG and Newham CCG to share patient information between GPs and Barts Health's six hospital sites. By implementing a Patient Health Information Network (or "HIE") launched in November 2013, Barts Health and its primary healthcare partners in East London aim to improve the quality of medical decision-making and the coordination of care between health services.

Cerner Millennium will soon be the trust's primary clinical information system. GPs at Tower Hamlets and Waltham Forest CCGs use EMIS and a range of other systems. Barts Health have developed Cerner's Health Information Exchange ('HIE) product by integrating the GP record with the MIG (Medical Interoperability Gateway). Health Information Exchange has been in use at the Royal London Hospital since November 2012 and is currently being introduced within GP practices across the east London community served by Barts Health.

Since implementing HIE, clinicians at the Royal London hospital are now able to view a patient's GP record together with other hospital records from Barts Health sites, providing a complete picture of the patient's healthcare needs. Later this year, the view will be extended to include pharmacy data sets, enabling the pharmacist to view the patient's medicines without having to call their GP.

Clinician and patients are already seeing the positive benefits. Dr Claire Dow, a consultant geriatrician finds the HIE particularly useful when dealing with elderly patients who are very confused and do not have their medications. Dr Dow cites the case of a patient she treated where she could see from the HIE that the elderly patient had not been to hospital for 5 or 6 years. This meant Dr Dow was not sure if the confusion was new or a diagnosed problem, which would change her treatment. With the patient's permission, she was able to check her primary care record. "If she was known to have dementia, I would have changed the testing protocols," she explains. "It's still early days, but this will reduce repetition of tests we are doing ....." Dr Dow says the new system also has significant potential for breaking down barriers between GPs and other community clinicians and the hospital teams.

Emergency medicine consultant Karim Ahmad noted that lack of the appropriate information had previously caused concerns, with the gaps in available patient information ranging from a full medication list from their GP to no information at all. "With the vast majority of patients, if you ask for their medical history, they are not that sure," he says. "With patients who are unable to give any information at all, we are pretty much blind – unless they have been to us before and we have something on our own records. Having access to a patient's GP record with more accurate information means that we have got quite clear, precise information about what and who we are dealing with."

80% of local GP practices in Tower Hamlets and Newham are currently signed up to the data sharing agreements, which facilitate access to the primary care record. Barts Health is working with the remaining practices in these boroughs to roll out the system. Eventually it is hoped that the HIE will be increasingly patient facing, allowing patients to take greater control of their own health.

## 8.4 Investigating Complaints and Serious Incidents

CRS has also started to be used to help investigate complaints and service incidents at all levels. In its most basic form, CRS helps track the health records required by the governance leads tasked with investigating complaints. As we have already seen in the

report, this saves significant time locating the required paper records. One respondent to a survey of departmental governance leads tasked with investigations noted “Case note tracking is of course crucial”.

Another response stated “In day to day governance work EPR and CRS are invaluable.” It helps in the early stages of a complaint or serious incident by confirming the initial information such as identifying the correct patient and the team caring for them. It can then provide a very helpful time line of events for example, when appointments were booked and by whom; whether an appointment letter with the correct information was sent; whether the patient attended; the appointment’s outcome; access to the timings of tests and results; and any attendances or admissions and the associated detail etc.

However, use of the system is patchy and amongst the governance leads there is a keenness to understand more about how the system can help them, how it replaces the systems they had before (e.g. TOPHAT, a system showing the wards patients stayed on) and what their colleagues are managing to achieve with electronic data. “On the whole I do not know how I would cope without the electronics systems, and am keen to know how the other Governance Leads use them...” was a response we received.

It was also commented that it will be very helpful to have clinical letters following outpatient appointments on the system. Similarly, there is significant benefit identified if electronic records increasingly replace paper ones and if the governance leads could be enabled to interrogate the electronic information available. It would be helpful to have some specific training for Governance, how CRS can benefit, interrogating historical data is a big part of many investigations.

Lastly a respondent made a telling point that many complaints arise due to the time taken to resolve complaints and that electronic data would significantly accelerate the investigations into complaints and incidents due to the delays that happen when trying to obtain information that may, or may not have been, captured on paper. It was commented, “Given that half of our complaints are also about delays in responding to earlier complaints, and that the delays are frequently due to missing paper records, I would love to be able to use CRS to improve our efficiency.”

# Appendices

## Appendix A – Glossary

<b>AAU</b>	Acute assessment unit (AAU) is a short-stay department with emergency medical treatment facilities where patients admitted in ED are transferred to before they are transferred to the relevant ward or sent home
<b>Atraumatic</b>	A medical or surgical procedure causing minimal tissue injury
<b>Analgesia</b>	Pain relief without loss of consciousness
<b>BLT</b>	The acronym for; Royal London/St Bartholomew's/The London Chest Hospital/Mile End Hospital
<b>C.diff</b>	Clostridium difficile infection is a type of bacterial infection that affects the digestive system
<b>CJD</b>	Creutzfeldt-Jakob disease (CJD) is a rare and fatal condition that affects the brain, causing brain damage that worsens over time. Variant CJD can be transmitted by blood transfusion.
<b>Clinical Commissioning Group (CCG)</b>	A clinically led group that includes all of the GP groups in a geographical area, set up to organise the delivery of NHS services
<b>COPD</b>	Chronic obstructive pulmonary disease (COPD) is the name for a collection of lung diseases including chronic bronchitis, emphysema and chronic obstructive airways disease
<b>Creatinine serum level</b>	A measured byproduct of muscle metabolism which provides an indicator of renal health
<b>CRS</b>	Care Records Service (CRS), a secure electronic service holding patient information
<b>EPR/EHR</b>	Electronic Patient Record/Electronic Health Record
<b>Finished Consultant Episode (FCE)</b>	An inpatient or daycase episode where the patient has completed a period of care under a clinician and is either transferred to another clinician or discharged
<b>Haemophilia</b>	An inherited condition that affects the blood's ability to clot
<b>Healthcare Resource Group (HRG)</b>	A grouping consisting of patient events that have been judged to consume a similar level of resource, the system is used by Payment by Results, an activity based payment system used to determine the income hospitals get for given hospital stays and procedures
<b>Local Service Provider (LSP)</b>	An organisation which has been contracted to be responsible for delivering services at a local level, providing electronic care record systems and services to the healthcare system
<b>Lumbar puncture</b>	A medical procedure where a needle is inserted into the lower part of the spine
<b>May-Thurner syndrome</b>	A condition in which compression of the common venous outflow tract of the left lower extremity may cause deep venous thrombosis (DVT)



<b>MRSA</b>	Meticillin-resistant staphylococcus aureus (MRSA) is a type of bacterial infection that is resistant to a number of widely used antibiotics
<b>Norovirus</b>	A highly contagious stomach virus
<b>Outliers</b>	Patients admitted to a different ward
<b>PACS</b>	A picture archiving and communication system (PACS) which provides storage and access to images
<b>PAS</b>	A patient administration system (PAS) which records the patient's demographics and details patient contact with the hospital
<b>PDS</b>	Personal Demographics Service (PDS) is the national electronic database of NHS patient demographic details such as name, address, date of birth and NHS Number
<b>Resus</b>	The resuscitation area, containing the equipment and staff required for dealing with immediately life threatening illnesses and injuries
<b>Sickle Cell</b>	A genetic blood disorder in which red blood cells develop abnormally. These abnormal red blood cells can then clog sections of blood vessels leading to episodes of pain which can be severe.
<b>SNOMED</b>	'Systematized Nomenclature of Medicine Clinical Terms' a collection of medical terms providing codes, terms, synonyms and definitions used in clinical documentation and reporting
<b>Spine</b>	The NHS' secure national database
<b>Transient ischaemic attack (TIA)</b>	A temporary disruption in the blood supply to part of the brain, also known as a "mini stroke"

## Appendix B - Contributions

This report would not have been possible with the help and time of a large number of people. We are sincerely grateful for their assistance and guidance.

With special thanks to:

**Emma West**

**Strategist, European Advisory Practice, Cerner**

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Andrew Brownless	Deputy Chief Information Officer, HSCIC
Andrew Freeman	Programme Manager, HSCIC
Dr Brian Kennedy	Consultant A&E
Ben Anderson	Information Assistant
Mr Boyd Goldie	Consultant Orthopaedic Surgeon
Ceri Guarnieri	Research Nurse
Dr Charles Gutteridge	CCIO/Consultant Haematologist
Charlie Grant	Governance Support Cardiovascular/Cancer
Dr Claire Dow	Consultant in Healthcare of the Elderly & Clinical Lead for the Fast Response Team
Dr Dan Hart	Consultant Haematologist
Deborah Madden	Deputy Director of Operations Emergency Care & Medicine
Derek Moseley	Infection Control Nurse
Darren Hinds	Service Manager - Outpatients
Denise Savage	Business Coordinator
David McClinton	Fast Response Team Leader
Edith Mahachi	Infection Control Nurse

Ellie Banner Ball	Communications Lead, Informatics
Eilidh Steward	Infection Control Nurse
Ekundayo Badmus	Medical Records Manager
Frances Stelling	EM Administration and Information Manager
Mr Gareth Scott	Orthopaedic Consultant
Gary Daley	Outpatients Health Records Supervisor
Georgina Baidya	Outpatient Service Manager
Geraldine Maher	AAU matron
Grace.Anjorin	MS Specialist Nurse
Gregory Bird	General Manager for Outpatients
Ian Dearlove	Head of ICC Information
Ishraga Mohamed	Sister
Jacky Ormston	Senior Project manager, HSCIC
Jason Pott	Senior ED Clinical Research Nurse
Jayne Baker	Secretary to Mr Shafi Ahmed & Mr Mo Thaha
Jo Conroy	ED Matron
Judith Bottruell	Head of Compliance
Julie Day	ED Matron
Kate Forsythe	Haemophilia Clinical Nurse Lead
Kathy McGovern	EM Administration
Kelly Buckley	Digital Adoption Team
Dr Klaus Schmierer	Consultant Neurologist
Lewis Charles	ED Clerical Officer
Dr Louise Bowles	Consultant Haematologist
Luke Maggs	ICT Back Office Support
Lynn Underhill	Central Appointments Manager
Malik Ramadhan	Consultant A&E
Mandy Hendricks-Calixte	Appointments Clerk
Dr Manoj Ramachandran	Consultant Orthopaedic and Trauma Surgeon (Paediatric and Young Adult)
Martina Cummins	Nurse Consultant Infection Control
Mary Holland	Service Manager Emergency Care & Trauma
Madeleine Hughes	Interim General Manager Outpatients Service Manager Elective Admissions

Mr. Matthew Hogg	Lead Obstetrician, Consultant in Obstetrics and Gynaecology
Mr James Green	Consultant Urological Surgeon
Neil Bourke	OPD Clinic Manager
Dr Nita Patel	Consultant Clinical Oncology
Dr Noorani Ali	Consultant Trauma And Orthopaedics
Dr Paul Telfer	Consultant Haematologist
Professor Pasi	Consultant Haematologist
Peter Nicholson	Outpatient Manager
Dr Sandhia Naik	Consultant Paediatric Gastroenterologist
Sarah Mills	Clinical Haematology Matron
Mr Shafi Ahmed	Consultant Colorectal Surgeon
Steve Heron	Health Records Service Manager
Surinder Padam	Technical Support Team Leader
Susan Small	Senior Clinic Preparation Supervisor
Tina Young	Head of Clinical Coding
Tony Luther	ED Service Manager
Dr Upal Hossain	Consultant Haematologist
Dr Virginia Wolstenholme	Consultant Clinical Oncologist

## Appendix C – Benefits mapped against supporting evidence and system functionality

In the table below the main benefits of the report are listed against the underlying system functionality and any supporting evidence that has been finalised. **The valuation of the benefits realised is currently being undertaken.**

### Emergency Department

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
Improved Decision Making	<p>One source of current, reliable and more abundant patient information, including specific care plans and protocols.</p> <p>Live information for better management of the department e.g. coping with activity peaks and bed management meeting</p>	Observations, Staff Survey, Interviews	<p>A staff survey indicated whilst at Whipps Cross just over half the respondents had less than 60% confidence in the patient information being up to date, this number fell to 16% of staff at the Royal London.</p> <p>Over 97% of ED staff answering our survey agreed "Having access to historical notes is very helpful for making a decision".</p>	FirstNet®
Reduced effort in maintaining two systems	Only one system to maintain and no need for cross checking	Observations, Interviews	See check in and discharge metrics below	FirstNet®



Improved teamwork	Less confusion caused by multiple sets of information, increased efficiency more generally, both providing greater capacity to recognise colleagues' needs and discuss matters	Observations	To be determined - specific metrics not yet available	FirstNet®
Less time lost searching for information	Information available when required and not missing	Observations, Interviews	A consultant was witnessed searching for information for twenty minutes during a four hour observation	FirstNet®
Less time lost due to multiple attempts to update record  Patient information is contemporaneous	Able to complete updates to patient record as needed	Observations	To be determined - specific metrics not yet available	FirstNet®
Less time lost confirming the most current source of information	Reduced confusion with one source of information rather than information being held in multiple places	Observations, Interviews	To be determined - specific metrics not yet available	FirstNet®
Less time required to support whiteboard	Electronic whiteboard is less onerous to maintain	Observation, Interview	To be determined - specific metrics not yet available	FirstNet®
Improved job satisfaction of Board/Nurse coordinator role	Improved tools to perform nurse coordinating role well	Observation, Interview	To be determined - specific metrics not yet available	FirstNet®

Less time duplicating information	<p>Specialist visiting department no longer needs to make notes from CAS card</p> <p>No longer a need to enter data on multiple systems and paper and cross check</p> <p>No longer necessary to photocopy and scan CAS card to enter it onto the electronic system</p>	Observation, Interview	<p>5 minutes saved by specialist not duplicating information from CAS card</p> <p>See check in and discharge metrics below</p>	FirstNet® and PowerChart®
Less time lost searching for patients	With better tracking information there are fewer patients for whom their whereabouts is uncertain	Observation	To be determined - specific metrics not yet available	FirstNet®
More efficient use of staff within ED	Information on activity levels by area allows management to better manage peaks in demand	Observation, Interview	“It is exceptionally difficult to manage the flow through the department without it [CRS system].” – ED Manager	FirstNet®
Less time spent on more effective handovers	Handovers are more succinct and structured being based on the information in the system which also provides a clear reference point	Observation, Interview	Staff handover time reduced from over 4 minutes to 2 minutes	FirstNet and PowerChart®
Less time lost when discharging patients freeing up cubicles more quickly	Information is ready at the point of discharge as it is compiled throughout a patient’s treatment	Observation, Interview	To be determined - specific metrics not yet available	FirstNet®

Significant reduction in admin time around check in and discharges processes	Fewer systems to update when checking in and discharging patients	Observation, Interview	Time taken for admin staff to complete discharge significantly reduced by 10 minutes per patient...down to just a few seconds per patient. Receptionist time spent photocopying and scanning CAS card is eliminated (Clinical discharge is completed within 4 to 5 minutes)	FirstNet®
Less time used across staff groups on electronic forms and lists	No need to duplicate data in forms and lists, and physically distribute them	Observation, Interview	9 minutes to complete and fax ambulance form	FirstNet®
Capacity is increased through faster decisions to discharge	Knowledge about what is normal for the patient and their specific circumstances can result in a quicker decision to discharge	Interview	See later metric in Care of Elderly section	FirstNet®
Less resources in the area of breach management	Breach reason entered by doctor at discharge and automatically reported	Observation, Interview, Timesheet	Time spent documenting and investigating ED patient breaches reduced for the senior ED team (2 x grades 8a +doctor) by 2-3 hours to 15 to 30 minutes per day through access to necessary patient information.	FirstNet® and Explorer Menu
Improved performance and issue resolution within team	Performance Dashboard posted daily in ED	Observation, Interview, Timesheet	To be determined - specific metrics not yet available	FirstNet®

## Outpatients

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
Increased revenue through more complete coding	Clinicians are coding episodes more fully using CRS	Corporate data, observations, Interviews	The increase in the number of diagnosis per coded episode has been mirrored by an increase in the average income received for each finished consultant episode (FCE). The YTD average income received per coded episode was £1270. Between April to November 2013 this figure increased by an average of 11.8% bringing the average income received over that period per coded episode to £1409.	SNOMED coding - <i>PowerChart®</i>
More efficient and improved booking service for patients	Centralised booking service for patients with referrals	Observations, Interviews, corporate data, patient survey	<p>Patient satisfaction when booking appointments increased – at the Royal London only 7% felt that it was not quick and easy to make outpatients appointment, whereas 21% felt this way at Whipps Cross</p> <p>Patient satisfaction increased –</p>	PAS - Registration and Scheduling) – <i>PMOffice</i> and <i>Scheduling Appointment Book</i>

			only 5% of patients at the Royal London felt that advice and support was not available when making a booking whereas this figure increased to 11% at Whipps Cross.	
Less resource to resolve duplicate record issue	Reduced number of un-flagged NHS numbers on system resulting in fewer automatically generated duplicate records	Observations, Interviews, corporate data	See report for no. of duplicates at both sites and time taken to merge them	PAS – Registration, Scheduling and PDS integration - <i>PMOffice</i> and <i>Scheduling Appointment Book</i>
Less resource required to search for missing records	Fewer missing records	Observations, Interviews	Significant reduction in time spent pulling notes for clinic - Estimated reduction from 5-6 hours to 25 minutes per clinic	Case Note Tracking – <i>Health Information Management (HIM)</i> with barcode scanning
Less resource intensive preparation of clinic notes  Improved quality of notes available for clinic	Issues with prepping Notes minimized prior to clinic	Observations, Interviews	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart</i>
More efficient means of accessing more of the patient's history	More information is readily available to the doctor when preparing for their next appointment during the clinic	Observations, Interviews	Quality improvement – specific metric not yet available	Clinical Documentation - <i>PowerChart®</i>



Less clinical time ordering tests and investigations	Electronic Ordering Process saves clinical time	Observations, Interviews	Reduction in time spent ordering tests – reduced from just under 3 minutes to 1 – 1.5 minutes during Outpatient appointment	Order Comms - <i>PowerChart®</i>
Improved continuity of patient care and patient satisfaction	Faster production of GP/Patient letter post appointment	Observations, Interviews, Patient Survey	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Less resource intensive process to produce GP/Patient letter post appointment	Clinical production of GP/Patient letter post appointment	Observations, Interviews,	See report for details for specific details	Clinical Documentation - <i>PowerChart®</i>

## Sickle Cell Disorder

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
Reduced Length of Stay	Correct and speedy treatment through the use of patient specific electronic treatment protocols in ED	Interview, audit, observation, patient survey	Reduction in Length of Stay for Sickle Cell patients from an average of 4.5 days to 3 days through the use of standardised protocols in patient's record	Clinical Documentation, <i>PowerChart®</i>
Avoidance of Admission	Correct and speedy treatment through the use of patient specific electronic treatment protocols in ED	Interview, audit, observation, patient survey	See report graphs for levels of non admission i.e. 0 days	Clinical Documentation - <i>Clinical Exchange Platform</i> (Health Information)

				Exchange) and <i>PowerChart®</i>
Improved patient safety	Correct and speedy treatment through the use of patient specific electronic treatment protocols in ED	Interview, audit, observation, patient survey	Improvement in regular recording of vital signs and pain scores – increased from 1 or 2 pain scores captured in first 6 hours of admission to 3 or 4 pain scores captured	Clinical Documentation - <i>PowerChart®</i>
Improved patient experience	Correct and speedy treatment through the use of patient specific electronic treatment protocols in ED reducing the time the patient is in severe pain	Interview, audit, observation, patient survey	Improved compliance in terms of following protocol – 10% increase in number of sickle cell disorder patients receiving analgesia within the first 20 minutes of ED attendance	Clinical Documentation - <i>PowerChart®</i>

## Haemophiliacs

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
Harmful and expensive treatment errors avoided	Correct and speedy treatment by having ready access to patient specific information on CRS in ED	Interview & observation	Inappropriate treatment cost the Trust an additional £10k  Cost to patient being determined	Clinical Documentation and Message Centre - <i>PowerChart®</i>
Improved support of patient managing their condition	Ready access to information about patient's circumstances held on their electronic record	Interview & observation	Quality improvement - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>

More effective blood testing	Able to annotate electronic blood test orders with specific requests to illicit specific information	Interview & observation	To be determined - specific metrics not yet available	Order Comms - <i>PowerChart®</i>
Reduced risk of infection for other patients	Treating clinicians are immediately aware of infection risk, e.g. CJD or Hep C through information being on CRS	Interview & observation	Incidents of infection risk	Clinical Documentation - <i>PowerChart®</i>
Quicker and more effective handovers between staff	Comprehensive patient record provides easily located information on CRS reducing the time for handovers and full patient reviews	Interview & observation	Reduction in nursing time spent carrying out a full patient handover from 20 minutes to 5 minutes due to access to all clinical information in one place in a structured format	Clinical Documentation and Message Centre - <i>PowerChart®</i>
More effective team working environment	Comprehensive, contemporaneous and legible information on CRS allows team to support each other in care of a patient	Interview & observation	To be determined - specific metrics not yet available	Clinical Documentation and Message Centre - <i>PowerChart®</i>
Prompter response to patients' needs	Comprehensive, contemporaneous and legible information on CRS allows team to support each other in care of a patient and to respond more promptly to a patient's needs	Interview & observation	To be determined - specific metrics not yet available	Clinical Documentation and Message Centre - <i>PowerChart®</i>
Increases certainty of intended care	Consultant easily able to review actions of team in caring for the patient	Interview & observation	To be determined - specific metrics not yet available	Clinical Documentation and Message Centre - <i>PowerChart®</i>
More comprehensive patient record on which to	Faster and easier to store and retrieve information in electronic	Interview, informal survey	It is estimated travelling to the Day Unit and pulling the record	Clinical Documentation -

base decisions Time saved updating accessible patient record	patient record No longer necessary to travel to Medical Records to retrieve patient information in paper notes	& observation	for review or to insert information, and then returning it, saves at least 30 minutes if the record is easy to locate. The alternative is to request the record which takes 24-48hours.	<i>PowerChart®</i>
Better use of history relating to rare events	Rare patients events are coded correctly using SNOMED coding on CRS	Interview & observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Improved planning, demand forecasting and commissioning	Department records all patient episodes on the system, long and short accurately reflecting their activity levels	Interview & observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>

## Infection Control

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
More efficient management of dispersed patients	Quicker to track and review patients on wards around hospital minimizing those needing to be seen everyday	Interview/ observation	“Using Millennium EHR has saved us a lot of time in tracking down the patient’s location. It could take us up to 2 hours per day [each] to locate our patients, now it’s virtually instantaneous. This is a real benefit. “	Clinical Documentation - <i>PowerChart®</i>
Avoids duplicating data inputting	All Infection Control notes are recorded once against the patient’s infection alert in CRS which is	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>

	easily created by the nurse			
Reduces possibility of further infection	Infection Control notes are readily available to all treating clinicians	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Time saved not trying to locate paper notes and IC notes	Infection Control notes are readily available to all treating clinicians	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Faster response to IC queries reducing risk of infection	Infection Control notes are readily available and legible, allowing IC team to better support each other	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Discharges and transfers not delayed by IC information	Infection control information is more readily available for discharge and transfer purposes	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Improved planning, demand forecasting and commissioning	Infection control episodes of care are coded more fully providing a more accurate representation of activity levels	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>



## Care of the Elderly

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
More efficient management of dispersed patients	Quicker to track and review patients on wards around hospital on the system	Interview/ observation	Not having to search for patients can save the consultant at least 2 hours of trawling the hospital wards a week. In addition, it is anticipated that at least 30 minutes of a consultant's time could be saved every day (7 days a week) by not having to travel to Mile End hospital to review a patient's notes in order to make a care decision where direct patient contact is not required	Clinical Documentation and PAS (Bed Management) – <i>PowerChart®</i> and <i>PMOffice</i>
Reduces chances of exacerbation and delirium in ED	Awareness of potential complications, e.g. Dementia, available on patient's record in ED	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Improved patient experience	All treating clinicians are aware of any limiting conditions and can act appropriately	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Increased potential to discharge rather than admit	Clinicians in ED have an awareness of what is normal and home circumstances	Interview/ observation	It has been estimated by consultants that 5 to 10% of elderly patients arriving in ED can now be discharged without being admitted	Clinical Documentation - <i>Clinical Exchange Platform</i> (Health Information)

				Exchange) and <i>PowerChart®</i>
More data to diagnosis, track disease progression and inform treatment plan	Easy access to five years of historic patient data on system, including outcomes and test results, which can then be trended	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Safer treatment plan	Easy access to 'starred' medications which have important side effects	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Safer and more efficient decision making	Effective presentation of data with flagging of key results	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Improved patient's comprehension and increased self care	Effective presentation of data	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Expedited patient treatment	Provides information to facilitate independence of Nurse led Fast Response team who can they proceed more quickly without the intervention of consultant	Interview/ observation	To be determined - specific metrics not yet available	Clinical Documentation - <i>PowerChart®</i>
Resource efficient treatment of patients	Provides information to facilitate independence of Nurse led Fast Response team	Interview/ observation	Between April 2013 and August 2013 the Fast Response team managed to avoid 670 bed days equating to just under a £170,000 in 5 months.	Clinical Documentation – <i>Clinical Exchange Platform</i> (Health Information Exchange) and <i>PowerChart®</i>
Improved patient	Fast Response team are able to monitor elderly patients arriving at	Interview/	To be determined - specific	FirstNet and Clinical

experience	ED and move appropriate patients to their care	observation	metrics not yet available	Documentation - <i>PowerChart®</i>
Faster commencement of appropriate treatment plan	Fast Response team are able to monitor elderly patients arriving at ED and move appropriate patients to their care	Interview/ observation	To be determined - specific metrics not yet available	FirstNet and Documentation - <i>PowerChart®</i>
More effective Multi-Disciplinary meetings	System is used in weekly Multi-Disciplinary meetings to provide live information updates and reduces preparation time for meeting. Decision also immediately made available on system.	Interview/ observation	4 hours saved not having to collate all the information for each patient for the MDT meeting	Clinical Documentation - <i>PowerChart®</i>

## Research

Benefit	Outcomes	Evidence	Metrics	Supporting Functionality
More equitable access to trials	More information to use when recruiting patients to trials	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu</i> and <i>PowerTrials</i>
More appropriate research patients improving quality of research	More information to use when recruiting patients to trials	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu</i> and <i>PowerTrials</i>
More efficient and quicker	Electronic patient information facilitates the search for the most	Interviews	To be determined - specific	Reporting and Research -

recruitment process	appropriate patients and the recruitment process		metrics not yet available	<i>Explorer Menu and PowerTrials</i>
Increased research funding	Improved research quality due to recruiting the most appropriate patients attracts more funding opportunities	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu and PowerTrials</i>
Increased research data	Able to monitor patients arriving in ED for potential for inclusion in research and collect more real-time data. Important additional information is therefore captured during the course of normal treatment	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu and PowerTrials</i>
Increased research data	Improved depth and breadth of coding means a greater amount of important data is more accessible and therefore valuable for research purposes	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu and PowerTrials</i>
Increased 'research mindset' amongst staff	Improved depth and breadth of data available about a patient and ability to run quick data extracts	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu and PowerTrials</i>
More secure patient data	Patient data is more secure when being used for research purposes as files are not removed from medical records and stored elsewhere or patient data is not	Interviews	To be determined - specific metrics not yet available	Reporting and Research - <i>Explorer Menu and PowerTrials</i>

	stored in standalone databases.			
Reduced impact of Inspections	<p>Better able to prepare for and run inspections with access to electronic data</p> <p>Better able to comply with and demonstrate compliance with trials legislation including patient consent</p>	Interviews	To be determined - specific metrics not yet available	<p>Clinical Documentation, Reporting and Research – <i>PowerChart®</i>, <i>Explorer Menu</i>, <i>PowerTrials</i></p>