Oxford University Hospitals NHS Trust

Electronic Patient Record (EPR) Benefits realisation case study

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This report may be of interest to patients, members of the public, clinicians, staff and other stakeholders involved in the use and benefits of an electronic patient record.

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1. Introduction

It is well recognised that healthcare information technology (IT) is a critical enabler of improved care and efficiency across health and social care, 'Better use of data and technology has the power to improve health, transforming the quality and reducing the cost of health and care services. It can … reduce the administrative burden for care professionals, and support the development of new medicines and treatments.'[1]

In recent years there has been an increasing focus on the need to account for the benefits enabled by major investments in IT systems. These IT systems have been in use for a number of years in many trusts and it is widely thought the systems and related change efforts have yet to deliver significant benefits that were expected.

Accordingly, a series of case studies are being undertaken by the Health and Social Care Information Centre (HSCIC) working in partnership with specific trusts that have deployed these systems, to better understand the benefits realised from the IT systems.

This case study explores the progress achieved with the electronic patient record at Oxford University Hospitals NHS Trust.

OUH comprises of four hospitals: the Nuffield Orthopaedic Centre, the John Radcliffe and Churchill Hospitals in Oxford, and the Horton General Hospital in Banbury.

OUH's website describes the electronic patient record (EPR) as a series of software applications which bring together key clinical and administrative data in one place. This case study focuses on the elements of the electronic record provided by Cerner Millennium within the BT Local Service Provider (LSP) contract.

A glossary of acronyms is in Appendix 1.

2. Executive summary

The case study highlights the benefits and value derived from using EPR to improve quality, safety and patient experience and to deliver clinical efficiencies contributing to the OUH strategic objectives of delivering compassionate excellence, a well-governed and adaptable organisation, delivering better value healthcare, delivering integrated local healthcare, excellence secondary and specialist care through sustainable clinical networks, and delivering the benefits of research and innovation to patients (see section 3.2).

The support, commitment and leadership of clinicians to the changes enabled by the EPR was observed in many areas and this undoubtedly underpins the progress to date. Adoption of the EPR is now growing more quickly with the electronic prescribing and medicines administration (ePMA) rollout; and the journey needs to continue in order to move away from the current mix of paper and electronic media, to fully exploit the benefits of the changes enabled by the technology platform.

Areas where benefits are being realised and areas where some challenges were experienced are detailed in the main body of this report. EPR has clearly made a positive impact in:

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[1] Personalised Health and Care 2020: Using Data and Technology to Transform Outcomes for Patients and Citizens A Framework for Action (National Information Board November 2014)

- Maternity

- Order comms for laboratories and radiology

- Electronic prescribing and medicines administration

- Neuro intensive care

It should be noted that there were difficulties with the Referral to Treatment (RTT) 18 week pathway, which was attributed to the product design. This was a 'first of type' requiring a lot of support underpinned by knowledge of the product alongside the NHS context of waiting list management, and led to additional work to accommodate gradual modifications to the system. During the case study observation and interviews, the ongoing significant amount of effort involved in managing and validating the elective pathway was noted.

The business case for the Cerner Millennium EPR deployment at OUH, one of the 'greenfield' trusts within the LSP contract, described the expected outcomes that the system would deliver. Most of the originally intended capabilities listed in figure 2.1 below are being achieved and will be described throughout this case study. The following sections summarise the themes of the case study under these headings.

Figure 2.1: Original capabilities from the business case

Key 'Benefits' (better described as capabilities) that were identified in the Greenfield [2] Business Case were:
• **The replacement of obsolete and/or expensive to maintain legacy systems.**
• **Full compliance with programmes such as Choose and Book Direct Booking (the Greenfields are some of the last Trusts in the country yet to achieve Direct Booking), and enabling use of NHS number;**
• **Delivery of the foundations for a solid information technology platform in preparation for the Foundation Status**
• **The provision of a modern system which can deliver a single patient record, supporting clinical decision making**
• **Reduction in the risk of errors arising from having multiple systems by consolidating information in one place and reporting**
• **Clinical Notes will be contained in one solution, enabling a single point of identification for all systems, and available at any point of access**
• **The ability to record and access patient allergy and alert information electronically at appropriate points in the patient journey**
• **Improved audit trail facilities from both a Clinical and Information Governance perspective.**
• **In addition, there are key benefits associated with efficiency and effectiveness such as:**
– **Bed management**
– **Discharge Summary which sends a message to Pharmacy to dispense drugs**
• **The potential to realise efficiencies in clinical decision making associated with length of stay, Clinic utilisation**

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[2] A greenfield software system is described as one that is developed in a completely new environment, without concern for integrating with other systems, particularly existing legacy systems

2.1. Replacement of obsolete and/or expensive to maintain legacy systems

Replacement of the legacy systems have been achieved. The Nuffield Orthopaedic Centre (NOC) has used Cerner Millennium since 2005. While significant reduction in the use of paper has been made, observation during the case study showed that there are opportunities to improve some processes and further reduce the use of paper (for example pre-operative assessment and some mandatory assessments).

The remainder of the trust (John Radcliffe, Churchill and Horton hospitals) replaced a PAS 'burning platform' with Cerner Millennium in 2011. Data quality improved through having 'one source of truth'; however work to validate patient waiting times continues where data are not entered in real time. Workarounds were created because aspects of the 'first of type' 18 week wait module provided required significant modifications following implementation. Also a time lag between data entry to the EPR and updating the data warehouse leads to additional validation work being required.

OUH is on a journey of change to fully exploit all that the EPR offers. Significant benefits will start to be realised once the EPR 'platform' provides sufficient functionality and content to make it a useful part of clinical processes for a critical mass of clinicians in the trust. The ePMA rollout which started in October 2014 and was almost complete in April 2015 eliminates the use of paper drug charts; it is seen as a 'tipping point' for the full clinical use of EPR. OUH is one of the earliest trusts to implement ePMA and now benchmarks third highest in terms of maximum concurrent users / finished consultant episodes within the cohort of trusts within the London and south of England using Cerner Millennium under the BT LSP contract.

Business change and adoption can be more challenging for organisations that are not implementing a 'new build' or using a 'big bang' approach to deployment as each function implemented requires adapting to existing processes, and users have to change their existing processes to make best use of the system provided. While a mix of paper, legacy and other electronic systems are in place, overall processes cannot be fully optimised. Organisational culture and behaviours significantly affect business change and adoption; the value of very senior leadership for change of this scale, while closely involving the 'front-line' staff should not be underestimated.

OUH is quite rightly proud of their track record in implementing aspects of the electronic patient records. Awards received are listed in Appendix 2.

2.2. Compliance with programmes such as Choose and Book Direct Booking, and enabling use of NHS number.

The legacy systems did not support Choose and Book direct booking. The replacement Cerner system does, and enables use of the NHS number. All specialties require a formal referral by the patient's GP first. The referral process via the contact centre is intended to allow patients to choose and book their appointments via a single access point, although this may also involve interaction with the specialty itself. Patients accessing the musculo-skeletal (MSK) service at the NOC can directly book their appointments for triage online using the Choose and Book website; or by telephone if they prefer. The triage step in the MSK process is intended to ensure referrals are directed correctly.

The Cerner Millennium system is integrated with the Spine, the national databases of key information about patients' health and care. This allows searches of the Personal Demographics Service (PDS), the national electronic database of NHS patient demographics; therefore EPR

requires use of the NHS number. The maternity service has successfully implemented the 'Birth Messaging System' to provide NHS number for babies (NN4B). By using EPR for this process the number of errors has reduced, meaning less time required for corrections.

2.3.   Foundations for a solid information technology platform in preparation for the Foundation Trust status

OUH is working towards Foundation Trust status; to achieve this, the trust is demonstrating systems that provide good quality care, keeping patients safe, delivering good outcomes and providing good experience of care. EPR is making a very significant contribution to this requirement.

Maternity services have been exemplars in the degree of benefits achieved through pro-active and clinically owned use of information. The majority of mums-to-be are booked onto EPR in real time (the remainder being done later as connectivity challenges in the community settings are a constraint). Use of the EPR has made a significant contribution to the achievement of NHS Litigation Authority (NHSLA) level 2 and the service's Care Quality Commission (CQC) ratings. Clinical datasets are being used for resource planning and service developments by forecasting and targeting areas of greatest need. Specifically, any potential safeguarding issues can be flagged, recognised and acted on by all clinicians involved in the women's care in every specialty.

Recent focus on use of medicines related incident data aligned with the roll-out phases of ePMA will provide the required evidence of safety improvements enabled by using ePMA.

2.4.   A system which can deliver a single patient record, supporting clinical decision making

The Cerner system delivers a single patient record, and is starting to support clinical decision making. EPR has delivered a single PAS for the trust with total transactions approaching 1 million per day (28,772,634 in March 2015 (Cerner User Experience monthly trend summary report April 2015)). Currently the EPR includes some clinical data such as the patient's medicines history, prescriptions and administration record with related records of allergies etc. The electronic discharge summary was observed to add value internally by providing key information to the clinician in the absence of the paper records.

Essential standard patient assessments including Venous Thrombo-Embolism (VTE) risk assessment and prophylaxis; and cognitive screening assessments are available on EPR and pop-up reminders are available for clinicians to indicate that the assessments are due (and see section 2.6 re Clinical Notes). Clinical data captured in a structured format facilitates audit and analysis.

2.5.   Reduced risk of errors arising from having multiple systems by consolidating information in one place and reporting

The new Cerner system has provided the platform for this to be achieved. Positive Patient Identification (PPID) is in use for the electronic patient record; for requesting investigations, labelling specimens, prescribing and administering. Patients and staff were heard to comment that this is one of the safest elements of the overall electronic record.

Currently each patient may have up to three or four sets of paper notes (one folder per site); the risk of errors associated with this will decrease as more of the clinical information is held electronically.

Overall safety improvements are expected to result from the use of ePMA for prescribing and administration. Robust analysis of incident data is required to demonstrate this and recent work to coordinate and make best use of the existing Datix data has now provided baselines. A forum is in place to monitor changes over time. The initial results are seen as encouraging and have not

shown any deterioration in safety during the initial implementation; however it is too early to draw any statistically significant conclusions. Medications related transcribing errors are being completely eliminated as roll out and adoption of the new process is completed.

2.6.   Clinical Notes will be contained in one solution, enabling a single point of identification for all systems, and available at any point of access

The Cerner system provides for this, and is starting to be used in some areas as a single place for clinical noting. One area that is now paperless is Neurosciences Intensive Care Unit (ICU). This significant change took place during the course of the case study and the staff who were involved in driving this through, deserve recognition for their vision and determination. Clinical leadership within the unit has clearly contributed to the success to date. There was an attempt to transfer the doctors' 'task list' from a printed document to EPR during the course of the case study; this is not yet working due to system performance issues which at the time of writing were due to be fixed in 2015.

OUH recognises the potential for EPR as a platform for storing comprehensive clinical data including full vital signs observations, test results, clinical notes and appointments in one record. Separate specialist systems are currently used in endoscopy, cardiac, trauma, obstetric ultrasound, clinical photography; all of which offer opportunities for integrating these stand-alone systems. Integrating safety enhancing systems such as the System for Electronic Notification and Documentation (SEND[3]) and BloodTrack will enhance the value of both by reducing the inherent inefficiency at the (manual) interface (for example nurses on Neuro ICU commented that interoperability with vital signs monitors would offer efficiency benefits). Using functionality within Cerner Millennium such as Surginet to replace existing specialty systems such as TIMS and Blue Spier is being considered, and will be prioritised according to the additional value these will deliver.

2.7.   Ability to record and access patient allergy and alert information electronically at appropriate points in the patient journey

Use of ePMA has been shown to be a driver for an increase in the recording of allergies within the EPR; this doubled between September and December 2014. The number of alerts increased five-fold over the same three months.

This greater use of technology is enabling access to the separate Oxfordshire Care Record, at admission and for medicines reconciliation, which more than doubled in 2014; and the complementary national Summary Care Record, use of which is being tested by pharmacy.

2.8.   Improved audit trail facilities from clinical and information governance perspectives

Clinical and management audits are becoming quicker, easier and more comprehensive. As the amount of structured clinical data stored within the EPR increases; these benefits will be more widespread. Examples from maternity and incident investigation are discussed in the main body of the report.

The 'tap and go' card readers in use have allowed session roaming and reduced the risk of information governance (IG) breaches from leaving smart cards in the slots on the computers on trolleys. Access to clinical records information is tracked within the system, by recording who has accessed the patient record, and P2 Sentinel (Cerner's auditing solution for tracking end user

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[3] SEND is a locally developed automated (electronic) monitoring system to identify deteriorating patients earlier, and enable nursing and medical staff to deliver more timely interventions and treatments.

access to confidential patient data in Millennium) records an audit trail. A facility for card issue for agency and locum staff is in place, however some agency nurses were observed who had not accessed the e-learning and were therefore unable to administer medications (this is being addressed).

2.9.   Key benefits associated with efficiency and effectiveness such as:

•   Bed management

•   Discharge Summary which sends a message to Pharmacy to dispense drugs

These benefits have yet to be fully realised; and the platform is now available for them to be achieved. Roll-out of the ePMA is expected to increase the real time admissions and discharge times (ADT) data entry. While there has been recent improvement in the timeliness of ADT data entry, real time bed management using EPR is not yet fully in place.

Within the pharmacy processes, several initiatives in addition to ePMA have contributed to improvements. The dispensing robot, the Bedford dispensary matching, patients' own drugs (POD) lockers on the wards and ward based dispensing have all been introduced in the last two years. All of these are expected to contribute to medicines cost reductions and process efficiencies to reduce delays and release time to care. Early findings have demonstrated no change in the time taken for medicines administration; some reduction in the process time for dispensing medicines to take out (TTO); and improved convenience for all clinicians in having the electronic drug chart available and easily legible. These improvements are partly off-set by a reported slightly longer time taken for prescribing, however as more drug histories are available at re-admission this should reduce.

Discharge notifications to GPs can be more easily compiled from the EPR by incorporating medications and results information held within the system. The discharge letter can of course be communicated electronically meaning that the GP is fully aware of the patient's condition should follow up care be required, and reducing the inconvenience of receiving this on paper. This facility supports the standard of discharge notifications being sent to the GP within 24 hours of discharge.

2.10.   Potential to realise efficiencies in clinical decision making associated with length of stay and clinic utilisation

These benefits have yet to be fully realised; and the platform is now available for them to be achieved. Use of EPR by the blood transfusion service has demonstrated a reduction in the use of blood products, with benefits realised in terms of patient safety and cost reduction. The use of care sets (groups of orders) within the requesting functionality and decision support (transfusion rules) has also enabled compliance with mandatory data for transfusion requests. The existing SafeTX system provides fail-safes in the blood product requesting and administration process; fully integrating this with EPR would deliver some additional overall efficiencies, releasing clinical time to care. Again clinical leadership within this service was seen to play a key role in driving standards of safety and effective, efficient use of blood products. Other examples of clinical efficiencies and effectiveness are discussed throughout the case study.

A summary register of the key OUH benefits is reproduced in Appendix 7.

3. Background

3.1. Oxford University Hospitals NHS Trust

Oxford University Hospitals NHS Trust is one of the largest acute teaching trusts in the UK, with a national and international reputation for the excellence of its services and its role in teaching and research. OUH provides general hospital services for people in Oxfordshire and neighbouring counties, and specialist services on a regional and national basis. In addition to Oxfordshire, a significant proportion of patients come from Buckinghamshire, Berkshire, Wiltshire, Northamptonshire and Warwickshire.

Oxford Academic Health Science Centre has recently been designated as the newest of six NHS and university partnerships which draw on their world-class research and health education to research new treatments and improve health education and healthcare delivery. They will bring scientific discoveries from the lab to the ward, operating theatre and general practice, so patients benefit from innovative new treatments.

The trust adopted the name Oxford University Hospitals on 1 November 2011, following merger with the Nuffield Orthopaedic Centre; it employs around 11,500 people and has a combined turnover of £868 million (2013/14).

3.1.1. Four hospitals, one trust, one vision

The name, Oxford University Hospitals NHS Trust, represents the trust's vision to integrate patient care, teaching and medical research to deliver the best in clinical treatment. It also signals a strengthened partnership with the University of Oxford.

Figure 3.1: The OUH ambition to be a foundation trust

Ambition to be a successful Foundation Trust

Our ambition is to build on our strong academic partnerships, combining our talents and expertise, and to enhance our ability to become a successful Foundation Trust. Our collaboration with the University of Oxford underpins the quality of the care that is provided to our patients; and our services and treatments benefit from the latest research developments and clinical trials. A joint working agreement between the Trust and the University of Oxford came into effect at the point of merger on 1 November 2011 and provides the ability to share ideas and activities in the pursuit of excellence in patient care, research and education.

It builds on the Trust's close partnership with the University of Oxford's Medical Sciences Division and Oxford Brookes University's Faculty of Health and Life Sciences, which both provide renowned teaching and education for doctors, nurses and other healthcare professionals.

Our existing university collaborations include the ambitious research programmes, funded by the National Institute for Health Research (NIHR), and established through the Oxford Biomedical Research Centre (BRC) and at the Biomedical Research Unit in musculoskeletal disease at the Nuffield Orthopaedic Centre. These set the standard in translating science and research into new and better NHS clinical care.

The John Radcliffe Hospital

The John Radcliffe (JR) Hospital in Oxford is the largest of the trust's hospitals and the home of many departments, including most of the trust's corporate functions. It is the site of the county's main accident and emergency service, the Major Trauma Centre for the Thames Valley region, and also provides acute medical and surgical services, intensive care and women's services. The Oxford Children's Hospital, the Oxford Eye Hospital and the Oxford Heart Centre are also part of the JR Hospital.

The Churchill Hospital

The Churchill Hospital in Oxford is the centre for the OUH cancer services and a range of other medical and surgical specialties. These include renal services and transplant, clinical and medical oncology, dermatology, haemophilia, infectious diseases, chest medicine, medical genetics, palliative care and sexual health. It also incorporates the Oxford Centre for Diabetes, Endocrinology and Metabolic Medicine.

The Churchill Hospital, and the adjacent Old Road campus, is a major centre for healthcare research, and hosts many university research departments and other major research centres such as the Oxford Cancer Research Centre, a partnership between Cancer Research UK, Oxford University Hospitals and the University of Oxford.

The Nuffield Orthopaedic Centre

The Nuffield Orthopaedic Centre forms the Musculoskeletal and Rehabilitation Services division. It has been treating patients with bone and joint problems for more than 80 years and has a world-wide reputation for excellence in orthopaedics, rheumatology and rehabilitation. The hospital also undertakes specialist services such as children's rheumatology, the treatment of bone infection and bone tumours, and limb reconstruction. The renowned Oxford Centre for Enablement is based on the hospital site and provides rehabilitation to those with limb amputation or complex neurological or neuromuscular disabilities suffered, for example, through stroke or head injury.

The Horton General Hospital

The Horton General Hospital in Banbury serves the people of North Oxfordshire and surrounding counties. Services include an emergency department, acute general medicine and general surgery, trauma, obstetrics and gynaecology, paediatrics, critical care and the Brodey Centre offering cancer treatment. The outpatient department runs clinics with specialist consultants from Oxford in dermatology, neurology, ophthalmology, oral surgery, paediatric cardiology, radiotherapy, rheumatology, oncology, pain rehabilitation, ear nose and throat (ENT) and plastic surgery. Acute general medicine also includes a medical assessment unit, a day hospital as part of specialised elderly care rehabilitation services, and a cardiology service. Other clinical services include dietetics, occupational therapy, pathology, physiotherapy and radiology.

Figure 3.2: The OUH vision

Oxford University Hospital NHS Trust's vision is to be:

"At the heart of a sustainable and outstanding, innovative, academic health science system, working in partnership and through networks locally, nationally and internationally to deliver and develop excellence and value in patient care, teaching and research within a culture of compassion and integrity. This vision is underpinned by the trust's founding partnership with the University of Oxford."

OUH website

3.2. OUH Strategic Objectives

The OUH strategic objectives and high level priorities taken from the OUH website http://www.ouh.nhs.uk/about/strategic-objectives.aspx are reproduced below.

Figure 3.2.1: OUH strategic objectives and high level priorities

STRATEGIC OBJECTIVES					
1. Delivering compassionate excellence	2. A well-governed and adaptable organisation	3. Delivering better value healthcare	4. Delivering integrated local healthcare	5. Excellence secondary and specialist care through sustainable clinical networks	6. Delivering the benefits of research and innovation to patients
To be a patient-centred organisations providing high quality, compassionate care with integrity.	To be a well-governed organisation with high standards of assurance, responsive to members and stakeholders in transforming services to meet future needs.	To meet the economic challenges and changes in the NHS by providing efficient and cost-effective services and better value healthcare.	To provide high quality general acute healthcare to the people of Oxfordshire including more joined-up care across local health and social care services.	To develop clinical networks that support the delivery of services through a regional network of care to benefit our partner organisations and the people they serve.	To develop durable partnerships with academic, health and social care partners and the life sciences industry to facilitate discovery and implement its benefits.
HIGH LEVEL PRIORITIES					
Improve access to services and reduce delayed transfers Improve quality, safety and patient experience year on year Involve patients in service development	Achieve compliance with national standards Develop robust governance and assurance systems Establish Council of Governors and membership.	Making savings and internal efficiencies such as weekend working Better use of our PFI estate Deliver clinical efficiencies through EPR	Work with GPs and trusts to improve pathways Patients are cared for in the best place for them New models of care outside hospital	Expand specialist services through strengthening of clinical networks e.g. trauma, stroke, vascular Develop regional partnerships with provider trusts	Deliver translational research to drive improvements in clinical services Partner in Academic Health Science Network - joint work on key themes such as dementia

3.3. OUH Digital Vision

OUH's digital vision is published on their website and summarised below.
http://www.ouh.nhs.uk/about/building-the-digital-hospital.aspx

Figure 3.3.1: OUH vision for the digital hospital

Oxford University Hospitals NHS Trust: a vision for the digital hospital

Our vision is to have our patients' medical history and care requirements available online in real time and easily shared between health professionals.

The implementation of an electronic system to store and manage patient information is the biggest operational change that the Trust has ever undertaken and is being delivered in phases over a number of years. Known as the Electronic Patient Record (EPR) system, it promises to provide a modern and comprehensive set of tools to support the Trust in achieving its strategic goals to be a provider of high quality and efficient patient care and treatment.

The aim is to hold patient records electronically, identifying medical history and ongoing treatment and care requirements, which can be easily shared between health professionals. This includes a picture archiving system for X-ray images and the ordering of diagnostic tests and viewing results.

We have implemented the system for patient administration and we are improving the mechanisms used within the system to record data. We are also working to improve access to the system so that all clinical staff are able to routinely use it.

3.4. Key indicators

Context data such as activity, income, facilities provided and staff employed, are a useful reference for other performance indicators, benefits and outcomes. These headline figures are shown in the table below.

Figure 3.4.1: OUH headline figures in 2013-2014 (source OUH annual report 2014)

OUH indicators	2013-2014
total patient contacts	1,000,000
ED attendances	130,000
beds	1,300
wards	67
operating theatres	44
nurses	3,600
doctors	1,800
healthcare assistants	1,300
turnover	£868 million

The table below shows OUH's overall activity since before the first stages of implementation at JR, Churchill and Horton. There was an 8% increase in admissions (inpatients and day cases) over the five year period shown; while outpatient attendances rose by 18% over the same time.

Figure 3.4.2: OUH activity summary last five years (source OUH annual reports)

OUH activity: patients seen				
year	emergency inpatient admissions	elective inpatient admissions	day case admissions	outpatient attendances
2009 - 2010	79,940	19,605	82.566	771,237
2010 - 2011	80,163	20,188	68,265	805,895
2011 - 2012	83,778	19,477	73,266	825,958
2012 - 2013	88,316	22,312	75,959	835,448
2013 - 2014	87,741	24,015	84,533	906,513

3.5. BT Local Service Provider (LSP) contract

The Cerner Millennium system at OUH is provided under the BT LSP programme for London and the South. The contract is managed by the Health and Social Care Information Centre (HSCIC) on behalf of the Department of Health. The contract to supply systems is expiring at the end of October 2015.

Cerner Millennium was one of the systems implemented in acute providers within the national programme in the south of England and London. Nine acute trusts in the south of England are using Cerner Millennium and eight in London.

Trusts that deployed Cerner Millennium under the BT LSP contract within the south were:

• Buckinghamshire Healthcare NHS Trust

• Hampshire Hospitals NHS Foundation Trust (originally Winchester which merged with Basingstoke)

• Milton Keynes University Hospital NHS Foundation Trust

• North Bristol NHS Trust

• Oxford University Hospitals NHS Trust

• Royal United Hospitals Bath NHS Foundation Trust

• Surrey and Sussex Healthcare NHS Trust

• Taunton and Somerset NHS Foundation Trust

• Weston Area Health NHS Trust

The following trusts deployed Cerner Millennium under the BT LSP contract in London:

• Barnet and Chase Farm Hospitals NHS Trust (now part of Royal Free)

• Barts Health NHS Trust

• Croydon Health Services NHS Trust

• Imperial College Healthcare NHS Trust

• Kingston Hospital NHS Foundation Trust

• Lewisham and Greenwich NHS Trust

• Royal Free London NHS Foundation Trust

• St George's University Hospitals NHS Foundation Trust

At the Nuffield Orthopaedic Centre (NOC), Cerner Millennium was implemented for a patient administration system (PAS) in 2005.

OUH implemented Cerner Millennium as part of the Greenfield Programme, via the BT LSP contract, in December 2011 replacing a legacy green screen PAS dating from the 1970s. This delivered a comprehensive patient administration system and clinical functionality in the Emergency Department and Maternity and at the Nuffield Orthopaedic Centre. This was followed by a major upgrade to the maternity system and a full implementation of Order Communications across the trust. The trust's business and reporting were maintained throughout this period which was a significant achievement by everyone involved.

Systems implemented in acute healthcare provider organisations under the BT LSP contract providing the basis for an electronic patient record included a patient administration system (PAS) as well as selected solutions such as:

• Emergency Department (FirstNet)

• Maternity

• Theatres (SurgiNet)

• Electronic prescribing and medicines administration (ePMA)

• Order Comms (test orders and results)

• Critical Care (iNet)

• Clinical Coding

• Case note tracking

3.6. Health and Social Care Information Centre

The Health and Social Care Information Centre (HSCIC) was formed in April 2013 when NHS Connecting for Health, the NHS Information Centre and some informatics functions from the Strategic Health Authorities merged. The HSCIC manages the remaining deployments, live service and exit from BT LSP contract on behalf of the Department of Health. The HSCIC also works to enhance benefits management, realisation and reporting within the trusts using those contracts.

4. HSCIC benefits case study at OUH: approach and scope

4.1. Objectives of the case study

The objectives of the benefits case study were to:

• Identify benefits associated with the investment made by the Department of Health and OUH NHS Trust in the Cerner Millennium implementation

• Provide baseline data on ePMA and Neuro Intensive Care operational performance to enable better benefits realisation management

• Provide an organisation wide view on the opportunities available for IT enabled benefits at OUH and provide collateral to prioritise these within the IT enabling vision for OUH, including benchmarking comparisons with other trusts

• Observation and measurement (baselines and ongoing) of EPR activities within the trust in terms of both quantifiable benefits and good practice in relation to pathways and processes

• Define and measure baseline process indicators prior to future deployments

- Transfer knowledge and skills from the HSCIC team to OUH staff on benefits realisation management processes

4.2. Scope of the case study

The overall scope of the case study was for HSCIC Benefits Subject Matter Experts (SMEs) to undertake an external review of the use and value of EPR at OUH, using observation, interviewing, measurement and analysis, advice and facilitation; to clarify benefits achieved and not achieved, exploring the reasons for this; and to report the findings back to the organisation. The programme asked for this to include:

- Reviewing progress to date with the use of the Cerner Millennium electronic patient record focusing on the areas listed in table 4.2.1.

- Providing advice and input for capturing baseline data before the e-prescribing and medicines management (ePMA) rollout

- Observing benefits post rollout to be evidenced by existing indicators and interviews with staff regarding their experiences and perception

Figure 4.2.1: Original scope of case study

Scope of case study from the trust's PID v 1.0

1. E-prescribing and Medicines management including base line measurements in time for September go live. (includes ED Single Encounter, Blood Products, iNET, 724)

2. Admissions, discharges and transfers (ADT)

3. Referral to treatment time (RTT)

4. Maternity pathway review

5. Orthopaedic pathway review

6. Urgent Care medicine pathway review

7. Urgent Care surgery pathway review

8. Theatres – Guidance on baseline measures

9. Therapies – High level analysis of measures

It was agreed early on in the work that the scope would be adapted in response to early findings.

4.3. Approach and methodology

The case study approach was developed by the HSCIC benefits team members for the case study at Barts Health NHS Trust during 2013. The OUH programme had already identified benefits, so the case study has focussed on reviewing these, finding evidence, validating it; quantifying; and starting to value the benefits.

Figure 4.2.2: HSCIC benefits case study approach
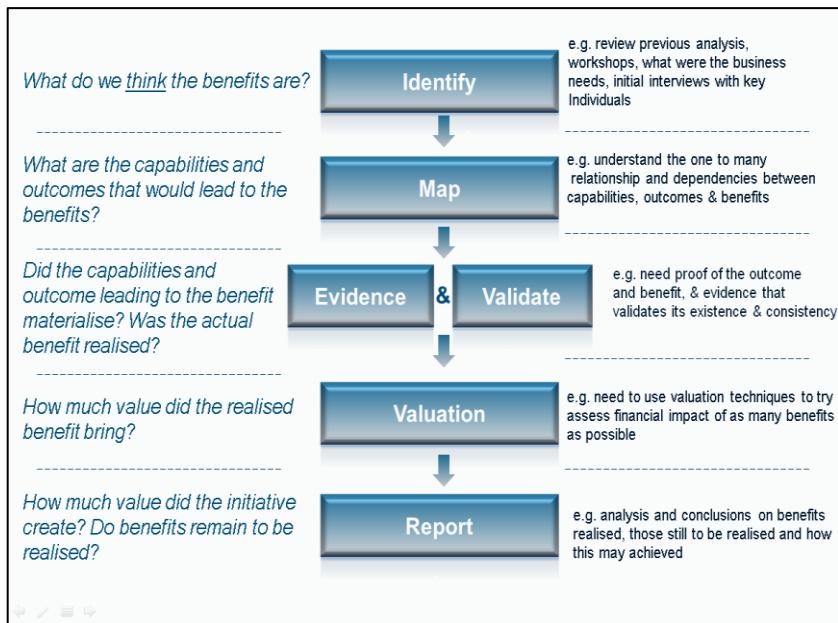
The initial project plan and scope was designed around input from two HSCIC benefits SMEs with some additional support. The OUH project benefits lead and programme lead and HSCIC benefits SMEs worked closely to ensure good scheduling of appointments. Due to unforeseen circumstances within the HSCIC team, the timescales were extended from December 2014 into February 2015 due to the need for continuity, and for extending the scope to include knowledge transfer.

The original plan was flexed in response to the availability of OUH staff, and all the work was carried out with the proviso that service delivery would always take priority. The staff involved deserve credit and appreciation for their willingness to engage with the case study observations and for the welcome extended to the HSCIC benefits SMEs, particularly in the clinical areas.

To focus improvement efforts, conversations with staff included:

• What improvements would reap the biggest benefit from existing IT systems?

• What changes in your service, agnostic of IT, would yield the biggest benefit?

• What aspects of the implementation and rollout of EPR were most beneficial?

The case study scope included the provision of a workshop to support skills development and this will be scheduled at a suitable time. A more flexible knowledge transfer approach has also been used throughout the work with the trust.

5. Organisation wide findings

5.1. Engagement and buy in

Significant interest and engagement among front line staff has helped during the implementation; however IT literacy and confidence varied.

Some clinicians, notably in Neurosciences ICU and therapists across inpatient services were particularly motivated, willing to work with any short term challenges through initial implementation as they could see the bigger picture and long term value of having a the patient's record accessible and legible to everyone. Other members of staff found the experience challenging and even de-motivating where IT skills were lacking. Clinicians were often seen to help, advise and support each other.

> *'It was a huge learning curve for my team.'*
>
> Phlebotomist lead

Initial frustrations with the system and infrastructure meant that some activities can take longer on Cerner Millennium; and worse, system enforced work-arounds; and errors made by some members of staff result in a significant amount of re-work by others later on in administrative and clinical processes, and inaccuracies in the captured data which then requires correcting. This was apparent from interviews with and observations of staff arranging out-patients appointments and the pathway administrators involved in theatre scheduling and arranging elective admissions within the 18 week pathway.

EPR has improved the overall quality; transparency and reliability of data due to having one electronic record (although existing paper records remain separate).

It should be noted that floor walkers during the ePMA implementation were appreciated by clinical and admin staff adopting the EPR throughout the areas observed; generally staff felt that the training (e-learning and specific face to face) met their basic needs.

The use of champions has no doubt helped significantly with engagement, confidence and process changes. During the observation work several knowledgeable and enthusiastic clinicians were discovered, who, while not currently engaged, could usefully contribute to good practice / advisory networks in future. Existing user groups established by the trust are intended to drive deeper adoption, optimisation, and improvement.

During interviews and observations it was clear that the training provided; and the adoption support offered by floor walkers was appreciated by staff. Staff also recognised that further and on-going training once they were fully familiar with new processes would help them to make best use of the system.

It was very clear from a number of sources that the value of EPR is greater than the sum of the parts. As the roll-out continues the value of the EPR is expected to increase; clinicians are already recognising the potential and expressing a desire to increase the range of data included in the records. This in turn will increase the trust's level of 'digital maturity' in practice. For example nurses on one ward are already capturing patients' vital signs observations on EPR; and therapists commented that their EPR notes are not read by other members of the multi-disciplinary team who are yet to start using it. Extending the first example and addressing the second could offer a couple of quick wins in terms of spreading use of EPR.

Basic IT literacy skills for all staff are key in today's healthcare environment; the observations and interviews indicated that current skills levels varied.

One of the orthopaedic consultants at the NOC had invested time early on to create operation note templates; he is able to complete the operation notes in theatre while one of the junior doctors sutures and dresses the operation site. This means that the record is immediately available to the recovery staff instead of up to 24 hours later following dictation, typing off site and then correction / approval.

There are potential efficiency and safety benefits to be gained if this practice was widely adopted; and the cost of outsourcing transcription from audio records would eventually be eliminated.

There were also examples of notable practice such as in the maternity service where system held data were being used to inform service developments. For example, by recording body mass index (BMI) and relating this to the location, health promotion activity for obese women is being targeted at the area of greatest need. This is expected to reduce the incidence of gestational diabetes and therefore improve the health of affected babies in future.

OUH has an active, experienced and motivated Chief clinical information officer (CCIO) and many of the clinicians shared their thoughts and enthusiasm during the programme of interviews and

observations. The Medical Director was particularly impressed with the work in the OUH transfusion service.

> *'We need to get this compelling evidence of higher reliability out there.'*
>
> Dr Tony Berendt, Medical Director, Oxford University Hospitals NHS Trust

5.2. Level of adoption

A benchmarking comparison of the level of use of EPR across trusts in the south of England and London using Cerner Millennium through the BT LSP contract, and normalised using trust's activity data, showed OUH to be near the median of maximum concurrent users / finished consultant episodes (FCEs) in March 2014 (11th of 16). Following the start of the ePMA roll-out in the autumn of 2014 the OUH ranking had increased to 3rd of 15 (the previous highest ranking trust has since exited the contract). The charts also demonstrate that most of the trusts had increased their level of use during this period, increasing the overall median from 5.6% to 6.4%. (BT provide monthly maximum concurrent users and maximum registered users data to the LSP programme.)

Figure 5.2.1: March 2014 and January 2015 benchmarking (ranked adoption) across acute trusts in London and south of England deploying Cerner Millennium under the LSP contract.
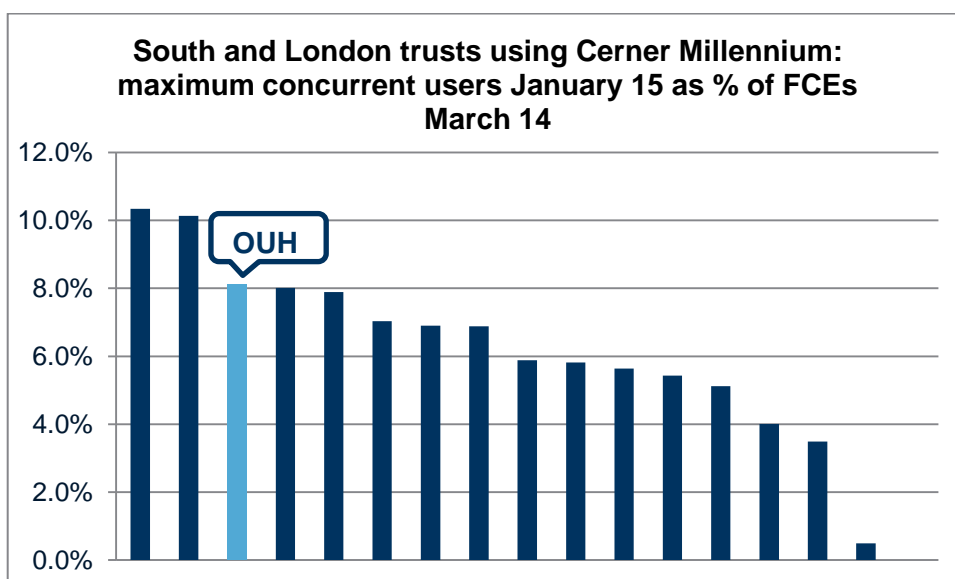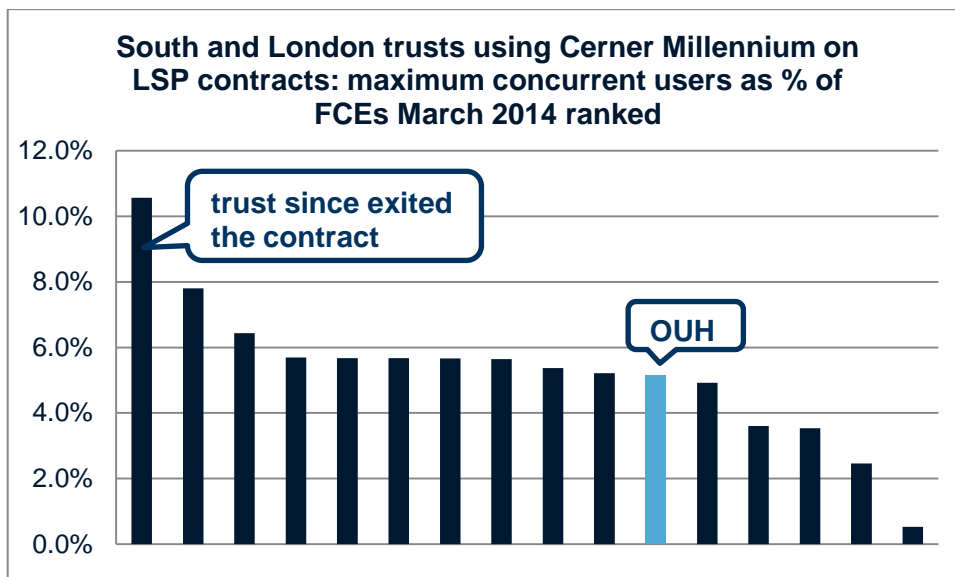
A recent increase in the number of maximum concurrent users at OUH (taken from BT supplied system data) correlates with the start of the implementation of ePMA. This is shown in the next chart.

Figure 5.2.2: OUH maximum concurrent users (proxy for adoption) December 2012 – May 2015
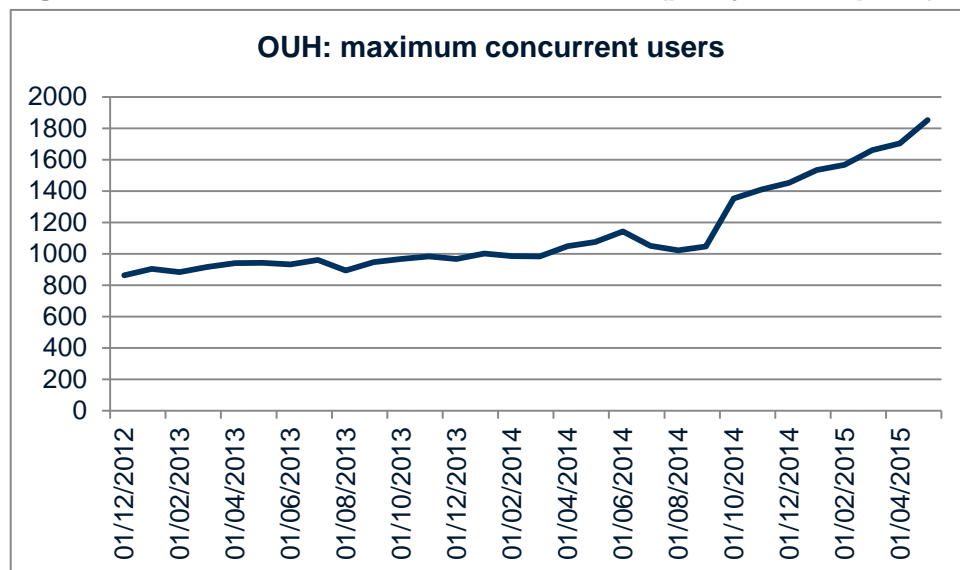
Comparing the percentage increase in adoption between OUH and the remaining trusts in the south and London using Cerner Millennium within the LSP contract shows a similar rate from December 2012 to September 2014, followed by a notable increase correlating with the start of the ePMA roll out.

Adoption and use in the context of digital maturity are discussed in section 8.

Figure 5.2.3: Increasing adoption – comparison of percentage growth in maximum concurrent users between OUH with overall Cerner Millennium LSP trusts in London and south of England.
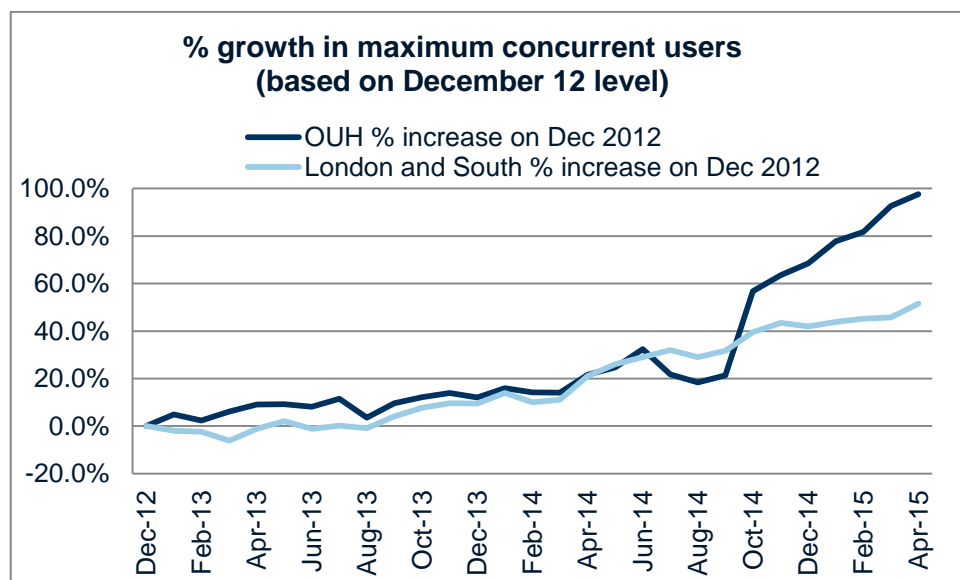
OUH receives 'Lights On' system use data from Cerner; selected indicators demonstrating use over the last 14 months are included here (a recording data error in May 14 has been omitted from the following charts; the problem appears to have continued into June as well). The recorded system response times are also shown; in spite of increased use these do not appear to have deteriorated for the overall transactions; a peak in October 2014 for results and medicines management when ePMA roll out started corresponds with system performance issues experienced by users at that time. Significant increases in selected inputs such as allergy recording

are related to the roll-out of ePMA, suggesting that this is adding significant value to the patients' records as described below:

Total transactions per month and the average time – transactions have approximately doubled over the last 12 months and in January 2015 over 8500 'unique' users accessed the EPR across the trust; a steady increase of around 1800 since January 2014

Figure 5.2.4: Cerner provided system use data from January 2014: transactions per month and system response times
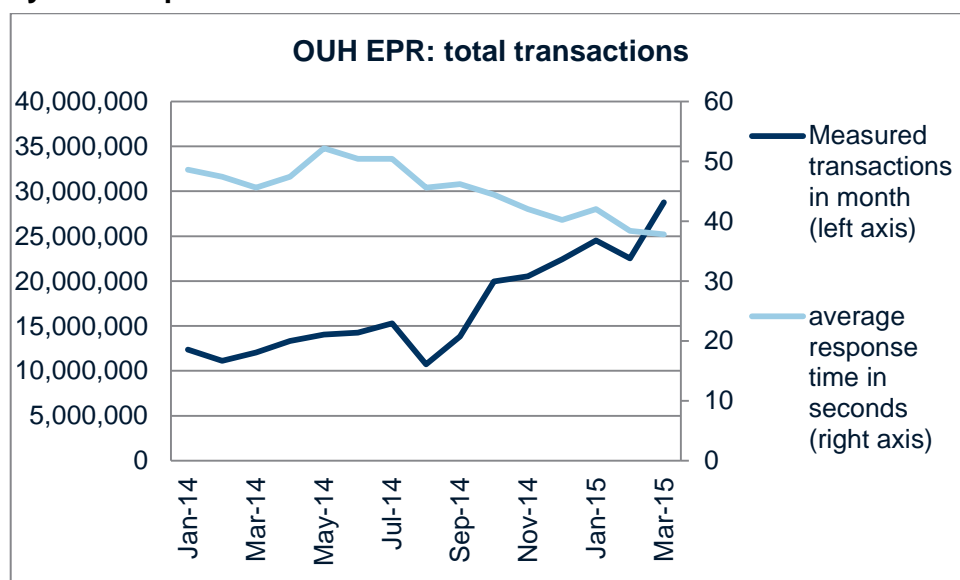
Results endorsements increased – each of these is an opportunity to access the results remotely, to act on the result promptly, to eliminate the time taken for filing results on paper, and potentially to reduce repeat requests.

Figure 5.2.5: Cerner provided system use data from January 2014: endorsing results
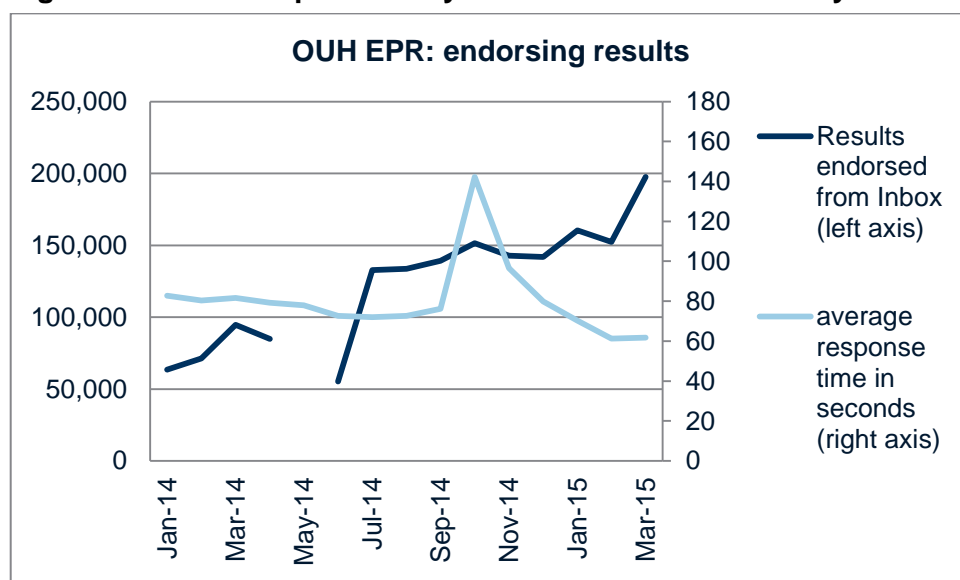
Electronic prescribing and medicines administration (ePMA) documentation accessed increased from implementation in October 2014 – each time the electronic drug chart is accessed it eliminates the risk of errors from poor handwriting, allows changes to be made remotely and avoids the need to re-write any paper charts that are full up.

Medicines and intravenous infusions administered and recorded increased from implementation in October 2014.

Figure 5.2.6: Cerner provided system use data from January 2014: ePMA access

OUH EPR: ePMA access
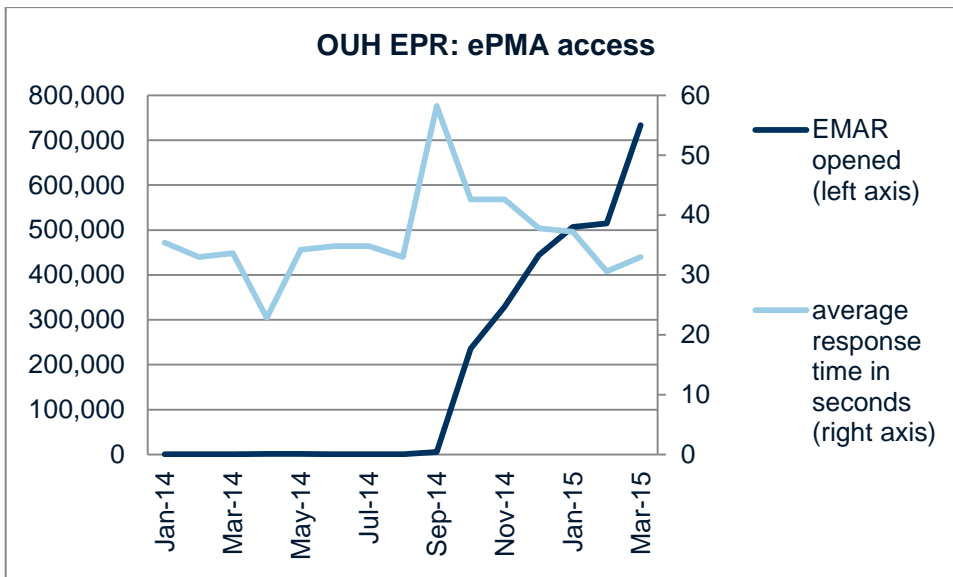
Allergies documented increased following ePMA implementation – every time the record is accessed allergies are visible to the clinician; this may affect decisions on treatment given and provide an additional opportunity to avoid exposing the patient to that allergen. The roll-out of ePMA appears to have driven an increase in documenting allergies.

Figure 5.2.7: Cerner provided system use data from January 2014: allergies documented

OUH EPR: allergies documented
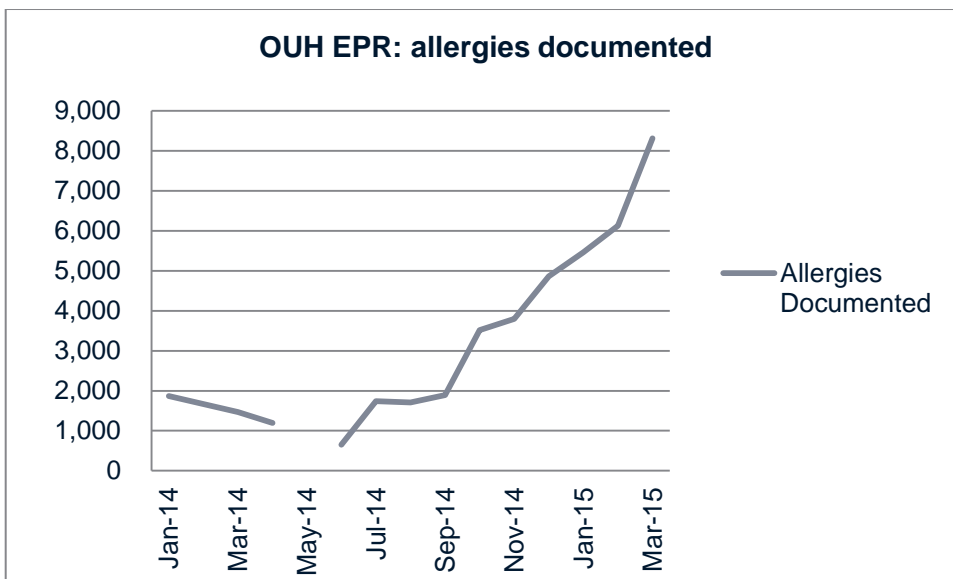
Since 2012 laboratory requests have increasingly been processed via EPR Order Comms, the next chart summarises the quantity of requests via each route since 2009.

Figure 5.2.8: Laboratory requesting
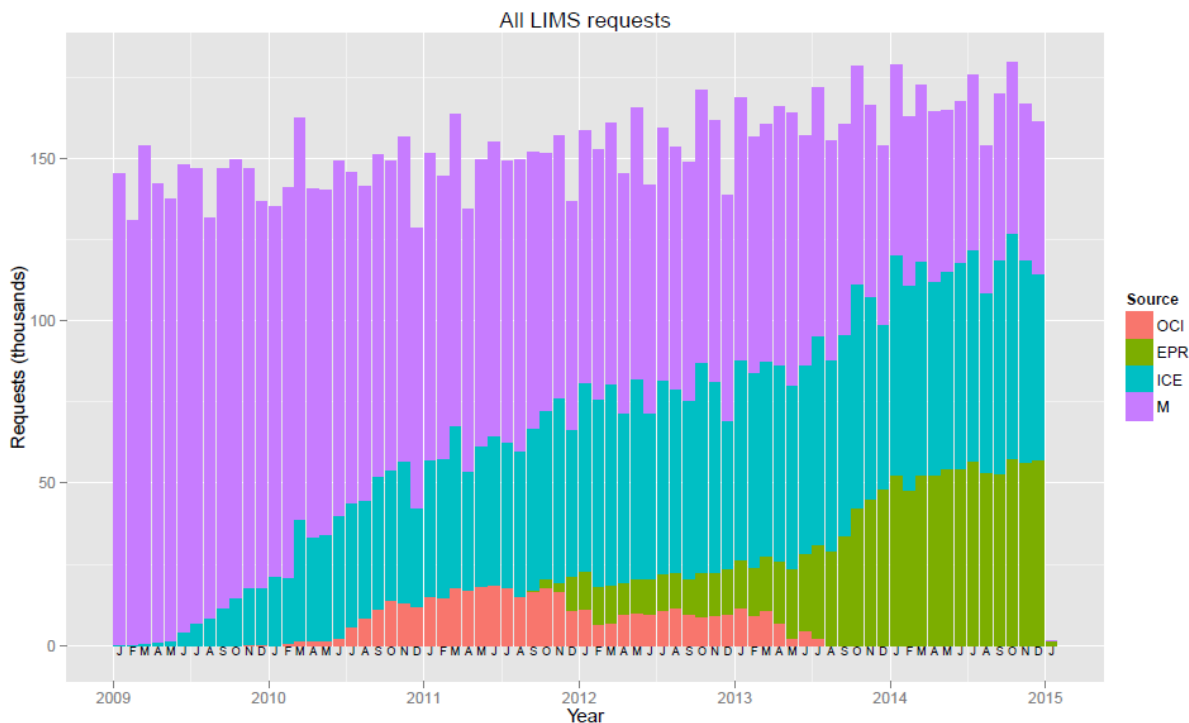
Key:
OCI = Casenotes
EPR = EPR order comms
ICE = Integrated Clinical Environment (Sunquest) GP requests
M = manual (paper)

Radiology requesting has shown a slight shift towards EPR and away from paper during 2014; as can be seen in the chart below (data provided by OUH).

Figure 5.2.9: Radiology requesting
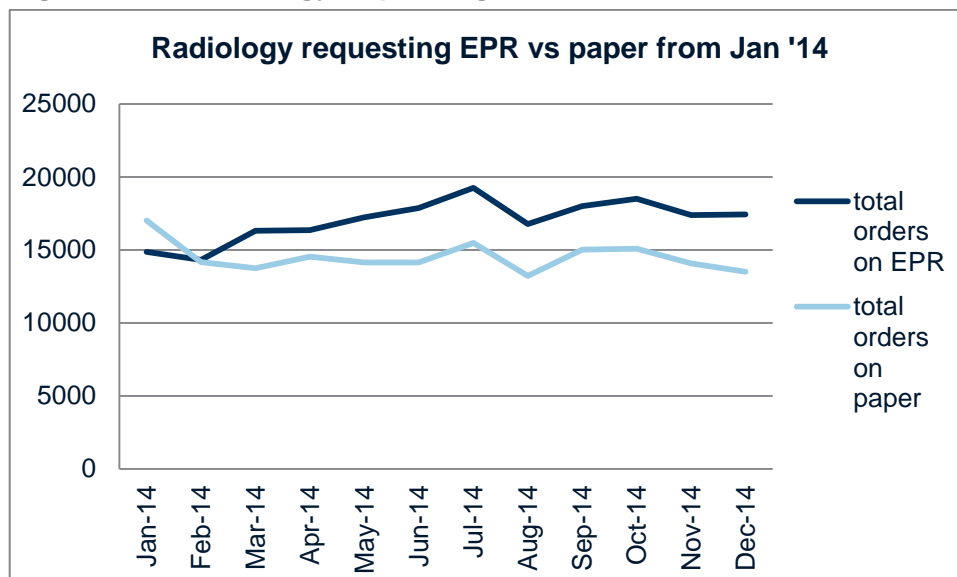
An audit carried out in 2009 on the JR site demonstrated frequent delays in requests reaching the department. While 65% were received within two days; the remaining 35% that were not received in that time or were so incomplete as to be unusable was clearly a concern at that time. Using EPR for requests means that those delays are eliminated.

Figure 5.2.10: September 2009 audit of delays in receiving requests

JR Radiology department: September 2009 audit of delays in receiving requests (sample 178)
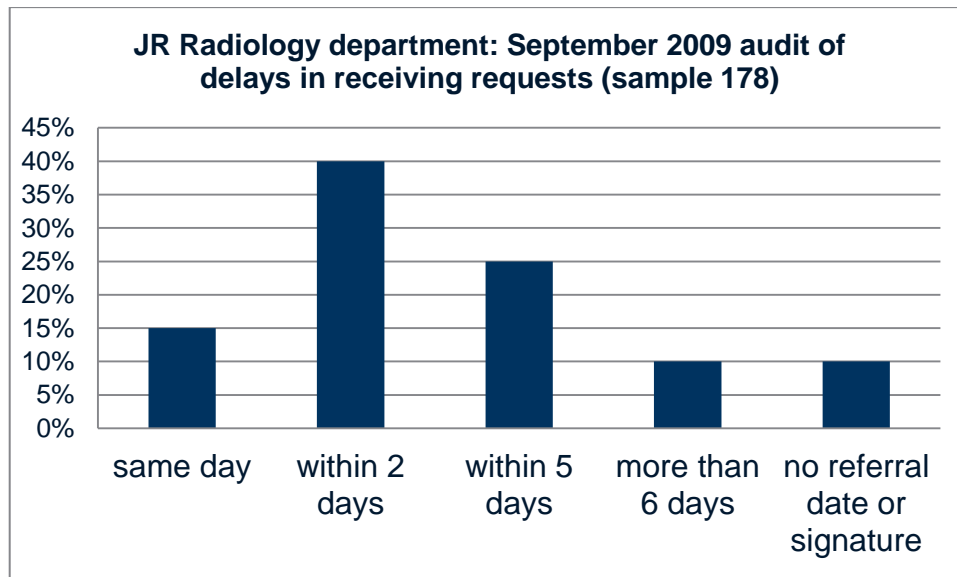
Microbiology requesting within OUH has shown no noticeable increase during 2014 (OUH Microbiology monthly data).

5.3. Cost Improvement programme (CIP), transformation and implementing the EPR

During the course of the case study OUH started to develop a new approach and governance of the required cost improvements, planned transformation, and how the EPR would enable these. Good practice in operating organisational level direction and oversight started to emerge, with notable alignment of priorities with agreement across the divisions. The next suggested CIP project for the team is an eRequesting project, using Cerner Millennium capability to reduce the number of investigation requests by using decision support to avoid investigations that are not required or recommend an appropriate alternative; this is anticipated to achieve £1.548m over the 2015/16 financial year.

The following list of priorities identified by the divisions is now with the EPR Programme governance structure for approval, and is incorporated into the annual delivery and benefits realisation planning.

• Electronic document management

• eRequesting – reduction in investigation requests

• SurgiNET – theatres efficiency

• GS1 barcoding and stock management

• Depth of coding and co-morbidity recording

• Electronic Prescribing and Meds Administration – patients' own drugs on discharge

• Oxfordshire pathways and SEND

• Optimising PAS and data quality

• Clinical utilisation review

• Showing where the patient is on their pathway

• Reporting for key performance indicators (KPI)

6. Benefits identified by specialty / pathway

6.1. New functionality deployed during case study

Headlines

- **The rollout of ePMA is seen as a tipping point for the full clinical use of EPR.**

- **Overall safety improvements are expected to result from the use of ePMA for prescribing and administration.**

- **Recent focus on use of medicines related incident data aligned with the rollout phases of ePMA will provide the required evidence of safety improvements enabled by using ePMA**

- **Some process time reductions within the TTO dispensing process have been demonstrated which are expected to contribute to reducing length of stay and more patients going 'home before lunch'.**

- **Neuro ICU is now all but paperless. Technology enable business change has eliminated time spent searching for and waiting to access paper notes on the unit; and allowed remote access.**

- **Use of EPR by the blood transfusion service has demonstrated a reduction in the use of blood products, with benefits realised in terms of patient safety and cost reduction.**

- **EPR order comms has enabled a significant increase in the completeness of information provided on requests**

6.1.1. Electronic prescribing and medicines administration (ePMA) implementation

The original OUH business case for prescribing and decision support stated that e-prescribing and decision support would allow 'safe, accurate, licit and economic supply and/or administration of medicines to patients' in inpatient and outpatient care locations. The perceived outcomes that would be achieved following implementation were:

e-prescribing and decision support:

- all prescriptions become legible.

- prescribers can always record a prescription due to the many access points to EPR and remote verbal orders will no longer be necessary, thus improving patient safety

History and search:

- once an encounter medication information record is started, no paper transcribing will be needed.

- should the patient re-present, the last encounter's medications history is a source for history taking without transcribing

The figure on the next page shows the original anticipated economic and efficiency benefits from OUH ePMA.

Figure 6.1.1.1: Potential economic and efficiency benefits from OUH Electronic Prescribing and Medicines Administration, after full implementation in March 2015 (from original business case)

Benefits	Aim	Cash releasing value	Non cash releasing value

1	Reduction in overall Trust drug budget due to use of standard catalogue	1% reduction	£690,000	1% reduction
2	Contribution to reduction in NHSLA CNST[4] premium			
3	Eliminating expenditure on paper based drug charts	90% reduction	£4,500	
4	Eliminating requirement to transport drug charts around hospital		£4,796	
5	Reduction in clinician time due to drug history/charts being readily available electronically and no requirement for duplicated data entry			£2,083,625
6	Junior doctor time saved per discharge summary preparation			£562,161
7	Drug round efficiencies due to accuracy and completeness of prescription information			£503,846
8	Reduction in pharmacist time querying and clarifying information			£347,513
9	Reduction in Length of Stay relating to preventable Adverse Drug Events.			£913,122
	TOTAL		£799,296	£4,410,267

During and after completion of the roll-out of ePMA progress towards achieving these benefits was observed during the case study and is discussed in the following section.

Surrey and Sussex Healthcare NHS Trust are also implementing Cerner Millennium ePMA with similar anticipated benefits. Within the London programme Croydon Health Services NHS Trust and Kingston Hospital NHS Foundation Trust are also using the ePMA functionality.

Five elements of medicines managements were observed and analysed for efficiency and quality benefits at OUH:

• Admission

• Prescribing

• Reconciliation

• Administration

• Dispensing

The ePMA roll out started in early October 2014 which allowed only a short time to gather baseline data from the wards in the first phase. Further baseline data were added by doing observations on the wards in later phases in January 2015.

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[4] NHSLA CNST NHS Litigation Authority Clinical Negligence Scheme for Trusts

Figure 6.1.1.2: Access / use of electronic medicines administration record increased with roll-out (Cerner 'Lights on data)

OUH Cerner Millennium: EMAR opened
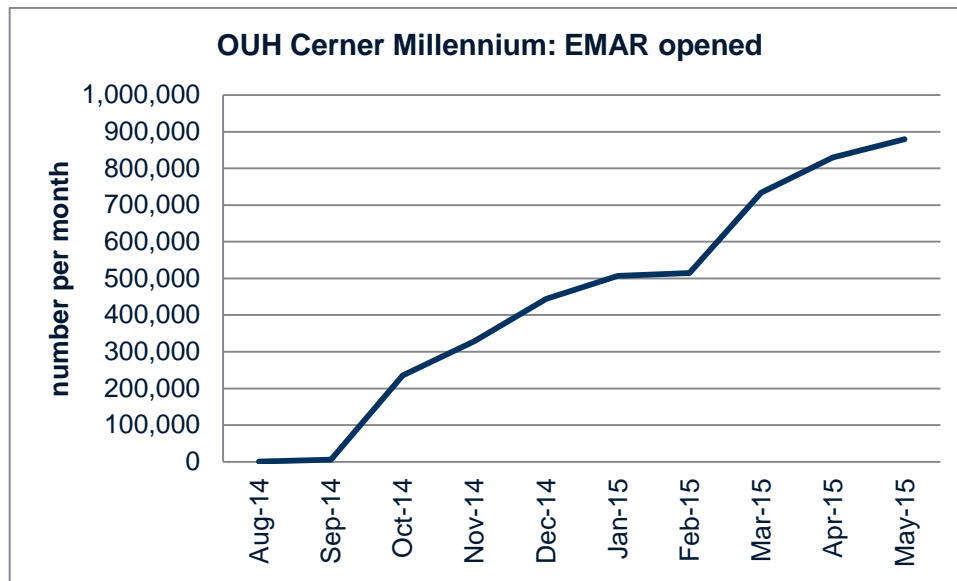
Pre-existing audits are being used alongside the observation data. A staff questionnaire is being developed by the clinical lead to gather information on perceptions of safety, convenience and time taken for the various activities involved in medicines management and administration.

From January 2014 to September 2014 (before the ePMA implementation started) just over 2000 medications errors were reported within OUH; of these 47% were classified as errors in medicines administration.

As the ePMA roll out progresses across the trust, analysing medications incidents for each group of wards will demonstrate any improvement. This of course should be looked at in the context of how the incidents are classified and the drive to increase the completeness of reporting. A governance group for monitoring documented medications related incidents alongside the ePMA implementation is now in place.

Fig 6.1.1.3: OUH total reported medications incidents (no harms) baselines

OUH: all medications incidents baseline
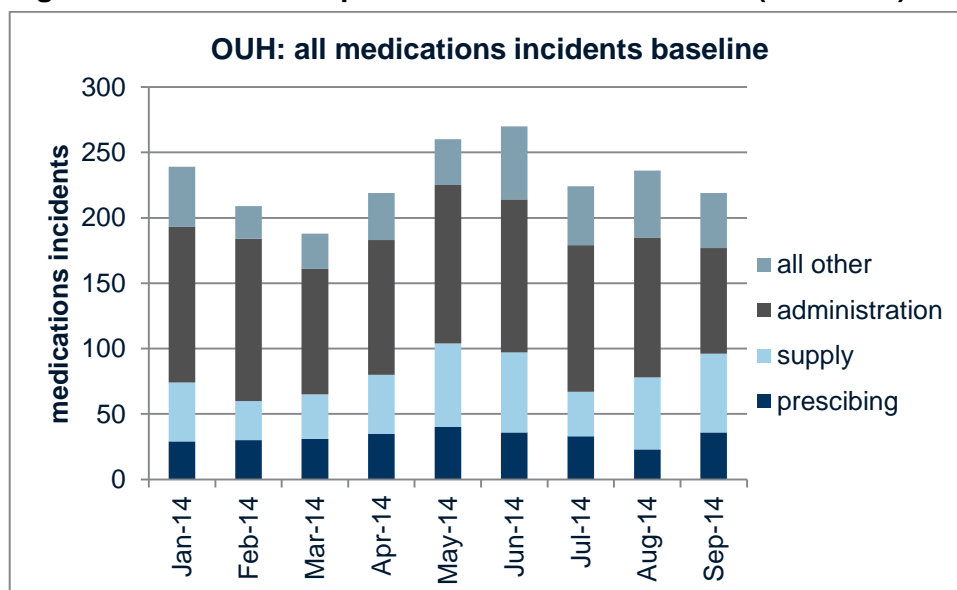
OUH is aiming to increase reporting and decrease / eliminate any harm related to medication management.

Phase 1 of e-PMA roll out took place on 6th October 2014 in these areas:

- Neurosciences (ward, theatres and recovery)

- Neurosciences ICU went live on 29th September in line with iNET roll-out.

- Emergency assessment unit (EAU)

- All adult general medicine wards (AGM) including short stay, post-acute and transfer lounge)

This included training approximately 550 staff in prescribing or administering medications on EPR.

Five months post e-PMA implementation there had been no significant change in the type and frequency of recorded incidents within the medicine, rehabilitation and cardiac directorate; although this is too early to draw any real conclusions. Analysis of the types of incidents has shown no notable changes since ePMA implementation; for example a reduction in incidents relating to medication allergy and contraindication started several months before ePMA implementation. (Figure 6.1.5)

The trust will be measuring and monitoring medications incidents grouped by roll out, to assess the realisation of this key benefit; of course recognising that other initiatives contribute to changes, not least of which is the trust's drive to increase the level of reporting.

Figure 6.1.1.4: Run chart of total reported incidents in the medicine, rehabilitation and cardiac division
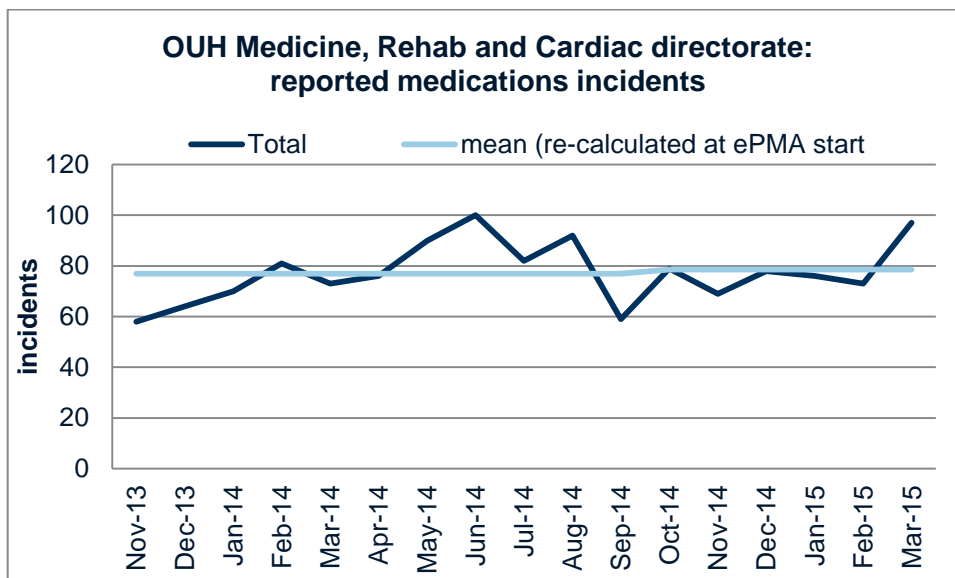
Figure 6.1.1.5: Medicine, rehabilitation and cardiac division: known allergies and contraindicated medications incidents
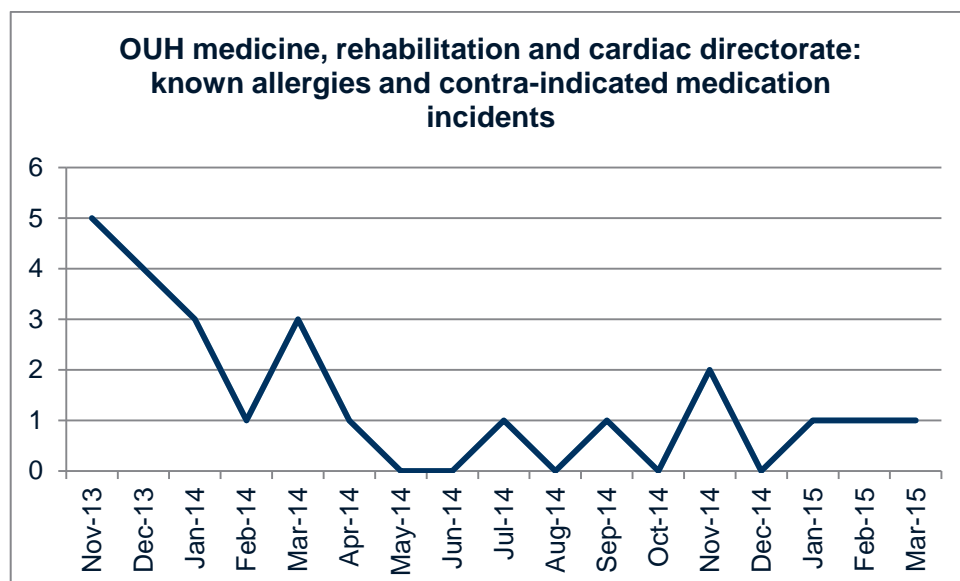
Admission (clerking)

Where a patient's record includes previous ePMA prescriptions, the medications history is now available when clerking patients on re-admission, reducing time for transcription and potentially increasing accuracy. The value of this will be realised as the number of patients this applies to increases and doctors start looking up patients' medicines histories on EPR.

Prescribing

Two months post go live doctors were saying that they were getting used to ePMA; outcomes and benefits they recognised include:

- Not having to search for missing drug charts saves time (time taken varies)

- Being able to prescribe while in another location; this will improve convenience and responsiveness once everyone is used to not having to be present, particularly where doctors are able to access EPR from home when on call

- Timely prescribing of TTOs and supporting the drive for 'home by lunch' (see TTO section)

- The medications history is available when preparing electronic discharge summaries which saves time on transcribing and supports the discharge summary reaches GP in a timely manner

Some issues were still being experienced:

- Discontinued medications not being removed

- Timing of stat (immediate) doses

Issues are being addressed as they arise through the user group and local super users and a review is due to take place once rollout has completed. This will identify improvements for later phases from lessons from early phases. Further support required to complete adoption with follow up training will be offered as needed.

Medicines reconciliation

Observation of a pharmacist undertaking this activity demonstrated no problems; however as she was still getting used to the system she was not yet able to articulate any improved outcomes, or efficiency and safety benefits. Doing medicines reconciliation electronically avoids spending time looking for the drug chart; waiting for another clinician to finish using it; and deciphering poor

handwriting. This may contribute to the overall achievement of reconciliation taking place within 24 hours of admission. However the patient's paper medical records are still required for this task.

Accessing the Oxfordshire Care Record, where this is used, is perceived to be helpful for medicines reconciliation. None of the pharmacists reported using the Summary Care Record (SCR) which would offer a similar facility for patients from outside Oxfordshire (over 80% of the population of England now has a SCR). The current usage rate of the SCR is 2.4%, which is described as 'quite low compared with similar trusts', although use has risen since September 2014, coinciding with a trial of SCR within the pharmacy department. The low rate can be explained and justified by the availability and use of the local Oxfordshire Care Record. It is anticipated that use of the SCR would increase if access could be integrated with Cerner Millennium.

Figure 6.1.1.6: Use of Oxfordshire Care Record at OUH by area
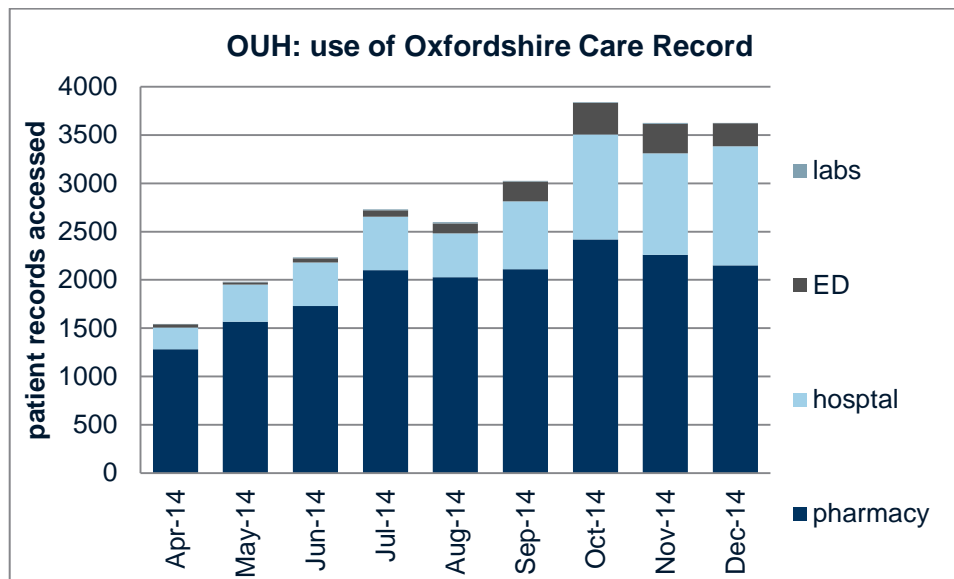
Tablet computers had been provided to pharmacists at implementation of ePMA; however these were not being used at the time of the observations; users reported experiencing some problems with the application and infrastructure.

Figure 6.1.1.7: Medicines reconciliation

Medicines administration

Given that OUH has 1300 beds (OUH annual report 2014), most of which are occupied at any one time; any opportunity to release time to care as well as increase the safety of medicines administration is welcomed. Medicines rounds take place 4 times a day as well as giving any ad hoc, as needed (prn) or immediate (stat) doses. The value of one minute (based on a mid-point band 5 nurse) can be valued at approximately 24p. Using this to value a change in the time taken for medicines administration for each patient can be calculated as:

24p x 1300 beds x 4 rounds = £1,248 per minute per day across the trust.

The benefits in terms of released time to care from any later improvements can be valued using this figure, and by fully understanding replacement activities undertaken, the real value achieved can be shared. The aggregated evidence from the observations shows little if any change as a result of ePMA, other than during down-time events, so no efficiency benefits or dis-benefits were demonstrated within the 6 weeks following implementation. The full findings are in Appendix 3. The project team is encouraged to continue to observe medicines rounds in this way to evidence any sustained results, when further process changes are implemented.

Figure 6.1.1.8: Medicines administration times summary

Meds administration: average time (minutes) taken per patient by observation cohort
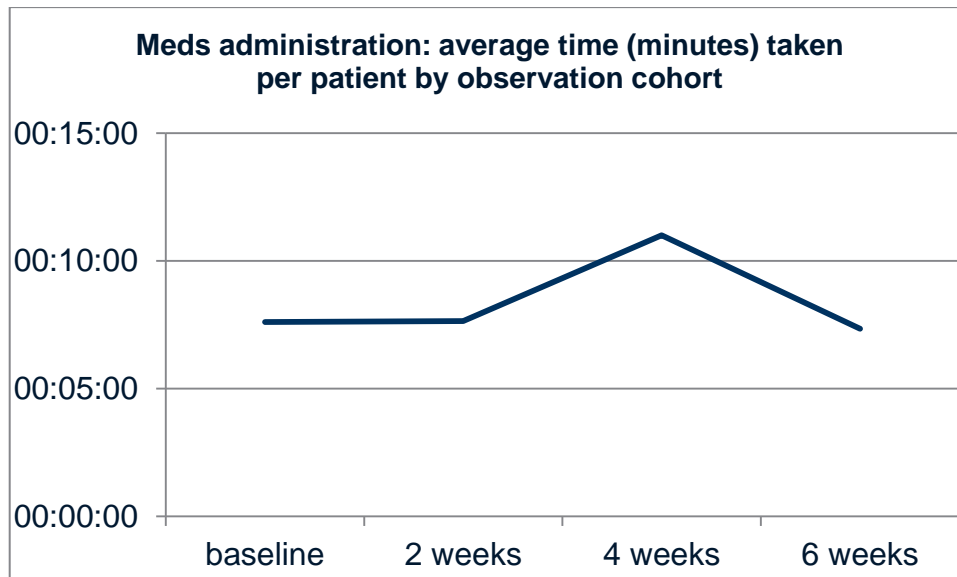
Working with nurses to observe the medications administration process gave the results shown in the charts in appendix 2. Everything other than reading and recording on the paper chart or ePMA has been classified as 'clinical', for example collecting medications from the stock room. Wherever possible activities unrelated to medication administration were removed (such as talking to another patient). Inevitably there is a small amount of estimation due to the multi-tasking nature of clinical work.

Figure 6.1.1.9: medicines administration using paper charts and folder

Baseline observation data were collected from several wards before they moved onto ePMA (the emergency assessment unit (EAU), cardiology and specialist surgery inpatients (SSIP)). Over the

43 patients observed, the average time per patient for medicines administration was 7 minutes and 36 seconds, of this:

•   Clinical process average was 6 minutes and 14 seconds per patient

•   Paper chart process averaged 1 minute and 22 seconds per patient

Anecdotally senior nurses had estimated a medicines round for 6 – 7 patients to take up to 1½ hours although this does of course include the interruptions that inevitably occur, and were excluded from the observations.

Figure 6.1.1.10: Computer trolley with 'tap and go' card reader and brief instructions for medicines administration
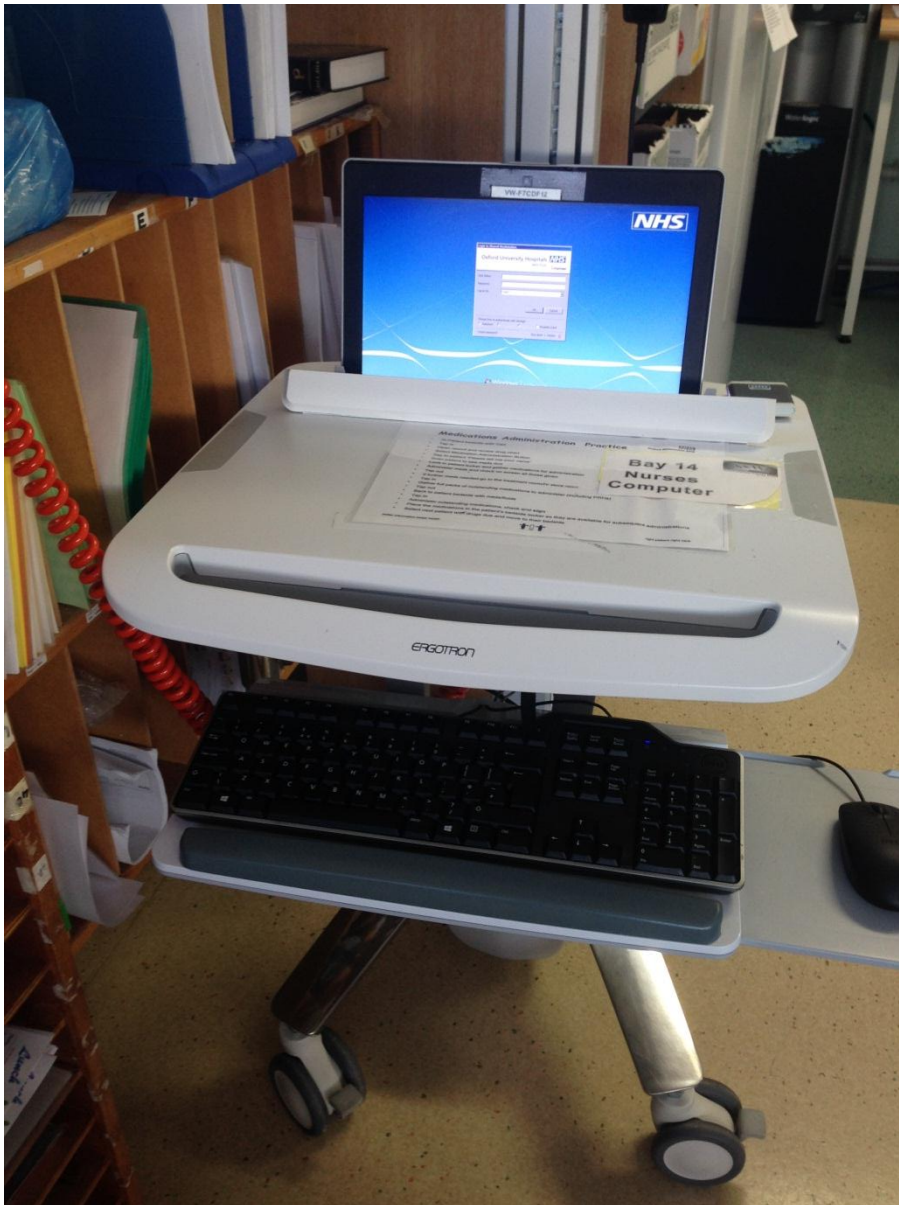
Following implementation of ePMA further observations were made on several wards (EAU, Adams, neurosciences, 7d and NOC ward F) at various periods from implementation. Overall the observations showed that the total medicines administration for each patient takes an average time of 8 minutes and 59 seconds; of this:

•   Clinical process take an average of 6 minutes and 3 seconds

•   ePMA process takes an average of 2 minutes and 56 seconds

However grouping the post implementation observations into time bands from implementation shows very little difference between the observation cohorts apart from those made in early

December. On this occasion there were some issues with a downtime event and subsequent log-in difficulties among staff who were still getting used to the 724Access solution for back-up (used in the event of the system going down); this has skewed the overall average and accounts for the increase described above.

It should also be noted that some wards started to use pod lockers (patients' own drugs) at around the time that ePMA was implemented. Nurses were seen to search in different locations for the required medications (pod locker and stock cupboard). Further work to get the stock levels correct and the clinical process optimised may further reduce the time taken (although this would be unrelated to the use of ePMA).

Specifically, during the 06:00 medicines round on ward F at the NOC, several quite lengthy delays were observed caused by medicines being out of stock in the patients' own lockers and in the drug trolley.

Reliability and safety improvements to the medicines administrations process were one of the important expected benefits. During the observations it was noted that the positive patient identification (PPID) process using a barcode reader for the patient's wristband was part of the medicines administration process using EPR. While no events of mistaken identity were apparent; a nurse and several patients commented about their perception of increased reliability and safety; this can be an important part of building trust in the overall system and process, in turn impacting on overall perceptions of confidence among patients and staff.

Dispensing medicines to take out (TTO)

The overall clinical and supply processes for providing medicines for patients to take out (TTO) is thought to cause some delay immediately prior to discharge. Changes enabled by the ePMA and the dispensing robot within the JR pharmacy are expected to enable some reductions in the overall TTO process time, although it is recognised that ordering TTOs at (or before) the time of the decision to discharge is likely to have a more significant effect; this can also help smooth the demand in pharmacy and reduce the impact of waiting for any items that need to be ordered in.

Figure 6.1.1.11: Pharmacy robot

The pharmacy team recorded the time taken from receiving the TTO prescription to completion of dispensing during August (before the start of ePMA implementation) and again in December once ePMA roll out had started (including some ePMA prescriptions and some via paper drug charts). The dispensing robot was installed in 2013, and therefore has not affected the improvements described here.

The following charts show the findings of this audit. A comparison of the two shows a 12 minute reduction in the process time mean from 1 hour 36 minutes to 1 hour 24 minutes. The process time includes waiting time; so this is not a 'time released to care' benefit, but it does mean that the TTOs

are available from pharmacy on average 12 minutes earlier, based on this process time reduction alone.

Bedford matching – pharmacy technicians reported that the number of pre-existing matched prescriptions are increasing as more prescriptions go through the system. Reducing the need for individual matches will further reduce the overall processing time. Further reductions can be expected as the ePMA roll out is extended and completed, further decreasing the proportion of prescriptions on paper charts.

Pharmacy will repeat this audit again during 2015.

Figure 6.1.1.12: TTO dispensing times before and after change
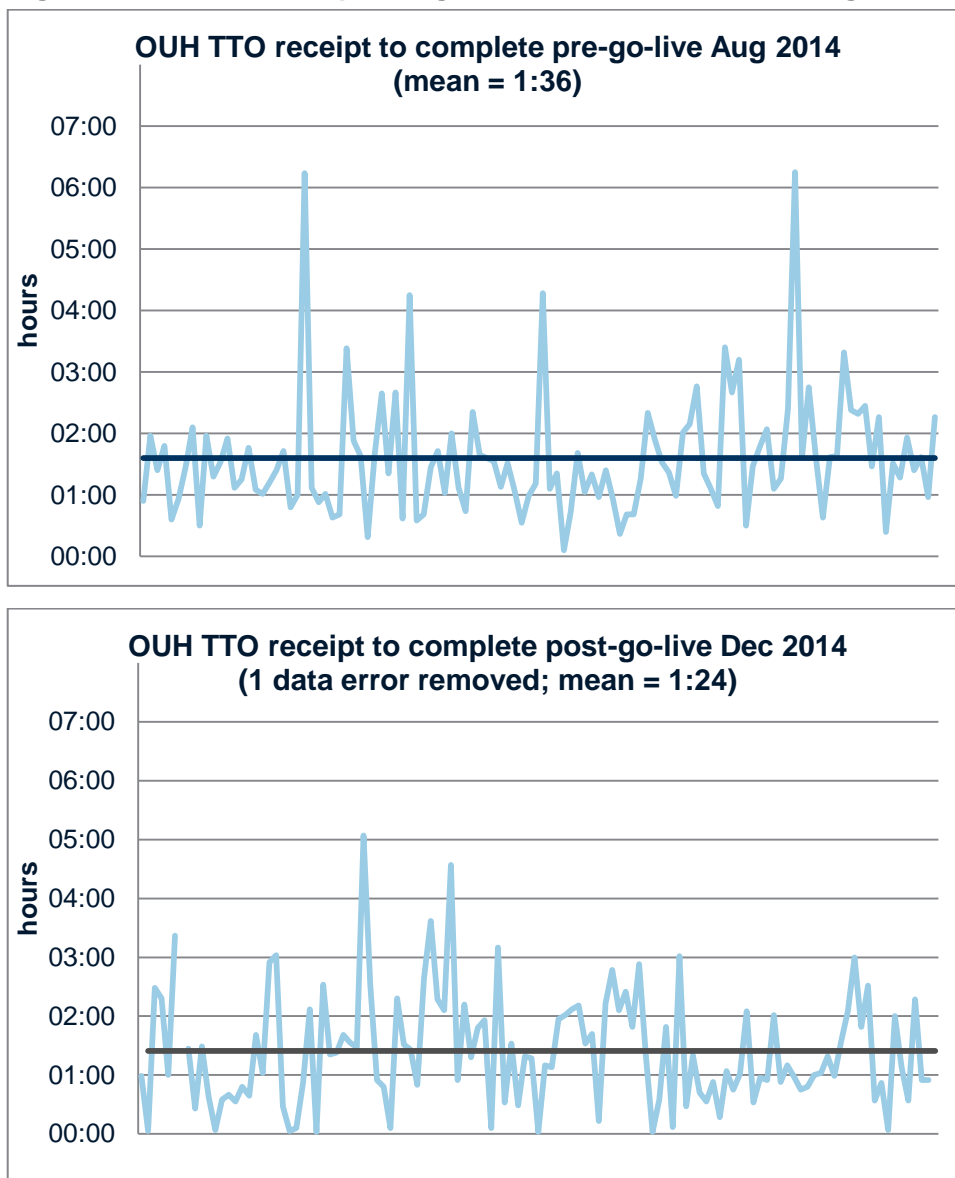
While potentially reducing length of stay by an average of 12 minutes will have only a very marginal impact and is almost impossible to measure; the value will come from reducing the variation and there will be a just a few cases where earlier discharge home creates the capacity to enable quicker admission for another patient from ED. In other cases the length of stay would not be affected where external factors affect the time, for example transport. Comparing the two charts shows a small reduction in dispensing time taken, with the variation in time taken also reducing.

Fixing outstanding software issues is also expected to contribute to further reduction in the time taken.

Further work is taking place to measure the overall process from time of decision to discharge to the dispensed medicines being given to the patient. The ePMA has an additional impact on this by reducing the time from releasing the prescription by the pharmacists to arriving in pharmacy for dispensing by completely eliminating the need to transport charts to pharmacy. This has already been reduced by the use of patient own drugs (pod) lockers and ward based dispensing.

The Bedford robot has automated much of the TTO process for picking for dispensing, which has released some pharmacy staff time to attend to prescription screening, preparation and queries, however the use of the robot is outside the scope of this case study.

Observation of the clinical decision to discharge process on the medical short stay ward showed a commendable focus on getting TTOs prescribed on ePMA across several medical teams. Of 5 patients being discharged that day 2 were gone from the ward by midday and a third had previously been delayed due to lack of a community bed but when a bed became available the transport was arranged and the patient on their way in less than an hour (TTOs had already been dispensed).

TTO prescribing before decision to discharge was observed on several patients in the medical short stay unit under the care of different medical firms. The extent of this practice on longer stay wards is much harder to observe as these decisions are less frequent and hard to predict by an outside observer. There has been ongoing encouragement for medical staff to start the TTO process ahead of the decision to discharge for several years. During the case study it was reported that this practice had started to change around the time of initial ePMA implementation; however it is not clear whether or how ePMA may have driven this change in practice.

Length of stay (LoS) is a key indicator for acute trusts; excess length of stay slows throughput, may reduce income and exposes service users to increased risks from healthcare associated infections (HCAI), pressure ulcers and venous thrombosis).

These baselines show LoS has been stable in the three specialties illustrated and that the mean values offer a reliable baseline.

**Figure 6.1.1.13: Length of stay (LoS) baselines**
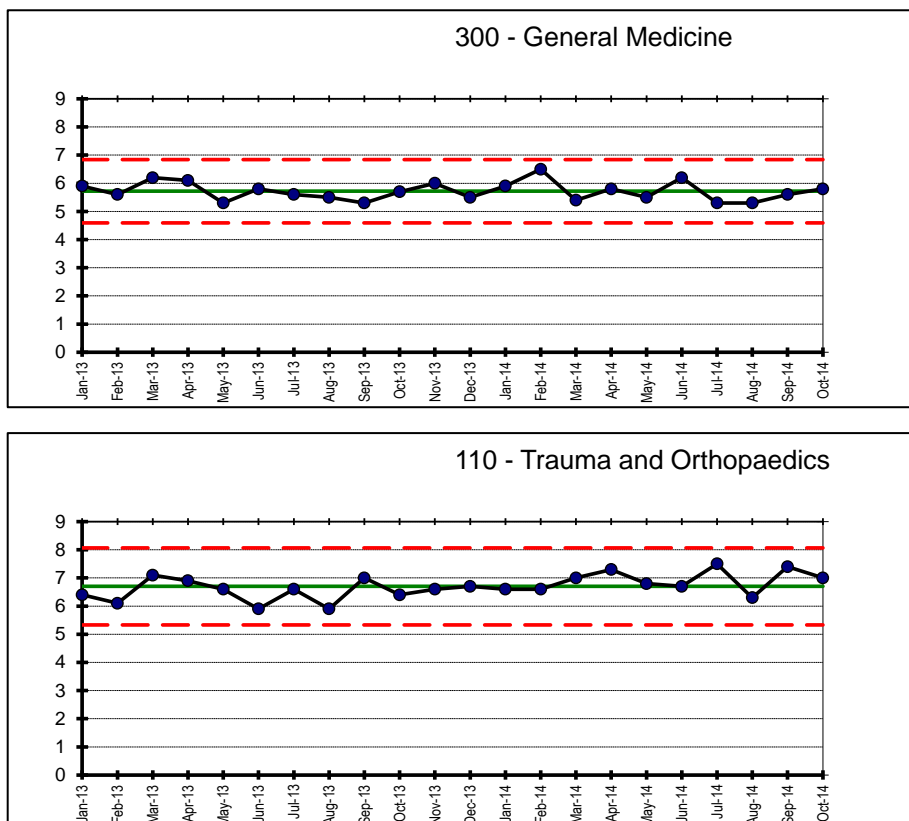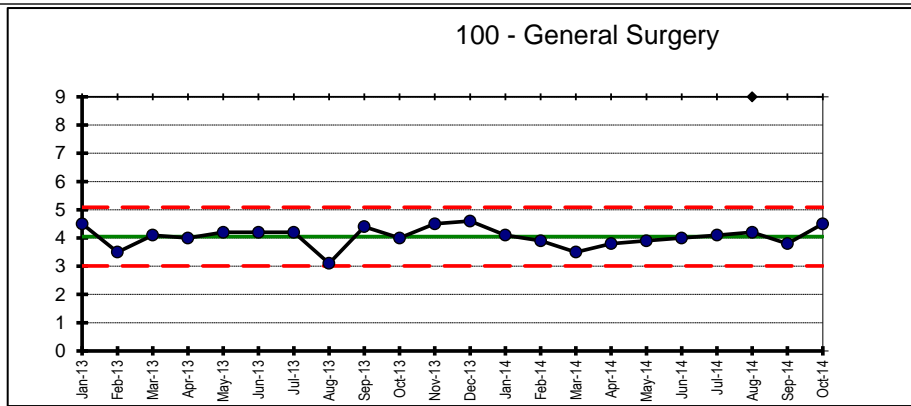
With the implementation and roll out of ePMA, improved TTO processes are expected to make a small contribution to reducing the overall LoS. By continuing to track LoS, noting improvement from the implementation dates for each specialty, and factoring in other transformation initiatives from the benefits map; any correlation between the change and LoS reduction can be attributed appropriately. Use of statistical process control (SPC) charts as demonstrated here will assist in differentiating real change from the natural variation, and ensuring any apparent LoS benefits are reliably evidenced.

As these data use LoS in whole days, times of discharge for a sample are needed to fully understand any improvement. The performance information manager has agreed to collect LoS data including time of admission to time of discharge; this will enable the trust to measure any change in the discharge time and LoS and attribute any demonstrated improvements across all transformation initiatives that may contribute to this benefit such as focus on:

• reducing delayed transfers of care (DToC)

• bringing forward more of the discharges from hospital to earlier in the day to improve flow (ePMA is seen as an enabler for this)

Analysis of a sample (from ward 7a,b,c and d) of time of discharge demonstrates variation across the 24 hour period, with an expected cluster between 10.00 and 19.00 with the mean at about 15.30. This analysis is quite easy to 'eyeball' for any change; and can be split by individual wards. Calculating the mean before and after the change confirmed that there had been no reduction. The dataset provided showed some apparent data errors in some ward during analysis; it would be worth checking that discharge times are being recorded accurately before using these data to evidence a change in outcomes. Using EPR to admit and discharge patients in real time will improve the quality of these data.

Figure 6.1.1.14: Hour of discharge

OUH ward 7a,b,c,d hour of discharge
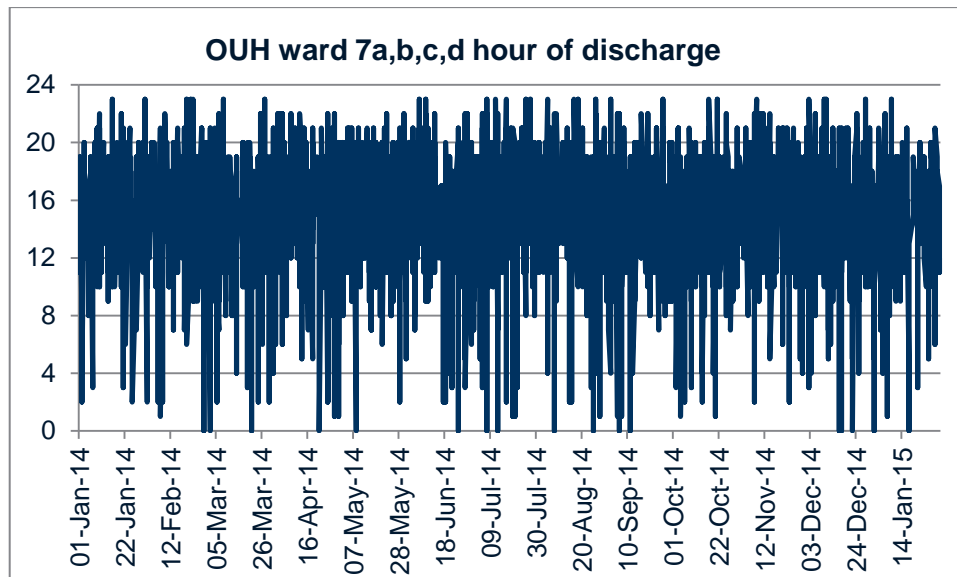
The same data (excluding January 2015), clustered into three month samples and plotted over the 24 hour period are shown in the chart below. This analysis does not show changes within a shorter period and needs several wards to avoid the 'noise' of the variation in a smaller sample.

These two different illustrations demonstrate the value of evidencing change and improvement in a variety of ways to engage with different audiences.

Figure 6.1.1.15: Discharge times 2014

OUH ward 7 a,b,c,d discharge times 2014
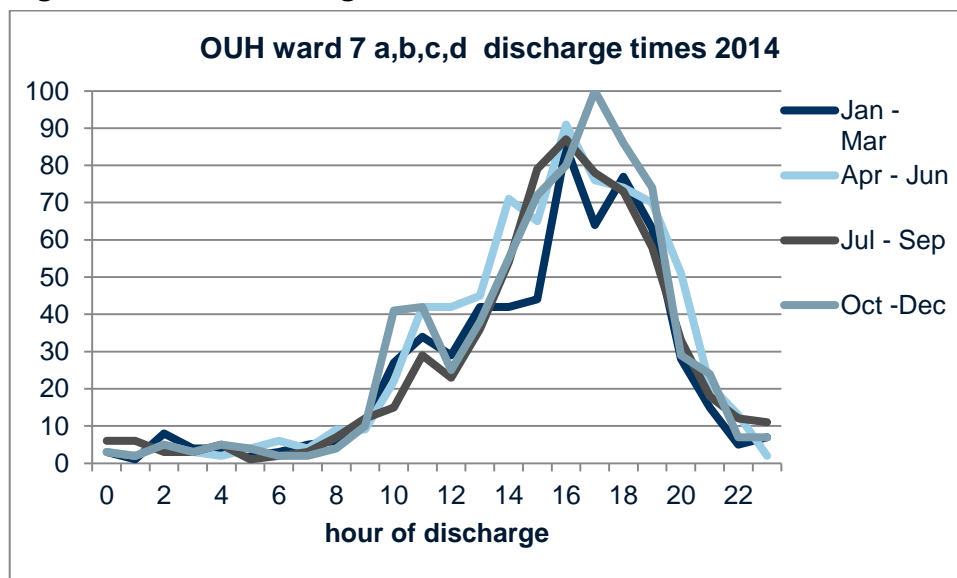
6.1.2. Emergency Department single encounter (EDSE)

The clinical and administration process was observed for one patient before the EDSE go live. The patient spent a total of four hours in the emergency department (ED); and was then transferred to the emergency assessment unit (EAU) to await an ultrasound result (which had been verbally reported as clear). Doctors' record keeping was very difficult to observe accurately as they were constantly being interrupted and were often looking at several patients' records at same time. One doctor said 'I'll do the EPR stuff later' which suggests that in practice the record keeping involved duplication.
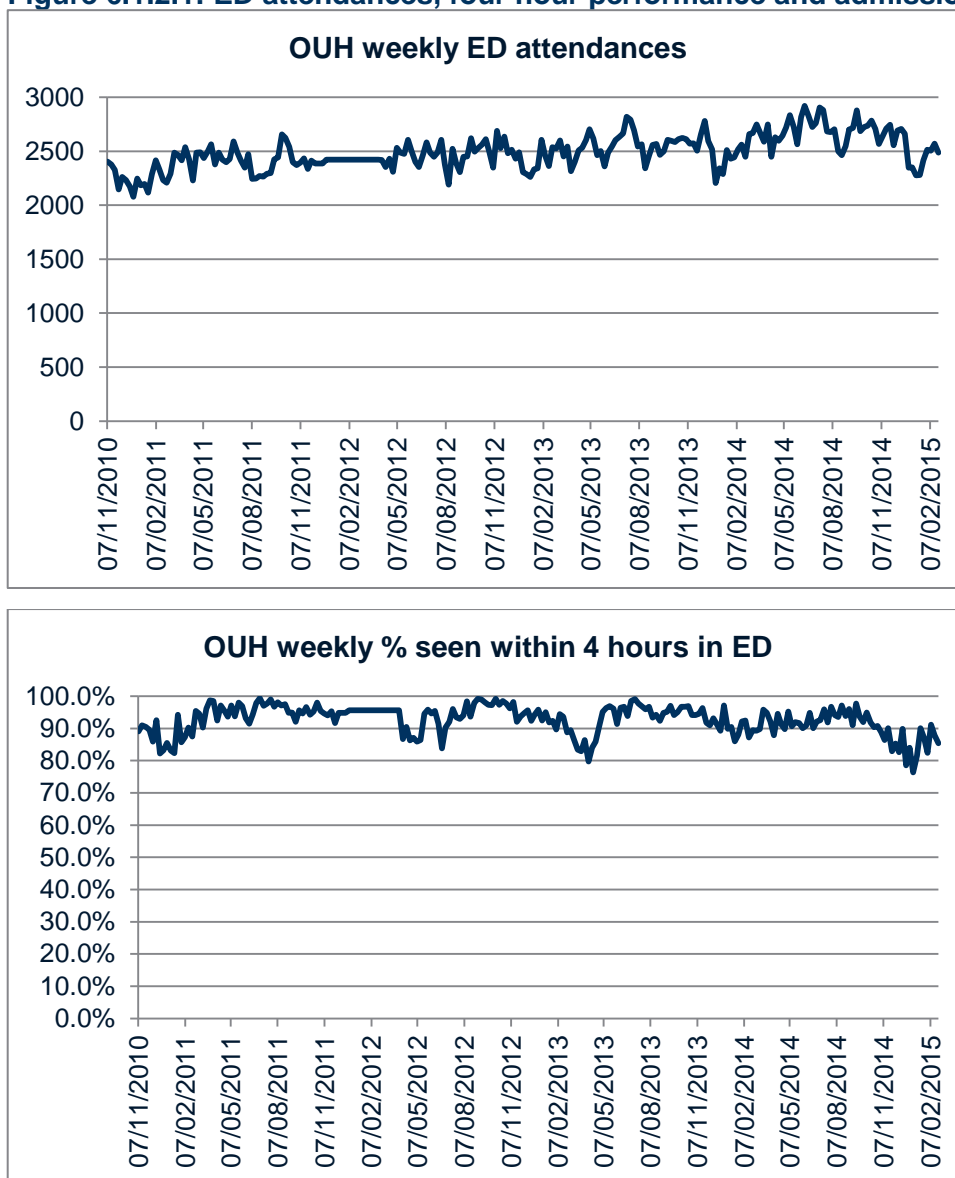
Several audits have been carried out in the department however these were not put forward for the case study. One audit pre go-live had examined the time to admit to a ward after ED had shown a

reported improvement from 40-45 minutes to 25-30 minutes; the operating standard is 15 minutes. It would be useful to repeat this.

Changing to EDSE was expected to impact four hour performance and reduce breaches by removing a process step (discharge from ED followed by admission to the ward being replaced by transfer); this also avoids the need to photocopy ED notes for inpatient ward transfers (varies according to the quantity of written notes produced in ED for that patient). However during the period following implementation there were some occurrences of down-time, system slow running, staff working to get used to the new work flows, These, combined with the nationwide whole system demand pressures related to social care capacity in late December and early January, suggests that this benefit is yet to be realised or evidenced, as demonstrated in the charts below.

In addition some building work in the EAU made the normal processes a little more difficult to follow. Tracking the attendances, four hour performance and emergency admissions over time will provide the data required to evidence any improvement; again in the context of all other initiatives and demand patterns.

Figure 6.1.2.1: ED attendances, four hour performance and admissions from 2010

OUH weekly ED attendances

OUH weekly % seen within 4 hours in ED

OUH total emergency admissions via ED

OUH total emergency admissions other than ED
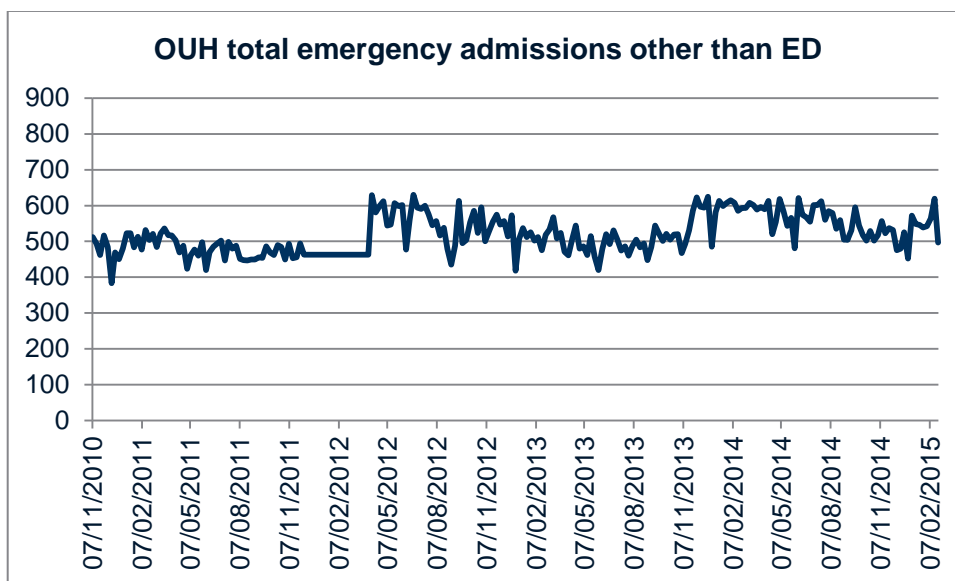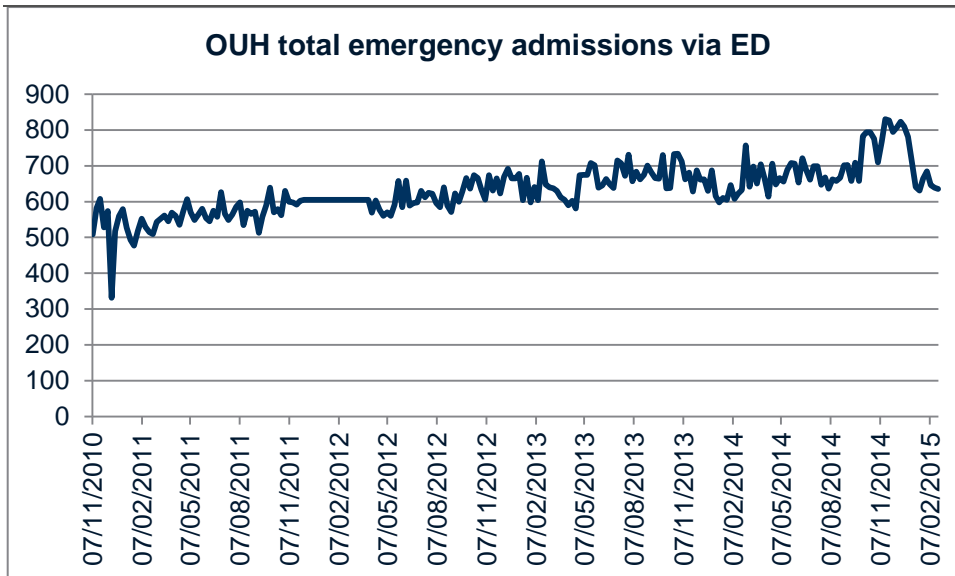
Some clinical staff commented that the ED roll out of ePMA was in a late phase of the overall programme plan. The programme's decision to avoid implementing a change during the busy winter months was based on a potential increase in clinical risk, and agreed by all the divisions. It should however be noted that the effect of this has been a short term increase in work within the admitted pathway as patients get a paper drug chart in ED which then has to be transcribed. Some junior doctors from the admitting specialty have been doing their prescribing on ePMA anyway, which the ED nurses were then unable to action (staff in EAU were providing support for this). Once ePMA is live in ED the time taken for doctors to transcribe the prescriptions for the 500 patients per week admitted from ED will be eliminated from the process.

6.1.3. Blood products

At the initial meeting with the clinical lead and team in haematology, it was clear that the main problem to solve was an inability to manage clinical decision support overrides. National data suggests that 20% – 30% of blood product administration is inappropriate.

The costs per unit were identified as:

- £126 red cells
- £223 platelets
- £28 FFP
- £247 cryo-precipitate

Reducing returned products was expected to save 20 minutes per unit (10 minutes for issue and 10 minutes for return). Currently:

•   14.4% of platelets are returned; aiming for 10%

•   22.7% of red cells are returned; aiming for 15%

A small group of junior doctors on the haematology ward at the Churchill hospital reported that requesting blood tests for a weekend (approximately 20 patients) takes 1 – 2 hours on EPR (3 – 6 minutes per patient). One doctor commented that 'it can take six hours from requesting to transfusion'.

One example of the end-to-end process for blood administration in the Surgical Emergency Unit at the John Radcliffe site (JR) was observed. The full process from calling the porter to starting the transfusion took 45 minutes.

In the Haematology day unit at the Churchill (25% of blood is used by haematology); 2 transfusions were observed; from the blood product arriving to the blood running took 19 minutes and 27 minutes.

The blood bank has audited parts of their own process to evidence efficiency improvements. Dr Tony Berendt, Medical Director, observed that an audit undertaken by the blood bank of EPR requesting compared with paper requesting was very encouraging.

EPR order comms has enabled a significant increase in the completeness of information provided on requests to the blood bank as evidenced in the audit reproduced here.

Figure 6.1.3.1: Blood bank audit of information provided with the requests comparing 100 request cards and 100 electronic requests

Information completed	Paper requests	Electronic
Name	100%	100%
Medical record number	99%	100%
Date of birth	100%	100%
NHS Number	24%	100%
Consultant	22%	100%
Location	69%	100%
Diagnosis	55%	100%
Special Requirements	(1/100 expected) 1%	(47/47 expected) 100%
Contact number	88%	100%

Regular meetings within the blood products project team have led to clarification and definition of the desired objectives, outcomes and associated benefits, and the indicators to track to demonstrate the improvements (see table below). For example, recognising that the system will provide some previously unavailable data is a capability of the system which will offer value in itself once the data are used, rather than an indicator with no baseline.

The blood products project supplied process maps which are included in Appendix 4.

Figure 6.1.3.2: Blood products benefits and agreed outcome indicators to track

| Transfusion KPIs	Type	Baseline	Target
% red blood cell transfusion where pre-treatment Hb > 100g/L (in stable non-bleeding patient)	Quality		L <2%, M 2-3.5%, H >3.5%
% single unit red blood cells transfusions	Quality		L >30%, M 15-30%, H <15%
% transfusions with pre- transfusion lab test and clinical indication documented	Quality		L >98%, M 90-98%, H <90%
Reduction in calls to labs to chase results by clinicians	NCR		
Reduced number of cancelled orders	Quality		
Remove need to write blood unit number in notes	NCR		
User experience	Quality		
Reduced red blood cell usage	CR	27,511	24,760
Reduced platelet usage	CR	3,668	3,302
Reduced fresh frozen plasma usage	CR	6,200	4,960
Reduced cryoprecipitate usage	CR	352	317
Reduction in wastage of blood products	CR	overall 1.1%	target 0.9%
More effective use of laboratory time (minutes)	NCR	2:30	1:45
Platelets returned	CR	14.40%	down to 10%
Red cells returned	CR	22.70%	down to 15%
Data quality improvement with the electronic ordering (request cards are poor quality)	Quality		
Audit (100 paper requests)	NCR	reduce time on audit	
Volume: electronic vs paper requests	NCR		electronic 100%

Figure 6.1.3.3: Use of blood products data over time to evidence outcomes and economic (cash releasing) benefits (activity = day cases + non-elective + elective)
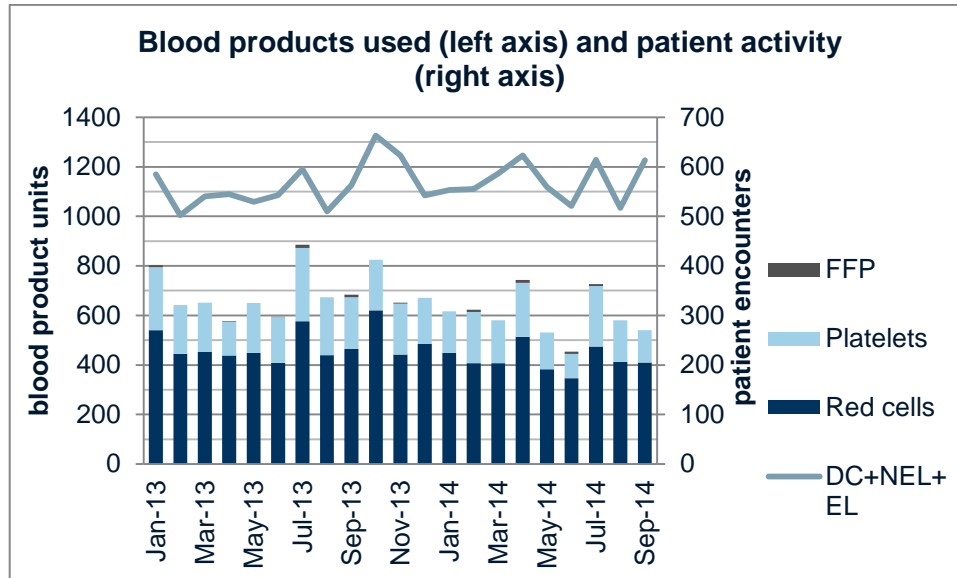
The following three graphs demonstrate the use of Statistical Process Control to show the mean (average) and upper and lower limits of the variation in the process. These were recalculated following the improvement in August 2013, demonstrating the reduction in the first two examples.

Fig 6.1.3.4: Red cells, platelets, fresh frozen plasma (FFP): use per month showing mean and upper and lower control limits recalculated at time of change
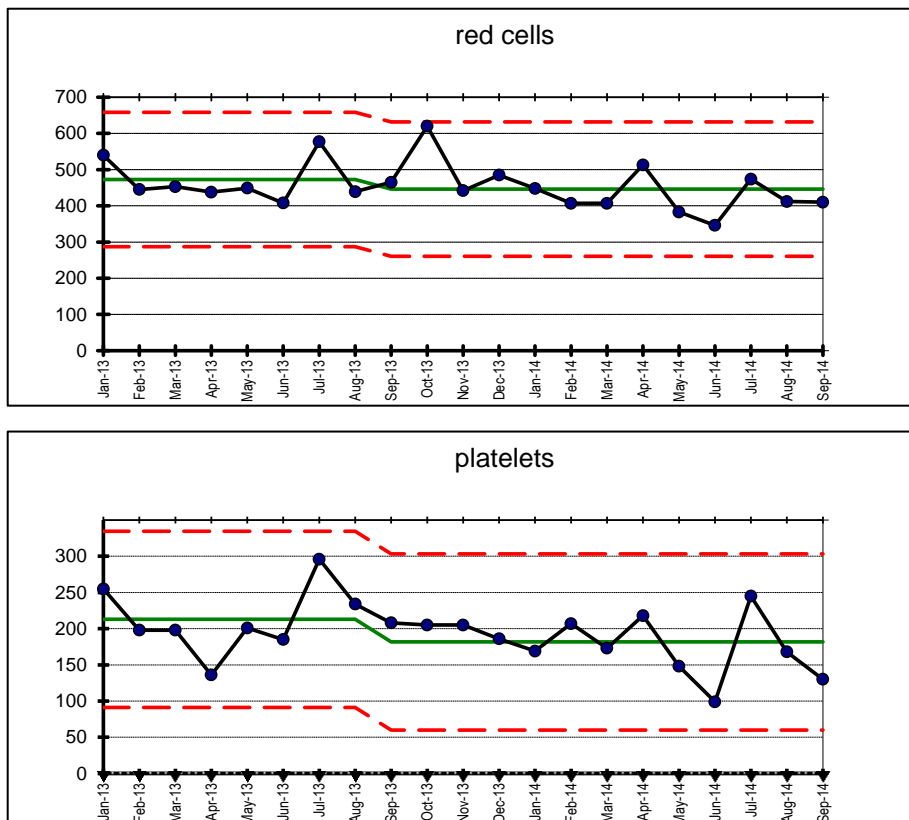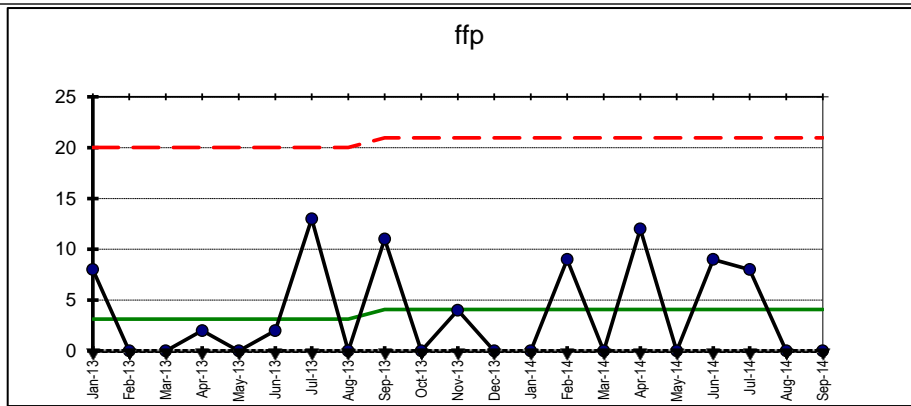
'Every blood product not administered reduces the potential risk to the patient.'

Transfusion team safety nurse

Decision support Version 1 was introduced in March 2013, with Version 2 in September 2013. These changes were intended to reduce the use of blood products by providing decision support within the blood ordering process.

Analysing the use of blood products before and after these changes using Statistical Process Control evidences no improvement after the first change and a small but clear improvement after the second. Including additional data pre-change would have given a more reliable result. Recalculating mean and control limits at the change shows slight reduction in use of red cells and platelets, and a slight (possibly insignificant due to low numbers) increase in use of fresh frozen plasma.

Economic (cash releasing) benefit should be valued using the actual blood products cost per month. Future benefits projections are planned using the mean.

The cost reductions per year based on the new means are:

• 25 fewer red cells per month @ £126 = £37,800 per year

• 30 fewer platelets per month @ £223 = £80,280 per year

This can be recalculated following further any improvement interventions.

A benefits map would show all the relevant enablers and outcomes.

The ratio of blood products transfused to the number of patients receiving blood products on the haematology unit has reduced slightly following the change (September 2013) further evidencing an overall reduction in blood product use.

'The benefit of the project would not be to save me time, but would allow me to do more in the time I have, for example by giving us better access to potentially useful…data such as lab results and…prescription ordering and cancellation data.'

Transfusion team analyst

Figure 6.1.3.5: Blood product use / haematology unit activity
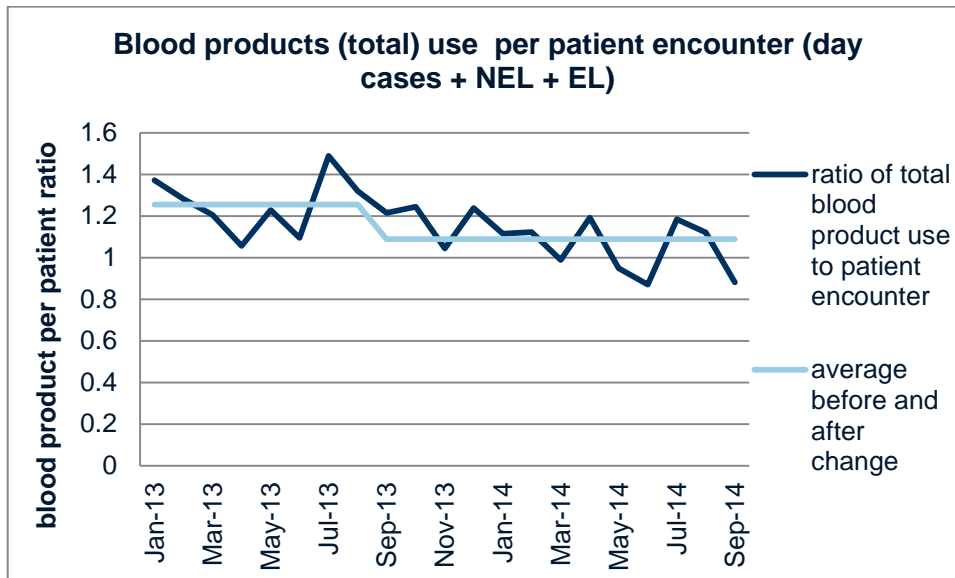
6.1.4. INet (neurosciences intensive care)

Neuro ICU went live with INet on the 29th September 2014.

Use of INet within EPR was anticipated to assist clinical decision making. Senior clinicians commented on the potential to reduce the need for some on-call attendance, where the record can be accessed and used remotely off-site (alongside telephone conversation with more junior staff).

Neuro ICU baseline observations were undertaken just before go live; showing time spent searching for information in the unit:

• Doctor – average 17 minutes during 3 hours observation period

• Nurse – average 14 minutes during 6 hours observation period

• Physiotherapist – average 15 minutes during 6 hours observation period

• Ward clerk – average 12 minutes during 6 hours observation period

Further observation shortly after go live demonstrated that this had been eliminated. However this was partly off-set by clinicians getting used to the EPR, and in some cases struggling with system issues. However all the staff spoken with were very committed to the new way of working and understood the value of a reliable and accessible record.

A nurse handing over to a colleague at shift change used the structure of the record; supporting a comprehensive and logical handover. One nurse also remarked that doing vital signs recording in real time had motivated her do the observations in a more timely way than previously. One doctor was still gaining confidence and was using the facility for a senior colleague to endorse her entries.

Buff folders are still held in the unit ready for when the patient transfers to an inpatient ward, but these were not accessed at all during the six hours observation period.

Further observation in early January showed that the doctors, nurses and therapists are now more familiar with the system and appreciating the accessibility and legibility of colleagues' notes. However some system issues were still impacting the speed of creating records on occasions.

Observation of a ward round showed that clinicians were using up to three computers so that various members of the team could see and use different sections of the notes at the same time, for example vital signs, medications, results and imaging. This helped to inform conversations and decision making throughout the multi-disciplinary team. One of the doctors was updating the short term care plan in PowerNote in real time.

Clinicians working in the unit also spoke about experiencing these improvements:

- Seeing the progress with lab tests was reducing the need for repeat tests

- Presentation of a series of results as a chart is much clearer than a pile of printed paper forms, enabling easier decision making.

- Easier and quicker to load certain information such as vital signs and medications into the discharge summary; time saved for this varies significantly according to length of stay on the unit and the patient's history and condition

- A record of junior doctors' clinical activity competencies achieved will be useful for their log book report accreditation

Clinicians also commented that slowness of the system could interrupt their train of thought, and that follow-up training would help to optimise use as it was difficult to pick which process option to use. An action plan was put in place to rectify identified system issues.

Nursing staff said that implementing and integrating the SEND system for vital signs recording would save them time on transcribing (depends on the level and frequency of monitoring), and potentially improve the accuracy and timeliness of recording.

One physiotherapist on the unit was observed using an i-pad with keyboard for EPR and CaseNotes. This was one of 35 which had been purchased using funding awarded from the Nursing Tech Fund. His experience was that this helped with the infrastructure speed, 'releasing time for rehab'; and potentially reducing errors in requesting sputum microbiology. Aside from EPR he had also found it useful for viewing presentations at meetings, reducing the need to print paper copies.

Other significant observations and feedback received from the multi-disciplinary neuro ICU team were:

- Robust prospective clinical data collection:
  - in the past there have been no automated data collection within the clinical record
  - access to clinical data for mandatory and non-mandatory reporting and audit purposes is limited by lack of consistent contemporaneous recording and difficulty in obtaining the patients paper record
  - clinical activity data are available for resource allocation, business case proposals, clinical activity trainee log book reports accreditation

- Immediate access to complete patient record(s) including medications, allergies and risk alerts:
  - currently there is limited access to paper health records of patients presenting for emergency and elective procedures. This presents significant risks to patients (particularly those with complex clinical problems) and has led to cancellation of elective procedures
  - paper health records are stored off site at Upper Heyford
  - tracking of paper health records to the current location is not robust within the OUH

- Legible patient record(s):
  - date, time, clinician identity and clinical notes entry are now legible
  - multi-access allows simultaneous viewing and entering of new data by the multi-disciplinary team
  - endorse and message centre within EPR allows you to communicate key data within the multi-disciplinary team

- more efficient communication of key clinical information with a clear tracking of key actions within a strong clinical governance and data protection framework. In the past the paper clinical record was photocopied and faxed or mailed within and outside OUH

• Paperless ICU environment:

- leading to reduced clutter, improved cleanliness, improved promotion to work in a safe high-tech and clean environment

- better productivity and clinical performance

6.1.5. Back-up system for downtime – 724Access

Each clinical area has a dedicated computer which can provide application based and a print out of the most recent copy of EPR should down-time occur. This fail-safe is essential for continuation of clinical care, notably for medicines prescribing and administration. The 724Access system was operated for planned downtime, and also on several occasions during the observation work for unplanned downtime, and seen to work. Staff had been trained in its use before the ePMA and EDSE go-lives; and were observed to gain confidence in the facility and how to operate it after they had used it for real.

## 6.2. Patient administration and management

Headlines

- **Where ePMA has been implemented, more complete and timely admissions data are becoming available.**

- **Business process changes are now enabling admissions, transfers and discharges to be managed increasingly and effectively on EPR.**

- **Currently each patient may have up to three or four sets of paper notes (one folder per site); the risk of errors associated with this will decrease as more of the clinical information is held electronically.**

- **Long term, moving to electronic records and stopping the use of paper records will allow visibility at any point by any member of staff that needs to have access.**

6.2.1 Recording admission on EPR:

Use of EPR for recording admissions, transfers and discharges in real time should improve convenience for all staff involved in managing the trust's operations on a 24 hour basis. Where patients can be admitted to the 'correct' ward the doctors have fewer 'outliers' to manage and it is generally accepted that this can contribute to optimising length of stay (that is avoiding unnecessary delays). At the time of the observations timely data entry had yet to be fully implemented. Observation of data entry and associated work with patient records gave the following results:

• EAU: four admissions observed taking an average of five minutes each

• SEU: five admissions observed taking between four and six minutes (clerk estimates twenty to forty admissions in a ten hour evening / night shift)

Once all the data are entered in real time and used by the bed management team, the value of this activity can be realised. Where ePMA has been implemented, more complete and timely admissions data are becoming available (reaching around 90% entered within one hour in April 2015). The project team report that business process changes are now enabling admissions, transfers and discharges to be managed increasingly and effectively on EPR.

Figure 6.2.1: Admissions, discharges and transfers – timeliness of data entry
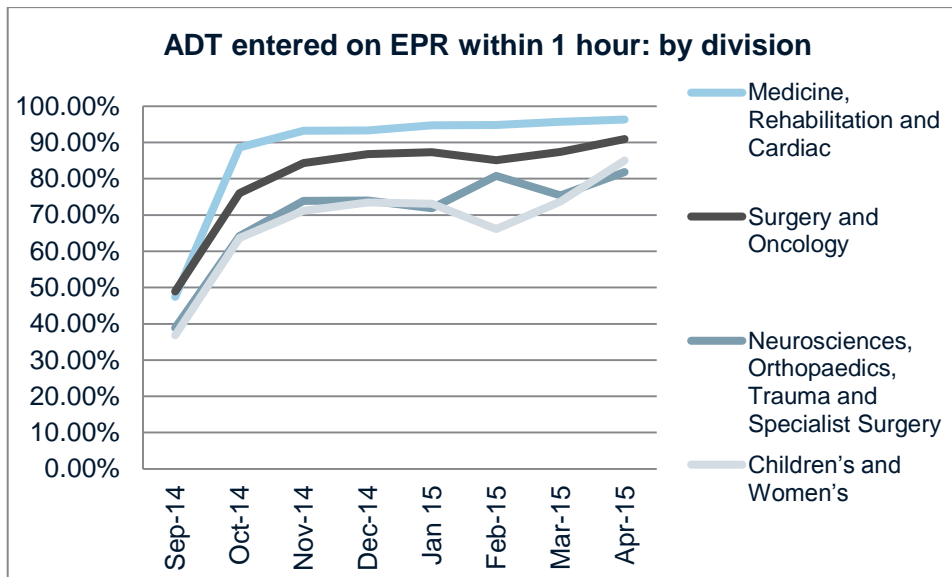
Observations of selected paper processes within overall ADT management included:

- One instance of a clerk in the surgical emergency unit (SEU) filing previous admission notes to prepare for readmission; this took 23 minutes excluding interruptions.

- One instance of the ward clerk in the day hospital having to file notes for the same reason, this took around five minutes.

In future, as paper records are taken out of use, this activity can be reduced and eventually stopped, freeing up the clerks' time for other patient related activity. Variation in the size of the notes, frequency of non-availability and the timeline for eliminating paper limits the potential for predicting the potential value of this efficiency benefit.

6.2.2. Medical records

The current staffing resource is approximately 17 full time equivalents (FTE) at the John Radcliffe site:

- 4.5 FTE band 2 prep 300 notes each for 20 – 30 West Wing clinics per day

- 1.0 FTE band 2 pulling

- 4.0 FTE band 2 filing and tracking

- 0.6 FTE band 2 FTE pulling (not prepping)

- 1.5 FTE band 2 FTE first pull

- 5.5 FTE band 2 FTE tracking and culling to off-site

In addition to this the ward clerks come and pull their own notes if they are on the same site.

In future, once paper records are no longer used for clinics, these staff can be freed up to do other patient related tasks.

Each patient may have up to four sets of notes as a different record is created at each site; normally just the record from the relevant site is made available for outpatient clinics.

Electronic Document Management (EDM) can support aspects of the efficiency agenda, since it can eventually release building space / capacity from storage to other potential uses, and eliminate the cost of moving paper notes around a large hospital estate. Observation elsewhere has demonstrated that EDM requires excellent file naming policies to be effective; and for all staff to avoid the temptation to print copies of documents stored in this way. Data capture and analysis (for example for building a clinical history or for audit) from electronically stored documents is likely take

longer than from a fully electronic record; although some time savings can be achieved by not having to source the paper notes for these activities.

The E-Health Insider CDMI report indicates that trusts are increasingly investing in both electronic patient records and EDM systems to deal with legacy notes, incoming paper, and, in some cases, clinical forms.

> *'The trust is looking towards paperless; we want this to work'*
>
> Medical Records Manager

Medical Records dealt with 1326 duplicate paper records between April and September 2014. Duplicate folders are created when the original cannot be found and the patient is attending for outpatient or inpatient care. Each duplicate paper record requires re-merging once the original is found; and the buff folder used is then discarded. The next phase of the Spine will reduce this issue for electronic records, as a local search before searching the PDS is expected to avoid a duplicate hospital medical record number (MRN) being created, and more up to date patient demographic data available on the Spine added to the EPR automatically. Reducing the incidence of duplicate records created reduces any risk resulting from the content of one of those records being unavailable and avoids the additional time needed to handle and look at both records.

The time taken for searching for a paper record varies from a few minutes to several days; depending on the site, tracking adherence, number of specialties involved and urgency. A significant proportion of the 17 FTE referred to above is used on searching for notes; this extends into other administration roles such as ward and outpatient clerks, and clinicians in all areas of their work.

Each instance of a missing record may result in clinic appointments being cancelled and the patient sent away, or the appointment taking place without the notes. Both of these add inefficiencies into the overall pathway, potential clinical risk and poor patient experience. As the content of the electronic record increases, and eventually paper records are taken out of use, this problem will reduce and eventually stop.

In one clinic that was observed, follow up patients with missing records were being seen as the clinician was able to access the GP discharge summary which contained sufficient information about a recent spell in hospital to make the appointment useful. Others attending out patients clinics reflected that they thought it was 'normal' that their blood results were available electronically for review at the appointment.

The problems caused by missing notes are clearly a concern that the trust aims to reduce, evidenced by this poster.

Figure 6.2.2: Poster regarding tracking patient (paper) records
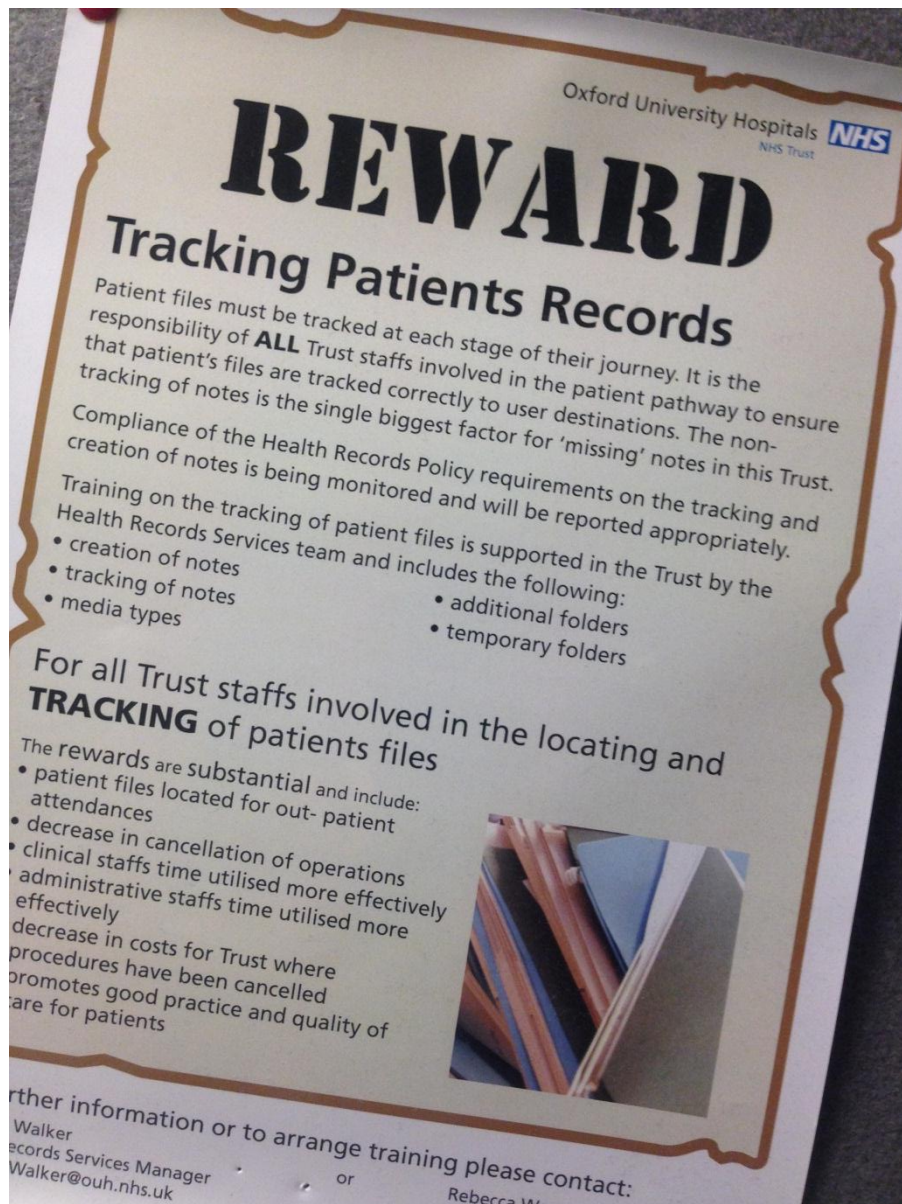
Long term, moving to electronic records and stopping the use of paper records will allow visibility at any point by any member of staff that needs to have access. The delays and work described above will then be eliminated, while the costs of managing and storage will eventually cease. The more structured the clinical record, the easier it will be for others to find the clinical and management data they need (an audit trail within the system assures proper access and use).

Throughout the case study examples were seen of staff starting to recognise the potential impact on patient safety and their working lives in terms of convenient, accessible, structured, legible and auditable records; the significant scale of cultural as well as business change for this to be fully realised has already been discussed.

6.2.3. Respiratory service – bronchoscopy preparation

An example, from the respiratory service, of how the administrator's time is used for entering patient information on EPR is described here:

- Clinic check-in 2 – 2½ minutes; checkout 1 minute

- Time to book bronchoscopy from clinic (about 9 patients per day) and update RTT status 5 – 8 minutes

- Bronchoscopy session preparation:

- Print labels and wrist band approximately 30 seconds per patient

- Patient notes are already here from clinic so only infrequent need to request.

- When sending notes to JR it takes about 2 minutes to add this information to the records tracking system

> *'It would be the best thing not to have to search for notes; I have spent at least 5 hours searching for notes this week.'*
>
> Respiratory services clerk

As previously suggested, generalising and extrapolating from averages and examples isn't reliable, however OUH provided more than 770,000 outpatient appointments in 2013 – 2014. Investing 5 to 10 minutes per patient at referral and clinic registration provides demographic, pathway and clinical data that are then available for use throughout the patient's journey and potentially releasing time for additional valuable care activities.

6.2.4 Beds and flow

Given the continuing demand on the trust, there is a need for real time bed state which would reduce the time spent 'looking' for beds.

There is some dependency on roll out of ePMA; once wards are 'forced' to use EPR in order to access the patients' prescriptions on ePMA, there is an increased drive to engage with and use EPR which in turn should improve the accuracy of the bed state. It is likely that this may contribute to the following outcomes, although other factors will affect these:

- ED 4 hour performance against standard

- reduced outliers and consequent impact on length of stay and potentially throughput

6.3. Referral to treatment pathway

Headlines

- **Currently there is significant resource requirement in dealing with data quality and validation with regard to the overall elective pathway.**

- **Reporting waiting times directly from EPR does not appear to be possible yet. Enabling this would reduce the impact of the time lag which contributes to reliability issues and compounds the problems with validation.**

- **There could be opportunities to further standardise the letter templates and optimise the function and use of scheduling within Cerner Millennium in a future upgrade; to best meet the needs of the service. This could offer efficiencies in the outpatient process, but was not investigated in detail during the case study.**

The overall elective pathway is subject to a referral to treatment (RTT) pathway target of 18 weeks. Interviews with managers, pathway administrators and others involved in elements of the pathway showed that there is an issue with dealing with data quality and validating entries and performance. This can be classified as:

- essential monitoring of performance

- rework of other's errors

The resource taken up with this is reportedly significant, and will need to be quantified as it represents a dis-benefit resulting from the solution within Cerner Millennium. For example it was

reported to take 3 to 4 band 4 FTEs in one of the directorates; and 2 band 6 patient access managers also do validation within their role.

One member of the orthopaedic team at the Nuffield Orthopaedic Centre (NOC) estimated that she spends:

- 3 hours / day for management validation

- 2 hours / day for rework

Just over 100,000 elective inpatient and day case patients were seen in 2013-2014. Depending on each patient's length of time on the waiting list the resource used per patient will vary, and the longer the wait the more effort is used each week to avoid breaching the target time.

Organisational changes in Oncology and Urology may offer an opportunity to change supervision arrangements and potentially improve this.

> *'Integration of EPR with Choose and Book is a major benefit as it cuts the registration process.'*
>
> Service manager

Currently standard operating procedures (SOPs) are developed separately in each directorate / division, based on core workflows, which may be adding further complexity to the pathway data within EPR, and limits opportunities to move staff between directorates to cover absence. Adherence to the SOPs appears to vary.

6.3.1. Data reporting via data warehouse and OUH Reporting Business Intelligence Tool (ORBIT)

Some elements of management information are not currently reported, for example patients not attending appointments (DNAs) and clinic utilisation (a DNA report is now under development).

Waiting lists are managed using a patient tracking list (PTL) to ensure that patients are seen in chronological order where there is no over-riding clinical priority. This process is currently unwieldy and resource intensive as the ORBIT reports are not real time; the time lag contributing to reliability issues and compounding the problems with validation. Reporting waiting times directly from EPR does not appear to be possible yet, but would reduce the issues described.

6.3.2. Outpatient letters

OUH saw over 900,000 outpatients during 2013 - 2014 last year; each of these required at least one letter (excluding letters confirming rearranged appointments); letters for these appointments are created centrally. The contact centre reported that clinic templates are constantly changing and that they use a local database to 'help book correct appointments'. The contact centre also takes enquiries from patients and issues appointment reminders by text message.

Five additional band 3 staff were recruited at time of change from the previous system (OXPAS) to Cerner Millennium. There could be opportunities to further standardise the letter templates and use the scheduling within Cerner Millennium at the next upgrade. This could offer efficiencies in the outpatient process but was not investigated in detail during the case study.

6.4. Maternity pathway

Headlines

- **Maternity services have been exemplars in the degree of benefits achieved through proactive and clinically owned use of information**

- **Use of EPR has made a significant contribution to the achievement of NHSLA level 2 and the service's CQC ratings.**

- **Potential safeguarding issues can be flagged, recognised and acted on by all clinicians involved in the women's care**

- **Clinical data are being used for resource planning (forecasting) and service developments (targeted at areas of highest need).**

- **Connectivity is a challenge in community settings. The trust is actively looking at options to address this.**

6.4.1. Service context and provision

The service takes 8500 maternity bookings per year and is provided from ten community 'pools', ninety five GP surgeries, running more than ninety five community clinics per week, as well as the inpatient and outpatient facilities at the JR and Horton hospitals.

Mums-to-be attend nine appointments (first time pregnancies) and five or six appointments (subsequent pregnancies). Two to three of these are with the woman's own GP.

Each mum-to-be has two ultrasounds per pregnancy with additional scans as required.

6.4.2. Use of EPR

70% of bookings are entered straight onto EPR; while the remaining 30% require duplicate process which takes 10 minutes (taking an estimated 425 hours per year); this is due to difficulties associated with arranging connectivity in a non-OUH location. Options to resolve this are being investigated.

Speaking with midwives throughout the service it was clear that the EPR has provided notable improved improvements and benefits for mothers in several areas:

- Safeguarding alerts – visible to all clinicians caring for the woman. Over 800 mothers-to-be were identified as vulnerable during 2013/2014 and could have benefitted from the relevant alert on EPR at any stage of their maternity care (see Figure 7.4.1 below).

Figure 6.4.1: Safe-guarding vulnerable families

Safeguarding (from OUH website)				
Within maternity services a Health and Social Score is used to identify Vulnerable Families and safeguard the needs of the unborn child and it is now established practice in Midwifery care.				
Information is held on women who are identified as vulnerable and have a score of 3 or 4 on the health and social assessment score (H&S).				
	H&S score 3 and 4	Teenage Pregnancy	Safeguarding	Mental health	Domestic Abuse
2012-13	243	68	61	69	41
% of all pregnancies	4.86%	27%	25%	28%	16-8%
2013-14	806	187	109	339	107
% of births	9.7%	23.2%	13.5%	42%	13.3%

- Following up DNAs – for example where the mother does not attend an antenatal appointment, the midwife can now check whether she may have attended ED for a miscarriage which saves potentially distressing phone calls

- Managing abnormal results – using EPR has enabled process reliability by referring to the pool and use of messaging.

- Predicting demand from bookings at 13 weeks and therefore the ability to plan resources to match peaks and troughs in demand.

- Screening – the compliance with new-born exam within 72 hours is now 100% due to queue management (seeing the babies chronologically). However the national screening committee wants all provider organisations to use a specific system – SMART – which would require duplicate data entry; the OUH maternity service has challenged this.

- Discharge to pool avoids 50-70 phone calls per day and will eliminate 8500 letters plus the associated postage per year.

- Discharge documentation – completing this used to take 20 minutes; and involved printing six copies, the new process now takes 10 minutes, with two printed copies. This has saved over 1400 hours per year (based on the 8500 annual figure).

- NHS number for babies (NN4B) errors reduced from estimated 3000 per year to 700 per year. Corrections take at least 30 minutes; this used to be done by band 5-7 analysts; now by a band 3; resulting in an efficiency benefit = 2300 x (difference between b3 and b6).

- Closed pregnancy discrepancies reduced.

- Audit – for example audits of C-sections before 39 weeks now takes senior midwife two hours instead of several days; 3rd and 4th degree tears are more reliably picked up from EPR than Datix.

- Freedom of Information (FOI) requests (two – three per month) now take a senior midwife just a few hours instead of a few days (varies).

- Use of management information from ORBIT reports – clinical; capacity planning (prediction), staff development.

- Service planning - Recording BMI (mandatory) supports geographical targeting of health promotion activity where needed (for example a pilot lifestyle clinic for obese women in Banbury is expected to have an impact on gestational diabetes and the future health of the baby (this will need a longitudinal study).

6.4.3. Opportunities

Connectivity is a challenge in community settings; midwives have been considering options including Digi-pens on booking forms. Recently it has been agreed that midwives will test a remote working solution.

Some workflow improvements are still needed to make best use of EPR, for example scan requests and forms for bloods for antibodies are still being faxed.

However the service should be commended for their clinical leadership, commitment, use of information from EPR and the associated service developments being made.

6.5.   Orthopaedic pathway

Headlines

- **The NOC is more 'paper-light'; than the rest of the trust. There are opportunities to improve some processes and further reduce the use of paper, for example pre-operative assessment and some mandatory assessments.**

- **The Choose and Book (since replaced by NHS e-Referral service) referral and triage process step, enabled by EPR, supports clinical prioritisation and queue management which provides optimal waiting times within clinical priority and available capacity for**

> **patients, and minimises the risk of waiting time breaches due to queue management.**
>
> - **Extending the example referred to in the text of making a structured clinical note of surgical procedures would further improve the value of the record. This approach could then be adapted for use in other specialties.**

Part of the aim of the case study was to understand the journey of EPR implementation at the NOC as this predates implementation at the rest of OUH.

Two separate Millennium builds are in place, arising from the two distinct implementation phases before the two trusts merged. The NOC is more 'paper-light'; than the rest of the trust; however there are several steps in the pathway still using paper records, notably pre-assessment, theatres and inpatient clinical records. The ePMA go live took place in early December; observation of medicines administration on the ward showed similar challenges to the rest of the organisation such as system reliability and availability of computers. A programme of work is in place to address these.

The pathway for orthopaedic referrals via Choose and Book includes referral triage by the musculoskeletal (MSK) service. The Choose and Book referral and triage process step, enabled by EPR, supports clinical prioritisation and queue management which provides optimal waiting times within clinical priority and available capacity for patients, and minimises the risk of waiting time breaches due to queue management. However at present significant validation is required to manage the overall pathway.

During the interviews with staff information was provided that 795 of 2000 (approximately 40% of) referrals required face to face triage, which is provided at five locations.

Pathway administrators use EPR to manage the patient pathway; monitor RTT and the patient tracking list (PTL). An audit trail is essential to manage and check progress.

Some consultants are still typing their notes which then require scanning into EPR; one FTE band 3 does the scanning.

One observation session took place in the pre-operative assessment clinic (POAC) at the NOC. Patients are typically in clinic for three to four hours. For each clinical assessment the clinical input is between 40 – 130 minutes face to face time; this includes assessment, recording findings and advising / counselling patients before surgery:

- Nurse 20 – 60 minutes

- Junior doctors 15 – 20 minutes

- Consultant 5 – 10 minutes

- Occupational therapist (OT) 10 – 40 minutes for 50% of patients

The findings are recorded in multi-disciplinary (paper) booklet which contains numerous duplications of the fields on EPR. Anecdotally, a recent decrease in use of EPR was driven by requirement for audit from paper records.

In theatres one example was observed of a consultant who had prepared his own templates for operation notes; he writes up the operation notes in theatre (while sutures and dressing are being done by other members of the surgical team) which are immediately available in recovery room instead of dictating, typing elsewhere, endorsing – elapsed time up to 24 hours. There's little if any time saved but everyone can see exactly what's been done immediately and this also optimises the procedure coding. The structured record should also contribute significantly to the ease and value of clinical audit from these records.

A full review of the required assessment information required across all disciplines; a redesign of the form to meet all these needs and then setting this up on EPR would avoid the duplication described, eliminate the cost of the paper forms and make further progress towards a 'paper-lite' process; particularly if this could be integrated with the Surginet design when this is taken forward (so that the assessment is easily visible during the perioperative period). Adding a structured clinical note of the surgical procedure as described would further improve the value of the record. This approach could then be adapted for use in other specialties.

The orthopaedic directorate's posters, describing their quality improvement priorities are clearly visible to patients, visitors and staff. EPR should be an enabler for reducing medication errors, increasing the completion of assessment for falls and pressure ulcers; and should make investigating complaints easier and quicker. Measuring outcomes and auditing compliance should also be quicker and easier with appropriate reports set up.

Figure 6.5.1: Orthopaedic directorate's quality objectives 2014-5
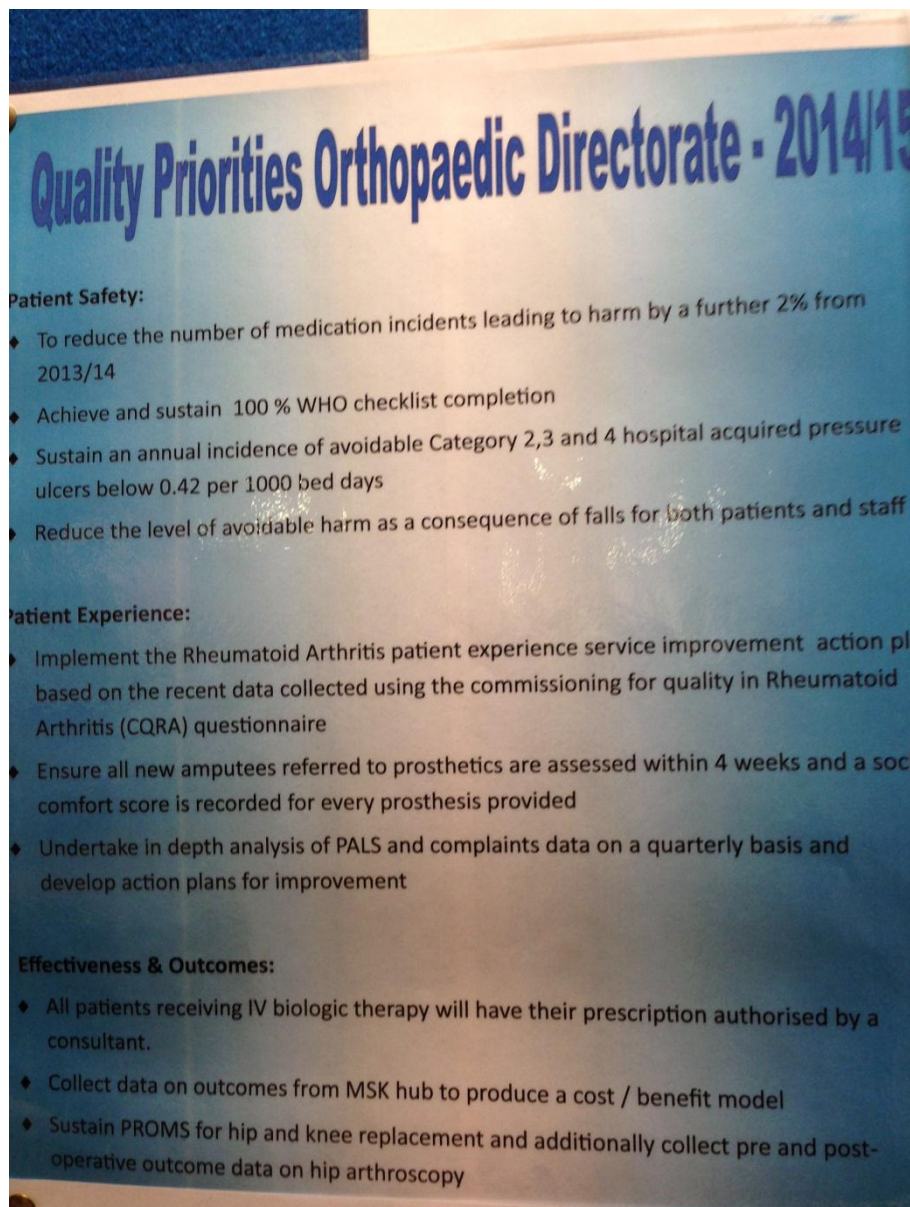
6.6.   Urgent care medicine pathway

The pathway for these patients is most frequently via ED and the medical wards; use of EPR in these areas is discussed elsewhere in the case study and therefore not included here.

6.7.   Urgent care surgery pathway

Headlines

- **The more patient clinical data that are entered into EPR the greater the value delivered as time spent tracking and looking for notes is reduced and clinical information can be viewed and updated away from the ward area.**
- **The ability to review electronic patient information remotely and securely enables increased responsiveness and potential for prompt and effective care.**

The two main pathways in operation are:

- GP referral → surgical emergency unit (SEU) for triage → admit to SEU or transfer to inpatient ward

- Self-referral / ambulance → ED → admit to SEU or specialist surgery inpatient unit (SSIP)

Observation in SEU showed that admitting a patient onto EPR takes the ward clerk four to five minutes; this can be used as an estimate for the admission process required for all admitted patients, and represents the 'investment' in making the EPR available for all inpatients. One ward clerk was observed having to file notes as these were still on ward when a patient was readmitted; this took 23 minutes excluding interruptions.

The clinical assessment (by nurses and doctors) is done on paper. As indicated elsewhere the more patient clinical data that is entered into EPR the greater its value as time spent tracking and looking for notes is reduced and clinical information can be viewed away from the ward area.

One example of a microbiologist reviewing a patient's results during the night while at home, and giving advice to a more junior doctor on site illustrate increased responsiveness and potential for prompt and effective care.

6.8.   Theatres

Headlines

- **The opportunity for integration of the theatre record with the main EPR gives some scope for reducing duplication; the resulting value will depend on eliminating duplication of data entry and, in time, as the system 'learns' about individual clinician's practice, scheduling may become easier and more accurate, with some potential to increase utilisation (although scope for this appears to be limited).**

- **Using Surginet functionality to replace existing specialty systems such as TIMS is being considered, and will be prioritised according to the additional value these will deliver.**

The existing theatre information management system (TIMS) as it is currently used does not appear to be delivering any significant value. Interviews with several key members of staff indicated that different areas of the theatres services have different problems to solve:

- Churchill: limited scope to increase utilisation, but reducing unpredictable overruns could improve staff satisfaction and therefore recruitment and retention. Currently 25% of scrub staff are long term agency; and support workers have been recruited.

- NOC: Surginet is in use but paper records continue, as the scope of Surginet as currently used is not sufficient for all required records for example the World Health Organisation (WHO)

checklist and use of devices, instruments, implants and disposables. The current system, TIMS, is not delivering any management reporting to theatres; although it is used by divisional and senior managers.

- A scheduling meeting is held each week about whether the operation lists are achievable, accommodated, and whether any staffing adjustments are needed

- Observation in theatres at the Churchill highlighted that:

- The weekly planning meeting had been held for preparing the theatre list scheduling; and is designed to agree resources such as ITU bed and kit required.

- The WHO checklist (assures that the planning is in place) was used at start of list however the list order changed due to no ITU bed being available and phone calls were made to seek specialist instruments from JR West Wing. The list order had to be changed and the session looked likely to under-run as the patient requiring post-operative care in ITU was being cancelled because no ITU bed was available.

- Lots of documentation is on paper; some on TIMS which mostly duplicates paper. It was very difficult to measure time taken as this is done concurrently with the paper and the theatre register, and some data were added at start of the operating list. However of two operations observed, up to five minutes was spent on TIMS data entry.

- Completing the WHO checklist at start of list took 10 minutes; before each patient check-in approximately one minute, after each patient check-out was less than one minute.

- At the NOC, the Pathway administrators do theatre scheduling 'shuffle' which is a clunky process; the time spent on this varies depending on how many changes were needed. Observation showed this to take at around 30 seconds per patient.

- There are numerous items to record against each patient in several different places, including but not limited to the notes; bar coding would improve efficiency.

Overall theatre utilisation is reported in the bi-monthly board reports at between 70% and 80% over the last two years. Analysing the variation within this would identify any problem areas and enable these areas to be targeted. Utilisation was not identified as a priority problem to solve.

Figure 6.8.1: Theatre utilisation rate
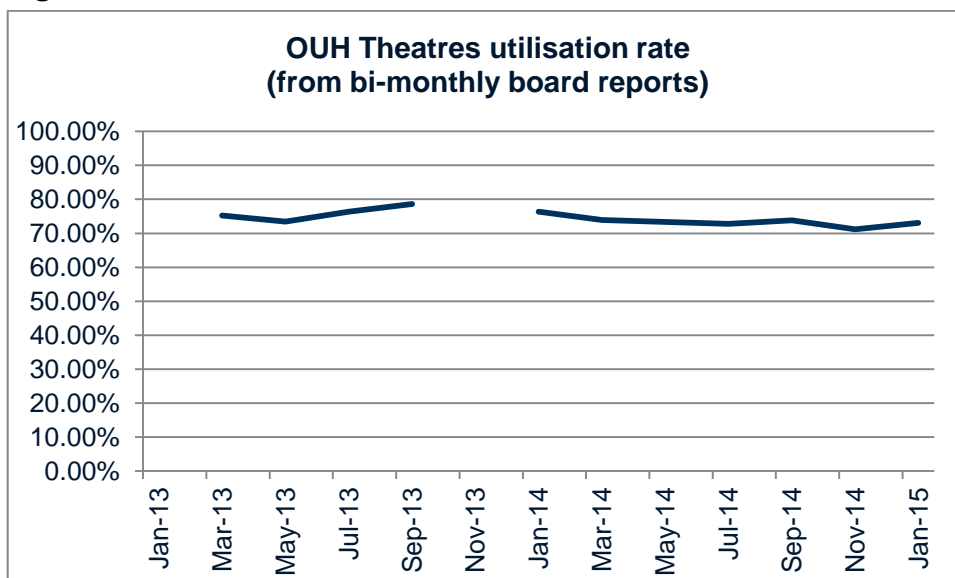
Overall OUH could benefit from implementing SurgiNet provided that the required interoperability with barcoding and tracking systems is in place; and paper processes are fully reviewed and either designed into the SurgiNet module if required or stopped. The opportunity for integration of the theatre record with the main EPR gives some scope for reducing duplication; the resulting value

will depend on eliminating duplication of data entry and, in time, as the system 'learns' about individual clinician's practice, scheduling may become easier and more accurate with some potential to increase utilisation (although scope for this appears to be limited).

Figure 6.8.2: Potential outcomes of a SurgiNet implementation

Capability	Outcome
Barcodes to track surgical trays	Investigate for control of infection
Bar codes to track implants	For local / national registers
Bar codes to track disposables	Traceability; stock management; reduce cost of excess stock levels and increase reliability of stock availability
Integrate PAS / EPR / theatres system	Reduce duplicate data entry; may release time from current theatre systems admin resource
Integrate PAS / EPR / theatres system	Reduce duplicate data entry
Integrate PAS / EPR / theatres system	Easier to locate patients pre-op and reduce resulting delays and wasted time
Integrate PAS / EPR / theatres system	Clinical and management audit supported (easier, quicker, more comprehensive)
Scheduling	Impact on staff resource planning and staff experience
Scheduling	May reduce overruns with associated costs and underruns with associated waste
Scheduling	Resource kit planning (kit, ITU bed etc)
Scheduling	Potential impact on waiting times not clear (would need to be investigated)
Clinical record	Real time data available
Clinical record	Opportunity to improve standards (structure, content and timeliness) of record keeping
Clinical record	Reduced cost of outsourcing notes typing
Clinical record	Clinical audit supported (easier, quicker, more comprehensive)
Clinical record	May enable easier / clearer risk management (would need to investigate how this would apply)
Overall	Improve safety / reduce incidents (requires monitoring)
Overall	Staff experience and turnover (requires monitoring)

6.9.   Therapies

Headlines

- **The ability to capture activity is building knowledge of resource inputs for the service and is expected to support accurate costing of the service provided.**

- **Therapies notes are now available to others; however looking for and moving notes around in clinical areas still takes time.**

- **The example of the use of EPR across the therapies services provides a useful story for other professional disciplines**

- **Once more disciplines are fully using EPR the comment 'no-one is looking at our notes' will no longer be relevant but it is important now as the therapy staff may become disillusioned if it goes on for too long.**

Observations in trauma unit ward and discussions with some of the therapists highlighted the following use of time which can be valued:

- Capturing activity minutes in EPR take 5 – 10 minutes per day for 12 FTE therapy staff on the trauma unit. This comes to six hours / week x 52 weeks at bands 4, 5 and 6. This activity is building knowledge of resource inputs for the service and is expected to support accurate costing of the service provided.

- Time spent on audit takes one day per month x 12 months at band 6.

- Therapies notes are now available to others; however looking for and moving notes around on the ward still takes each of 12 FTE therapists on the trauma unit approximately 5 – 10 minutes per day. This equates to six hours per week x 52 weeks by bands 4, 5 and 6.

- In outpatients, pre-go live therapy notes entry was observed to take four and a half minutes (anecdotally this is fairly typical time for handwritten data entry).

- The multi-disciplinary team (MDT) rehab prescription is six pages; typically taking 15 – 20 minutes to complete the paper document for each patient; this is required for the best practice tariff.

> *'I prefer writing on a computer; it's easier to correct; I feel more efficient and I don't feel stupid in front of patients and families as I can see what's happened before; people like to be remembered.'*
>
> (OT)

> *'Some buff notes are quite chaotic, so it's difficult to find information'.*
>
> (OT)

There is no integration with Blue Spiers (a local system doctors use to record ward round notes); and the Thames Valley trauma network (a booklet started by ambulance paramedics; then doctors' clerking notes).

> *'Therapies are the only ones using EPR so no-one is looking at our notes'.*
>
> Inpatient ward therapist

Therapists reported that EPR avoids time wasting; anecdotally it can take up to 15 minutes searching the ward for a patient's notes folder; on other occasions the notes are readily available. This variation will depend on other activities taking place in the clinical area at the time such as medical ward rounds, nursing records, drug rounds and pharmacist medicines reconciliation and TTO screening.

> *It's convenient – it's easy to read other peoples' notes'*
>
> Therapist

Anecdotally data entry is 'slightly quicker but not massively'. One example was observed of a therapist taking 13 minutes to complete a falls assessment on EPR including free text and excluding patient contact time. The time taken to complete these assessments and records varies widely depending on amount of information to be added; the clinician's familiarity with the system and the patient's history and condition, and the system speed at the time of data entry.

'Reliability isn't great – the computer crashed twice yesterday.'

Therapist

Therapies are using the data on time taken for care / rehab input to each patient to improve understanding of the costs of the services provided and to inform service planning in future with more reliable reference costs per type of activity.

The example of the use of EPR across the therapies services provides a useful story for other professional disciplines. The highlights (less time looking for notes, availability of patient information and improved auditing) and issues (notes not being read by others and lack of integration with the Blue Spier system) described above should give insight and confidence to others. Once more disciplines are fully using EPR, the comment 'no-one is looking at our notes' will no longer be relevant but it is important now as the therapy staff are likely to become disillusioned if it goes on for too long. One consultant in a different discipline suggested carrying a stamp to use in the paper notes saying 'look in the EPR'.

The work to better understand the resources used to inform costing of the service, once complete, could be a useful example for use by other services.

7. Delivering effective care

During the course of the case study improvements and benefits relating to trust wide functions for providing effective care such as safety, reducing errors, supporting audit, standardising assessments and clinical coding were observed and reviewed.

Headlines

- **EPR should be an enabler for reducing medication errors, increasing the completion of assessment for falls and pressure ulcers; and should make investigating complaints easier and quicker**
- **Measuring outcomes and auditing compliance should also be quicker and easier with appropriate reports set up.**
- **Positive Patient Identification is in use for the electronic patient record. Patients and staff were heard to comment that this is one of the safest elements of the overall electronic record.**
- **Essential standard patient assessments are available on EPR and pop-up reminders are available to indicate that the assessments are due.**
- **Clinical data captured in a structured format facilitates audit and analysis.**

7.1. Patient safety

*'PPID is one of the safest things you can have in preventing errors'*

Ward manager, NOC

'PPID will always be verbal as well as scanning, but this helps when patients are unable to communicate and a nurse is not available to confirm for you.'

Phlebotomist lead

Data held on the National Reporting and Learning System (NRLS) and previously collected by the National Patient Safety (NPSA) on reported incidents related to types that are most likely to be impacted by EPR implementation are shown here. Unfortunately these data were only collected at six month intervals and while they have provided a baseline, OUH aims to increase the level of incident reporting.

Figure 7.1.1: Reported incidents by type
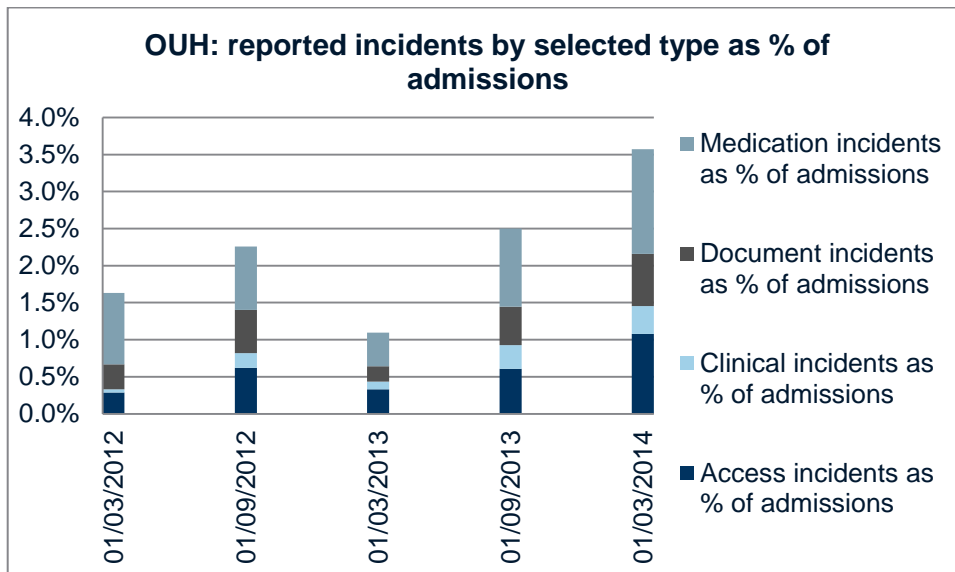
Clinical assessments are required for patients admitted to hospital, for example for venous thrombo-embolism risk (VTE) and whether prophylactic treatment is required. EPR provides a flag that VTE assessment is required. Improving compliance and therefore treatment will reduce the incidence of VTE; the benefits of this will be in patient outcomes and a contribution to length of stay reduction which is subject to a CQUIN payment. Internal analysis of the number of patients experiencing a VTE over time would provide evidence of this benefit.

Figure 7.1.2: Risk assessment for VTE completed
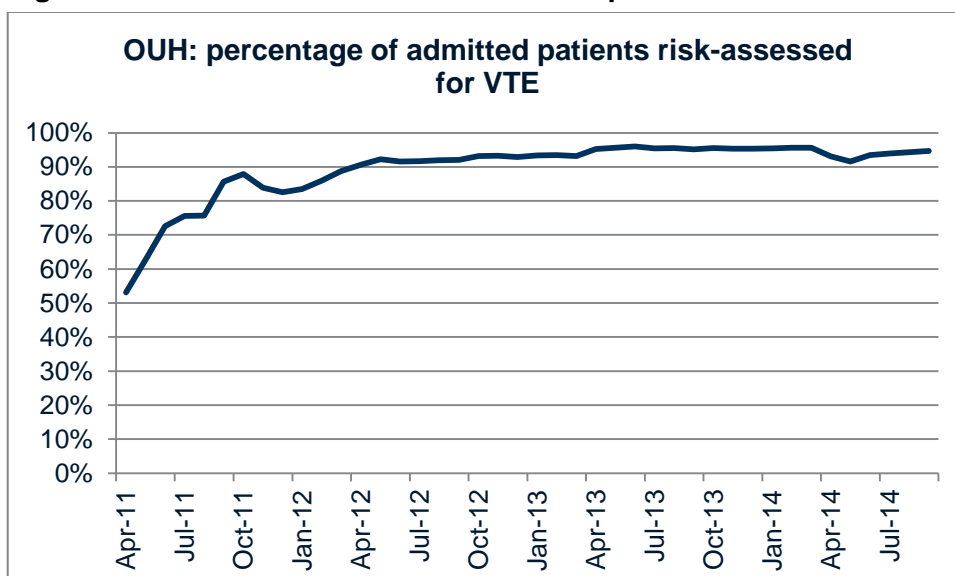
7.2.   Clinical governance; audit; incidents

Two interviews with staff in clinical governance roles demonstrated significant potential value once the full record is on EPR.

Currently incidents can take up to one day to investigate the time line. Staff estimated that if everything was on EPR the same work would take around one hour just by cutting and pasting from EPR into the report releasing time from everyone involved in the process and increasing the evidence available to prioritise improvements.

Two of the key performance indicators that would demonstrate the benefit of the EPR are incidents (near misses) and incidents involving harm, where record keeping and medications are a factor. OUH will use existing internal analysis and reporting arrangements to do this. Some high level medications incidents (no harms) were made available which are included in section 4.1 as a baseline for the ePMA implementation.

A range of clinical audits are undertaken across the organisation, in all specialties and clinical professions, such as doctors, nurses, midwives, therapists and pharmacists. EPR is a key enabler for clinical audit in all these areas, once the required data are fully included in the EPR. There were useful examples which are referred to in the appropriate sections of this report such as use of blood products, therapists and maternity.

The capability delivered by EPR is that audits could be 'almost automated' and therefore improved by:

•   being properly randomised

•   run at increased frequency

•   using larger samples

•   increasing the range of audits

•   more complete analysis (currently compiled by division; reported at trust level)

It should also be noted that some audits could not previously be undertaken at all.

The resulting benefits include time saving to undertake the audits and the value of using the data provided to inform clinical service developments and to evidence compliance with standards for example C-section rates and information provided to the blood bank on requests.

7.3.   Clinical coding

The Clinical Coding department employs two band 2 FTE to look for notes; each search takes from one minute to several days. 34 coders code 200,000 to 250,000 finished consultant episodes (FCEs) per year.

The department was reported as achieving target of 95% completed coding and billing at five days from month end.

Work is ongoing to improve the capture of co-morbidity data and overall accuracy. This represents an opportunity for more accurate performance information to be used for commissioning negotiations, however any change in income generation would affect other parts of the health economy and is therefore not technically an economic / cash releasing benefit.

8. Benefits management evaluation and digital maturity

It is widely believed that the level of benefits achieved relates to the organisation's 'digital maturity' resulting from widespread adoption and use. The relationship between implementation, adoption

and perceptions among staff about the usefulness of the system was a recurring theme during the observations and during dialogue with members of the project team; and the approach to benefits management at the trust matured during the case study.

8.1.   HSCIC evaluating benefits

The HSCIC benefits team are continuing to work with provider organisations across England to improve the level and accuracy of realising and reporting benefits enabled by centrally funded EPRs such as Cerner Millennium. A key element of this is to offer support in developing benefits management skills within organisations as part of the deployment projects. Several models support this and are reproduced below; some of these are adapted from Managing Benefits by Steve Jenner (APMG, 2012).

Realising the benefits is the underpinning reason for implementing a programme to deliver outcomes. The benefits realised may be affected by costs and resources, actions and major risks / issues.

Figure 8.1.1: Benefits in a programme
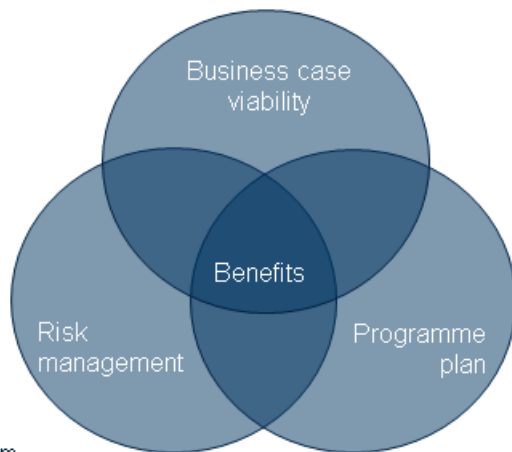
The HSCIC benefits management approach incorporates the five practices of the iterative benefits management cycle developed by Steve Jenner in Managing Benefits

Figure 8.1.2: The benefits cycle (from Steve Jenner's Managing Benefits)
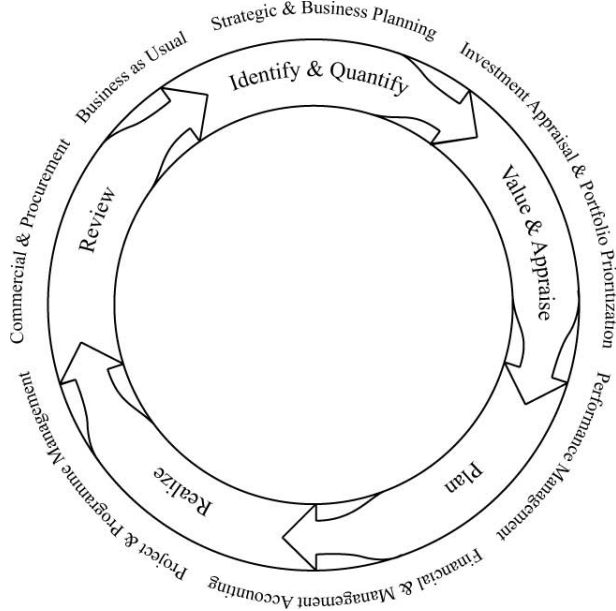
The HSCIC benefits team promotes the use of benefits mapping to assist in recognising the interconnections between different project outputs, initiatives and other enablers. Benefits mapping also helps stakeholders to relate outcomes to benefits and the organisation to focus the initiatives and resulting benefits to its key objectives.

**Figure 8.1.3: Simplified example benefits map based on MSP with reference to EDSE and ePMA**
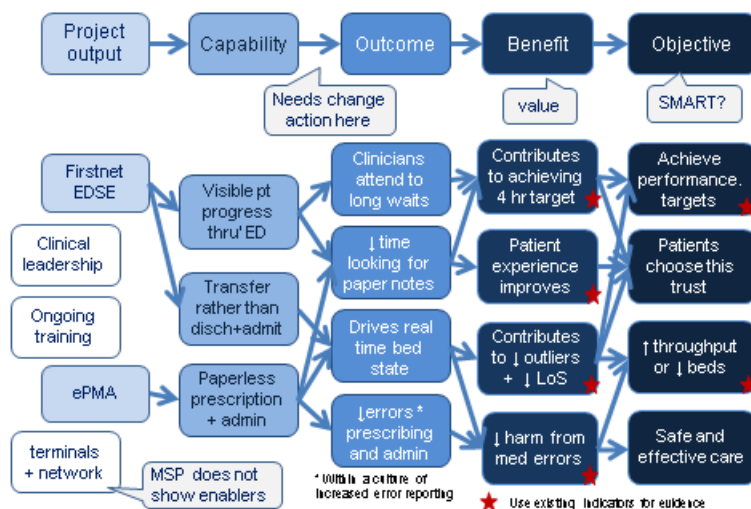
The requirement to report benefits is to provide evidence of a return on the original investment (centrally and within the trust). This idea also underpins the revised approach to the OUH cost improvement programme (CIP).

Figure 8.1.4: Simplified illustration of return on investment
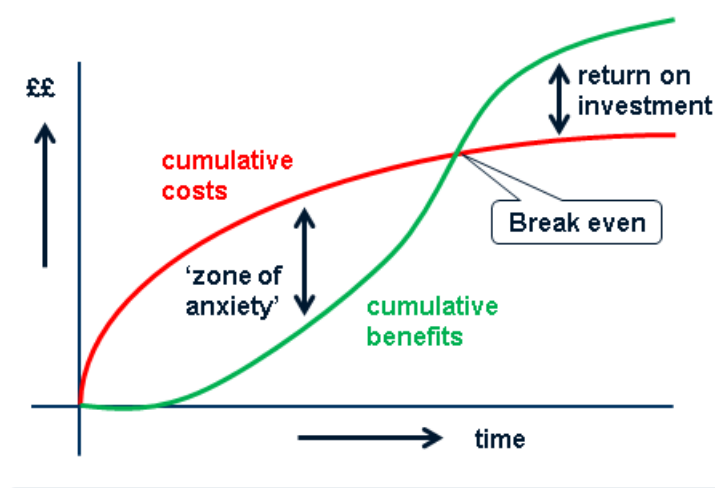
It can be useful to express benefits realisation against costs as a cumulative time series, showing progress towards break-even (and possibly a 'target' return on investment (RoI) ratio with caution). It's also useful to agree a tolerance (e.g. 10% above or below the plan) to underpin decisions about escalation.

8.2. Evaluating benefits in the LSP cohort of healthcare organisations in south of England and London

Work with provider organisations in London and the south of England, delivering acute, community and mental health services, using care records systems supplied under the LSP contract provided useful insight into critical success factors for deployment and use. Key findings in 2013, from evaluating benefits across southern community and mental health organisations within the LSP programme are shown here.

Figure 8.2.1: Key success criteria for EPR implementation from community and mental health organisations in London and south of England

During 2012 - 2013, work with community and mental health provider (participating) organisations deploying RiO confirmed the previous findings about key success criteria and overall maturity:

1.   Leading and mandating the change at the top of the organisation

2.   Clinicians and improvement leads identify and implement best practice

3.   Clinical services, performance and information management share objectives, requirements, skills and experience. Benefits measurement processes (definition, baselines, tracking over time and reporting progress) must be well integrated with performance management information

4.   Policies and standards underpin new processes

5.   Education and training supports high quality clinical record keeping and use of information; and integrates this into daily practice

6.   Standards of **clinical and administrative record keeping are monitored and reviewed regularly**

Barts Health NHS Trust also uses Cerner Millennium; in 2013-14 a benefits 'deep dive' was undertaken as a joint piece of work between Barts Health and HSCIC. The approach used at

Oxford has incorporated the successes and learning from that work, with the key findings from the Barts study reproduced here for comparison. At Barts, significant benefits were realised as a result of going 'paperlite' in their Emergency Department, other findings at Barts Health are summarised in table 8.2.2.

Figure 8.2.2: Key findings from the Benefits 'deep dive' at Barts Health NHS Trust 2013 – 2014

- **Key findings from the Barts 'deep dive':**

- **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 the system's performance issues and the need for a greater focus on business change, particularly continuous system training for staff**

Several of these findings have been replicated at OUH; notably in that 'pockets' of enthusiasm are ripe for spread to other areas as part of the process of continuing implementation, and that the success and value of the whole system depends on universal adoption across all clinical and administrative processes. This in turn will eventually enable the trust to stop using paper records. Similarly to the findings at Barts, OUH has experienced system performance issues, and there is still a need for ongoing training and support for staff to avoid any poor practice creeping in.

8.3. Clinical Digital Maturity Index

In November 2013, EHI Intelligence published the baseline Clinical Digital Maturity Index (CDMI), the first benchmark of the relative digital maturity of all English NHS acute trusts. Based on the EHI Intelligence Database, the CDMI captures the presence (rather than extent of implementation and use), of key administrative and clinical systems in acute trusts, and so provides a unique resource for analysing their digital maturity at a national, regional, trust and system level.

The e-Health Insider Intelligence Clinical Digital Maturity Index (CDMI+12) report tracked progress against the 2013 baseline, and provided the first, comprehensive, longitudinal measure of NHS progress on digitisation over a 12 month period. Information is clustered into 9 levels. OUH was ranked overall 7th in November 2013 with a score of 88; in September 2014 the rank had increased to joint 5th with a score of 90. This placed OUH into the highest rank of all the trusts with Cerner Millennium under the BT LSP contract. In April 2015, OUH improved again, reaching the top of the CDMI rankings, following completion of the seven stage roll-out of e-prescribing across all the directorates and the implementation of iNET in Neuro ICU:

http://www.ehi.co.uk/news/EHI/9989/oxford-hits-height-in-digital-maturity

Figure 8.3.1: EPR programme update to OUH Board April 2014

'The Integrated Business Plan and supporting IM&T Strategy establish an ambitious goal to establish a digital hospital, developing a culture that exploits digital technology to improve care and work more efficiently. EPR is fundamental to this. We have made good progress in the past 3 years in moving away from a legacy Patient Administration System, upgrading our digital imaging system and building up our infrastructure. Recently the Trust was scored 7th (*subsequently 5th in September 2014, and 1st in April 2015) in the HSCIC sponsored Clinical Digital Maturity Index which ranks all English NHS Trusts on the maturity and efficacy of their clinical IT systems; once the Trust has completed the implementation of electronic prescribing the expectation is that we would be in the top 3 across the UK. As a Trust we will need to increase our investment in IM&T and EPR infrastructure in order to deliver the vision.'

EPR programme update to Trust Board April 2014 (*with updates)

8.4. Health Information and Management Systems Society (HIMSS) analytics

Overall progress with the Cerner Millennium EPR at OUH suggests an opportunity for OUH to plan for HIMSS accreditation in future; in order to benchmark within the digitally leading edge healthcare providers in Europe, and fully recognising the level of adoption of the systems in use.

HIMSS Europe, part of HIMSS[5], recognises hospitals for improvement in their delivery of healthcare through the use of information technology and electronic management systems. It grades hospitals using the European Electronic Medical Record Adoption Model (EMRAM), with ratings running from 0 to 7. Grading criteria are strict, with an active accreditation process. Those organisations that demonstrate effective electronic systems for specific functions such as patient records and medicines management achieve a high grade.

Figure 8.4.1: HIMSS analytics Europe – summary of European EMR adoption model

European EMR adoption model SM © 2012 HIMSS Analytics Europe	
Stages	**Cumulative capabilities**
Stage 7	Complete EMR; CCD transactions to share data. Data warehouse feeding outcomes reports, quality assurance and business intelligence. Data continuity with ED, ambulatory, OP
Stage 6	Physician documentation interaction with a full CDSS (structured templates related to clinical trigger variance and compliance alerts) and closed loop medication administration
Stage 5	Full complement of PACS displaces all film-based reporting
Stage 4	CPOE in at least one clinical service area and/or for medication (i.e. e-Prescribing); may have Clinical Decision Support based on clinical protocols.
Stage 3	Nursing / clinical documentation (flow sheets); may have Clinical Decision Support for error checking during order entry and /or PACS available outside Radiology
Stage 2	Clinical data repository / Electronic Patient Record; may have controlled medical vocabulary, clinical decision support (CDS) for rudimentary conflict checking. Document imaging and health information exchange (HIE) capability

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[5] HIMSS is a global, cause-based, not-for-profit organization focused on better health through information technology (IT). HIMSS leads efforts to optimize health engagements and care outcomes using information technology.

Stage 1	Ancillaries – Lab, Radiology, Pharmacy – all installed or processing LIS, RIS, PHIS data output online from external service providers
Stage 0	All three ancillaries (LIS, RIS, PHIS) not installed or not processing Lab, radiology, Pharmacy data output online from external service providers

As an example for comparison, Croydon Health Services NHS Trust was awarded a 'Grade 6' rating; the first in the UK to achieve this level, (no UK Trusts currently hold a Grade 7). Croydon also uses the Cerner Millennium Electronic Medical Record, which was implemented in September 2013 through a local supplier provider contract with BT and managed by the HSCIC.

9. Conclusions

Using the originally intended business case capabilities and benefits as a framework, the following is a summary of achievements to date. All but one of the capabilities planned in the LSP and trust business cases have been delivered; and a critical mass of adoption achieved which is beginning to yield evidenced benefits.

- Replacement of obsolete and/or expensive to maintain legacy systems – *in place*.

- Full compliance with programmes such as Choose and Book Direct Booking (the Greenfields are some of the last trusts in the country yet to achieve Direct Booking), and enabling use of NHS number – *patient choice in place; fully achieved; directly bookable clinics are available throughout the trust.*

- Delivery of the foundations for a solid information technology platform in preparation for the Foundation Status – *foundations are in place and being built on*.

- Provision of a modern system which can deliver a single patient record, supporting clinical decision making – *foundations are in place; a single record can be delivered in future*.

- Reduction in the risk of errors arising from having multiple systems by consolidating information in one place and reporting – *foundations are in place; integration of several clinical systems within the trust will reduce duplication at the interfaces*.

- Clinical Notes will be contained in one solution, enabling a single point of identification for all systems, and available at any point of access – *foundations are in place; complete clinical data within the electronic record will be required before reliance on paper records can be eliminated.*

- The ability to record and access patient allergy and alert information electronically at appropriate points in the patient journey – *in place and use has increased.*

- Improved audit trail facilities from both a clinical and information governance perspective – in place; additional structured clinical data recording within EPR is required to fully deliver the benefits associated with clinical audit.

In addition, there are benefits associated with efficiency and effectiveness such as:

- Bed management – not yet fully in place; there is a dependency on real time admission and discharge (ADT) data which is at least partly being driven by ePMA roll out. Figures indicate a recent improvement in the timeliness of ADT recording.

- Discharge Summary which sends a message to Pharmacy to dispense drugs – the electronic discharge summary to GP and ePMA TTO processes are both in place; note that the discharge summary does not (and is not intended to) trigger TTOs dispensing.

There is potential to realise efficiencies in clinical decision making associated with length of stay, clinic utilisation etc. Length of stay efficiencies result from a range of transformation and improvement initiatives across OUH and within the health community, and are very difficult to attribute accurately (benefits mapping would help with this). Some process time reductions within the TTO dispensing process have been demonstrated which are expected to contribute to more patients going 'home before lunch'; a repeat of this audit following further stages of the ePMA roll-out will be undertaken by pharmacy.

The findings that are intended to support future developments (after exit from the BT LSP contract and transition to a locally contracted instance of Cerner Millennium) are outlined here.

• **Staff across OUH are keen to increase the momentum of deployment.** Overwhelmingly comments were made such as 'everybody should be doing it; everything should be on there'; although it is recognised that capacity for business change and adoption limits the possible speed of implementing a full clinical EPR.

• **Roll-out of ePMA is clearly a 'tipping point'.** While safety and reliability improvements and 'released time to care' benefits have been demonstrated, these are still to be fully realised as the system is yet to be fully used for the entire clinical record.

• The most significant problem encountered was the resource, time and effort being used on patient pathway validation for the 18 weeks referral to treatment pathway. Initial difficulties with a solution not designed for the UK waiting list management requirements led to a high level of 'system' workarounds. This suggests that a robust 'system fix ' with workflow redesign and process improvements are needed to resolve the problem.

• **Notable practice was observed in maternity** for safeguarding, for audit and in demonstrating how data can be used to plan service development.

• Numerous other clinical systems which already provide value are in use, including CareView, SEND, SafeTX, Blue Spier etc. Any opportunities for integration would add value to both these clinical systems and EPR, for example integrating SEND with EPR was identified as a desired improvement by Neuro ITU nurses, and the process safety provided to blood products transfusion is recognised by all staff using SafeTX, but currently requires a little duplication.

• **Training / coaching / support / embedding change takes significant and ongoing leadership, coaching and direction**, and is supported by the floor walkers at implementation of each module. Feedback from the areas observed indicated that more follow up training would help staff to get the best from EPR.

• **Connectivity for peripatetic services (midwifery)** – whatever solution is taken forward will provide useful lessons and insight for other peripatetic services in future.

• A recent improvement to the CIP approach and governance, driven by Blood products exemplar suggests a notable shift towards benefits thinking, value and the need for return on investment. Priorities are now being set by divisions and services rather than the IT teams.

• It has proved difficult on occasions to access and use existing trust held data which has limited some of the context and baseline analysis opportunities.

• **There is potential to strengthen the approach to the use of data** for example by developing a broader understanding of variation in processes; illustration throughout this case study is intended to support this.

Discussions on the need to use incidents data has resulted in additional reporting by ePMA roll out phase and can be used to evidence benefits realised if tracked and analysed with benefits enabled by EPR in mind for example:

- Medications incidents and harms

- Record keeping / communication

Reporting and analysis of medications incidents in the medical division has now been aligned with reporting into the medications subgroup.

Work in partnership with OUH to value the efficiency benefits continues.

10. Recommendations

Overall recommendations are made in response to the specific observations and findings at OUH and are intended for the trust to use in the context of existing plans to optimise the EPR and other technology.

As with the Barts Health 'deep dive in 2013, the report is intended to be publically available and used by other organisations implementing an electronic care record. While local contexts are inevitably (at least partly) different, some common challenges are evident in many healthcare provider organisations and health communities.

The following recommendations align with the trust's strategic objectives (seen in section 3.2).

Recommendation 1: The recent increase in use and adoption is related to the ePMA roll-out; more / ongoing support to staff is needed to further spread adoption. The staff have demonstrated enthusiasm and determination and would benefit from more ongoing training and support across the trust following implementation. These needs related to some fairly minor issues with ePMA, and more importantly, the ongoing level of work involved in validation.

Recommendation 2: Consider investing in accelerating the rollout of EPR. Realising benefits depends on the extent and speed of roll-out balanced against the costs and resources of doing this, and as previously discussed the capacity within clinical services to do this. OUH could consider accelerating the roll out and use, to optimise value and build on the existing enthusiasm as indicated by the example of the therapists' notes, neuro ITU, the (temporary) re-work involved in transcribing prescriptions on admission from ED and the initiative displayed by one ward that started to enter patients' vital signs observations on EPR. The CIP process recently introduced now provides a framework for doing this, with services leading their own prioritisation.

Recommendation 3: Showcase the maternity success to drive wider adoption: The maternity services achievements for safeguarding, audit and service planning are useful examples that could apply elsewhere in the organisation; and potentially other trusts providing maternity services.

Recommendation 4: Continue the focus on the single EPR, integrating where appropriate. There are numerous other solutions in place for example SafeTX, SEND, Case Notes Blue Spiers etc. Some of these such as Case Notes are effectively replaced by the Cerner Millennium EPR and some are valuable adjuncts such as SafeTX and SEND. Integration with EPR would ensure that the combined value of those systems and Millennium are maximised; taking into account the investments already made on these examples. Again the prioritisation process for these decisions is now in place.

Recommendation 5: Leverage the data coming from EPR (and other trust sources) to drive cost and quality improvements. OUH holds and processes significant quantities of data. Aligning the use of data with organisation wide transformation and cost improvement (CIP) activities including the implementation of EPR and to demonstrate improvements, would make the benefits enabled more visible. There is potential to strengthen the approach to the use of data for example by developing a broader understanding and analysis of variation in processes and outcomes. The new governance arrangement for an OUH integrated annual plan for transformation and cost improvement offers an opportunity for directing use of data held by and enabled by the EPR.

Recommendation 6: Use benefits mapping to maintain focus on the end-game of the EPR implementation. Using benefits mapping as a technique alongside the other prioritisation processes would assist with staff and stakeholder involvement, and in understanding the connections and attribution of the various initiatives being planned and implemented.

Recommendation 7: Focus on resolving the remaining 18 week RTT issues. Patient administration related to waiting list (18 weeks referral to treatment) involves a high level of workarounds. This suggests that a robust process and workflow redesign is very likely to free up some of the staff time currently spent on patient administration, validation and queue management. This time could be reinvested in patient facing activities (released time to care); each division would need to clarify how that time would be re-used to add value.

Recommendation 8: Replicate the practice of using incident reporting in the Medical Division across OUH; relating this to other relevant change initiatives. Incidents data can be used effectively to identify problems and evidence improvement over time. Datix stores all reported incidents; reporting and analysis of medications incidents in the Medical Division has now been established, with reporting into the medications subgroup; this approach should be replicated in other divisions.

Recommendation 9: Opportunity for pre-operative assessment as a potential area for process improvement. Observation supports that position with processes relying on paper and some duplication still in place. There are likely to be opportunities to redesign the entire pre-operative process with the aim of reducing process duplication, use of paper and potentially on-the-day cancellations.

Recommendation 10: Benchmark OUH's level of digital maturity against the internationally recognised HIMSS model. This has been discussed in the context of system produced data, the Clinical Digital Maturity Index and HIMSS adoption model. Recognising the progress to date and the perceived 'tipping point', there is potential for the trust to consider the value of achieving HIMSS accreditation for electronic health record adoption and use.

11. Index of figures

12. Appendices

Appendix 1: Glossary of Acronyms

acronym	meaning
ADE	Adverse drug events
ADT	Admissions and discharge time
BMI	Body mass index
BT	British Telecom – Health
CCIO	Chief clinical information officer
CDMI	Clinical Digital Maturity Index - eHealth Insider's intelligence database
CIP	Cost Improvement Programme
CNST	Clinical Negligence Scheme for Trusts premium (to NHSLA)
CQC	Care Quality Commission
CR	Cash releasing (benefit)
DToC	Delayed transfers of care
EAU	Emergency assessment unit
ED	Emergency department
EDM	Electronic document management
EDSE	Emergency Department Single Encounter
ePMA	Electronic prescribing and medicines administration
EPR	Electronic patient record
FCE	Finished Consultant Episode (an indicator for activity)
FFCE	First finished consultant episode (an indicator for activity)
FFP	Fresh frozen plasma
FTE	Tull time equivalents (staff)
GP	General practitioner (primary care)
HIMSS	Healthcare Information and Management Systems Society
HSCIC	Health and Social Care Information Centre
HSJ	Health Service Journal
ICU	Intensive care unit
IT	Information technology
JR	John Radcliffe
LoS	Length of stay
LSP	Local service provider
MDT	Multidisciplinary team
NCR	Non cash releasing (benefit)
NHSLA	NHS Litigation Authority
NN4B	NHS number for babies
NOC	Nuffield Orthopaedic Centre
NPSA	National Patient Safety Agency
NRLS	National Reporting and Learning System (safety)
ORBIT	Oxford Reporting Business Intelligence Tool
OT	Occupational therapy / therapist
OUH	Oxford University Hospitals

OXPAS	Oxfordshire Patient Administration System
PAS	Patient administration system
PDS	Personal Demographic Service
PPID	Positive patient identification
RTT	Referral to treatment
SCR	Summary Care Record
SEND	System for Electronic Notification and Documentation (local solution)
SEU	Surgical emergency unit
SPC	Statistical process control
SSIP	Specialist surgery inpatients
TIMS	Theatre Information Management System
TTO	To take out (medicines)
VTE	Venous Thrombo-embolism

Appendix 2: Awards to OUH for achievements with electronic patient records

EPR Order Comms

•   Winner of Patient Safety awards 2012 (Technology and IT to Improve Patient Safety).

•   Winner of Health Service Journal awards 2012 (Improving Care with Technology).

•   Highly Commended for NHS Innovation Challenge Prizes (Improved Diagnostic investigation).

•   Finalist for EHealth Insider awards 2012 (Outstanding work in Healthcare Imaging Informatics).

•   Finalist for British Medical Journal awards 2012 (Transforming Patient Care using Technology).

EPR with Blood Bank SafeTX systems

•   Winner of The HSJ Efficiency award 2013 (Efficiency In Pathology Services)

•   Finalist for Guardian Healthcare Innovation awards 2013 (Innovation with Technology)

•   Finalist for EHealth Insider awards 2013 (Best use of IT to promote patient safety)

Pharmacy TTO project

•   Awarded £200,000 from Safer Hospitals, Safer Wards Technology Fund 2014 (Automatic Robotic dispensing from EPR for To Take Out (TTO) and Outpatients Medications)

•   Overall information technology infrastructure

•   E-health Insider CDMI scores: November 2013 – 7th; September 2014 – joint 5th; April 2015 joint 1st in England.

Appendix 3: Charts of ePMA medicines administration baseline observations before ePMA implementation and at intervals after implementation

These charts show the findings from the medicines administration observations carried out by the HSCIC benefits SME for the case study. Each patient process was observed and the findings allocated to either using the record (paper or electronic) or the clinical and patient interaction element. Inevitably there is some estimation as the nature of clinical work is very holistic. The observations were made on a range of wards at a range of times including the evenings and early mornings; which were reported as being the busiest times for medicines administration.

Charts showing medicines administration pre-go-live

Chart of EAU meds admin observations pre-go live 23 and 24 September 18:00 round (average total time taken was 11:05 minutes)
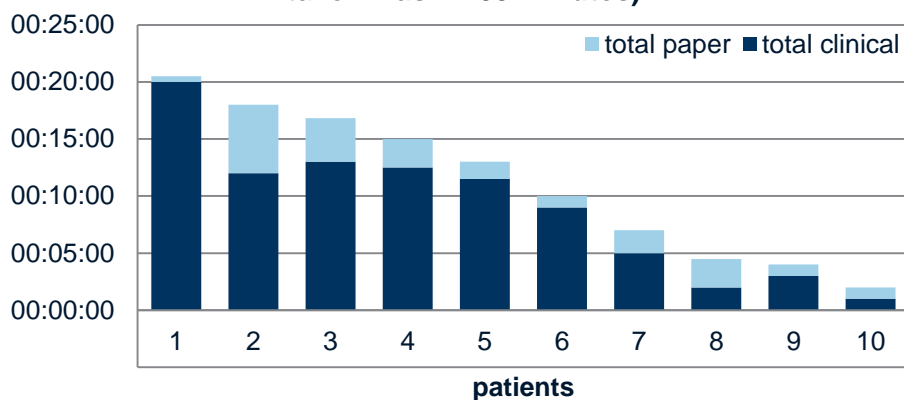
Cardiology ward: medicines administration baseline 28 and 29 January 2015 (average 05:33)

medicines administration baseline: SSIP 29 January 15 (average 08:47)
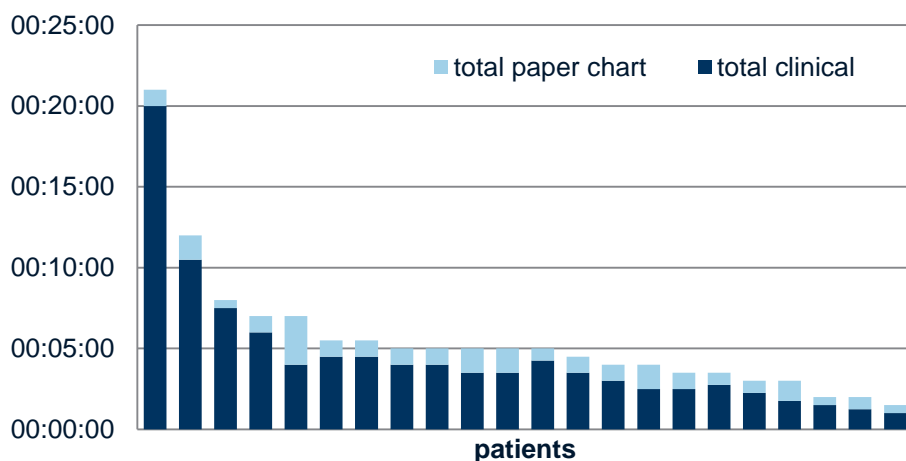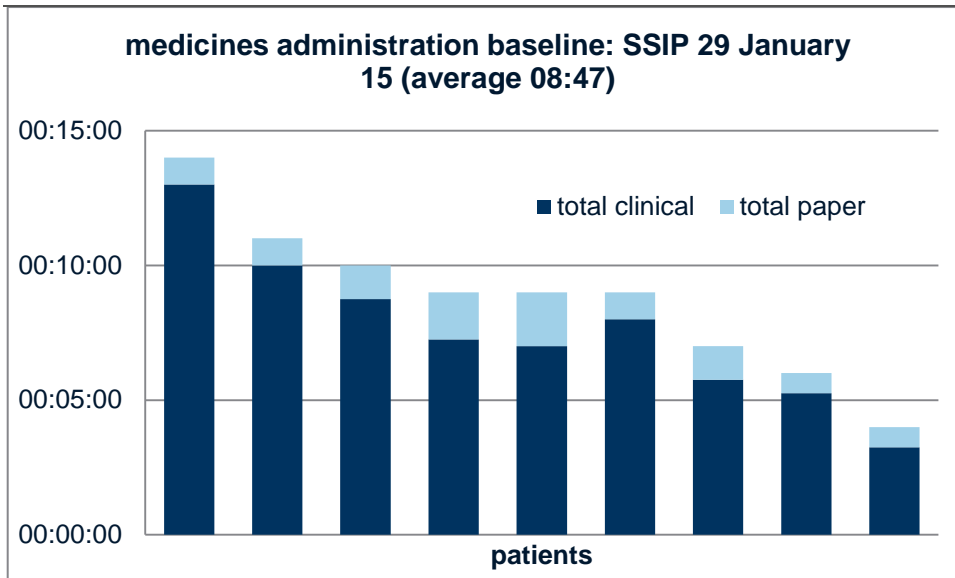
Charts of ePMA medicines administration observations following ePMA implementation

Chart of time taken for meds admin on EAU and Adams wards late October 18:00 round (average time per patient was 7:39 minutes)

Chart of time taken for meds admin on neurosciences and ward 7d mid December post ePMA implementation (mix of am midday and pm rounds; outliers removed) (average time per patient was 11:37 minutes)
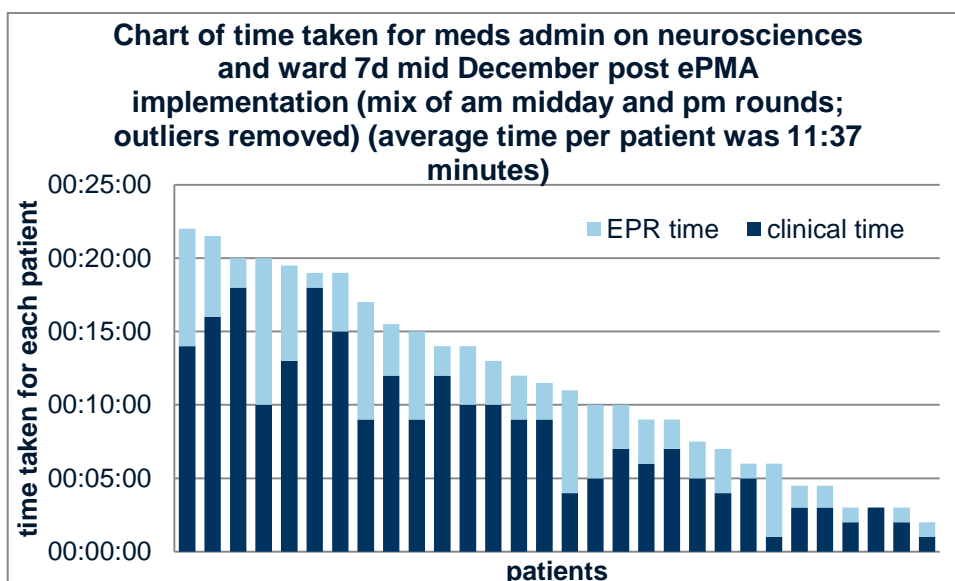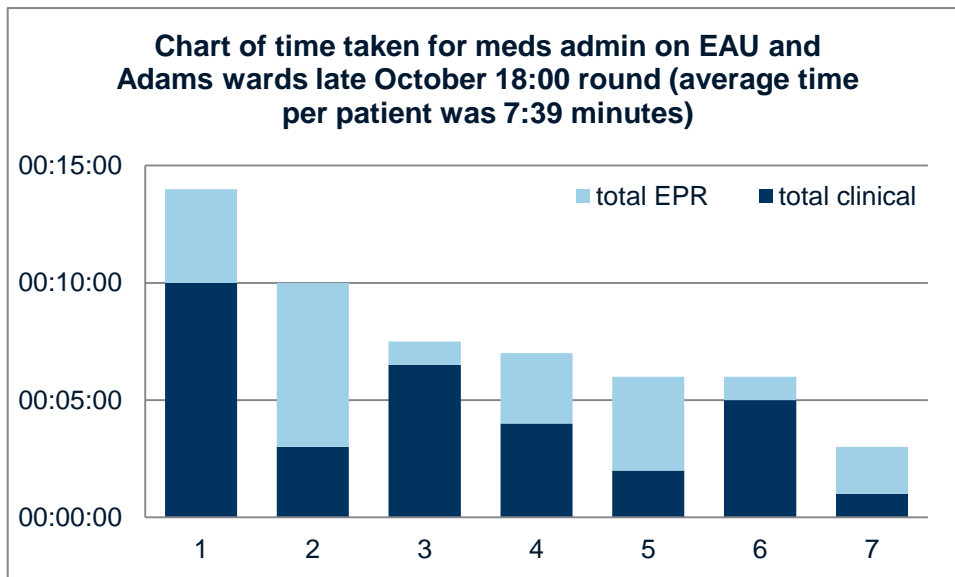
Chart of time taken for meds administration on NOC ward F 18:00 07.01.15. (average 06:30 mins)

Chart of time taken for meds administration on NOC ward F 06:00, 08.01.15 (average 8:16 minutes)

Appendix 4: TTO overall process using ePMA

OUH TTO end to end process

Phase

Medical staff

Doctors' ward round → Ready for discharge? → If yes; patient informed by medical staff → Junior doc prioritise tasks → TTO prescription written up (was on casenotes; now EPR)

TTO prescription corrected

Discharge prescription released to pharmacist

Nursing staff

Nurse checks dispensed items against prescription → Nurse discusses prescription with patient and provides meds

Pharmacist

Clinical review → Transcription accurate → Clinically appropriate → Liaise with patient

Prescription ready for dispensing? → no / yes

Pharmacy

Prescription printed in pharmacy → labelled → dispensed → Checked accuracy

porter

Scheduled portering round collects dispensed items → TTOs supplied to ward

Or pharmacist

Or HCA

Patient

Patient informed ready for discharge by medical staff

Pharmacist liaises with patient

Patient discusses prescription with nurse and receives meds → Patient ready to go

Appendix 5: Process maps for blood products

Red Cells Ordering and Administration

Clotting Products Ordering and Administration (FFP, Platelets and Cryoprecipitate)
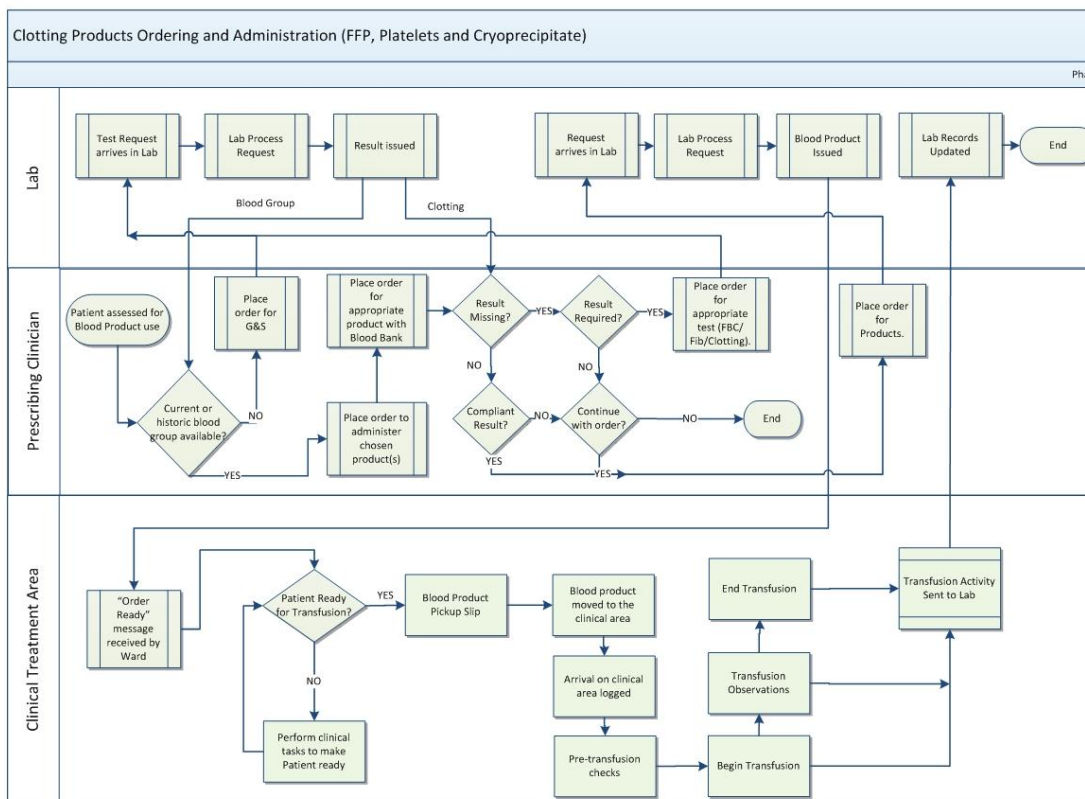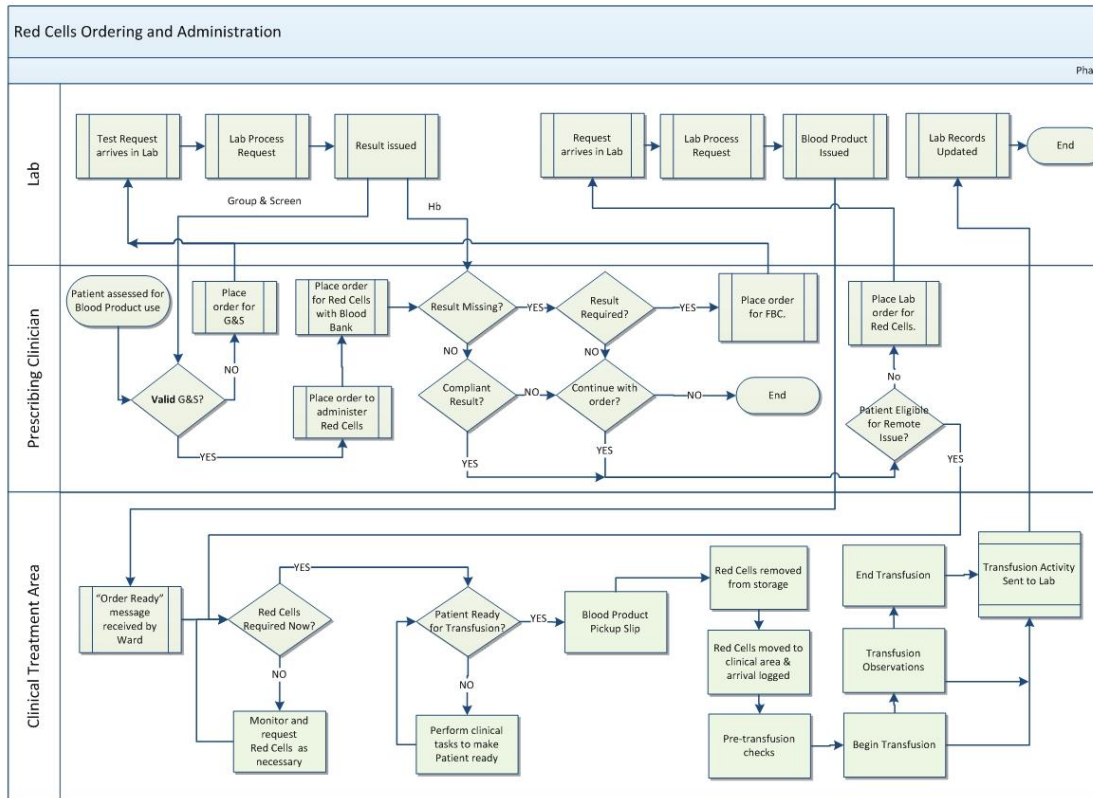
Appendix 6:   Orthopaedic referral / triage / treatment process map

Choose and Book / Orthopaedic referral to treatment and discharge

Phase

GP
- Patient sees GP
- Patient needs referral?
- Referral via Choose and Book
- Discharged to GP

Choose and Book
- MSK triage (telephone)
- Patient needs specialist care?

Outpatients
- MSK triage (face to face)
- Outpatient follow up
- care complete?
- Outpatient waiting list
- Outpatient clinic appointment and diagnostics
- Patient needs inpatient treatment?

POAC
- Impatient waiting lkst
- Patient assessed and advised in POAC
- Patient fit for surgery?

MDT (doctors, therapists and nurses)
- Inpatient admission and assessments
- Surgery and post operative recovery
- Post op treatment and rehabilitation
- Patient fit for discharge?

RTT timeline / episode
- GP referral to Choose and Book
- Outpatient treatment starts
- Inpatient admission starts
- Inpatient admission completed
- Episode completed

Appendix 7: Summary (selected columns) from OUH benefits register Jan 2015

Key benefit area	Rationale/Imperative	Outcome	Benefit Title	Detailed Benefit Description (inc Target measures)
Maternity	Data Quality/Financial	Mandatory fields will result in an improvement in data quality and completeness, especially KPIs and National screening data.	Improved quality of maternity data set.	Improvement in data quality and the ability to achieve high levels of CNST compliance for audit.
Maternity	Safeguarding alerts against the Electronic Patient record	An electronic alert can be placed on the Maternal Patient record indicating to end users safeguarding concerns and plans for the unborn child. Alert shows on bed and whiteboards, on the patient banner bar and also as an alert on all registration conversations (eg admission, transfer etc)	Reduced likelihood of safeguarding issue being missed	Improvement in the data quality and dissemination of safeguarding alerts for newborns
Maternity	Payment by results reporting	Mandatory electronic capture of Payment by Results data via Antenatal booking and Iview at Discharge, and automated reporting of said data.	Reduced overhead in the completion and reporting on mandatory PBR information	Electronic capture of data, including mandatory fields, will reduce the overhead required to collate the data set for PBR
Maternity	Operational efficiency	Ability to audit CNST data electronically	Reduction in clinical time spent on CNST data	Ability to audit Clinical Negligence Scheme for Trusts (CNST) data electronically eliminating time wasted manually looking for and auditing data
Maternity	Operational Efficiency/ Improved Quality & Safety	Reduction of CNST premium	Reduction of CNST premium	Contributing to reduction in CNST premium resulting from safer Maternity process.
All Clinical areas	Operational Efficiency/ Improved Quality & Safety	Electronic Discharge Summary to GPs.	Faster arrival of discharge information with GP will support improved continuation of care in the community	Quality of care given by the GP can increase due to the detailed and timely receipt of the discharge summary, giving improved continuity of care
All Clinical areas	Operational Efficiency	Discharge summary will be sent electronically rather than by post	Reduced cost of sending discharge summaries to GPs	Reduced cost of sending discharge letters to GPs in terms of stationary, postage and resources to print letters and envelopes and stuff envelopes

All Clinical areas	Operational efficiency/reduction in risk/cost reduction/patient experience	Standardised clinical orders will result in uniform clinical practice including pre printed labelling. This will lead to a reduction in mislabelled specimens/ eligible specimens which are rejected.	Reduction in costs associated with rerunning specimens which have been rejected	Pre printed labelling will lead to a reduction in mislabelled specimens/ eligible specimens which are then rejected
All Clinical areas	Patient Safety/experience,	All the information relevant to a patient is held in one place and simultaneously accessible to all users requiring legitimate access	Increased staff efficiency through being able to access patient information when required in a single location	Staff work more efficiently as their access to patient information is not delayed through mislaid information or by it being in use by others
All Clinical areas	Operational Efficiency/ Improved Quality & Safety	Improved recording of, and access to patient demographics	reduced clinical and admin errors resulting from duplicate errors	Record CDS quality. Record no of untracked duplicate records. Reduced time on PDS lookups. Reduced queries arising from wrong patient address. Reduce time on baby maternity record
All Clinical areas	Operational Efficiency/ Improved Quality & Safety	All the information relevant to a patient is held in one place and simultaneously accessible to all users requiring legitimate access	An electronic longitudinal patient record is available	
All Clinical areas	Operational Efficiency/ Improved Quality & Safety	Co-Morbidities captured electronically and available to clinical as well as commissioning teams	Improved co-morbidity recording leading to improved patient safety and increased ability to recover costs effectively	Record quality and link to CQUINN
All Clinical areas	Operational Efficiency/ Improved Quality & Safety		Improved ability to develop integrated multidisciplinary care pathways	
All Clinical areas	Data Quality/Financial	More complete clinical coding, including secondary conditions due to the availability of more complete records	Improved coding, Increased revenue and improved clinical information	% of secondary conditions captured, increase in revenue attributed to secondary conditions
Meds	Operational Efficiency/ Improved Quality & Safety	Electronic MAR (eMAR) for every patient seen as IP and ED attendance	Saving time searching for patient drug information	Clinician time saving due to drug history/charts being readily available electronically and no requirement for duplicated data entry (mins)
Meds	Operational Efficiency/ Improved Quality & Safety	Electronic MAR link to discharge summary	Saving time when preparing discharge summaries	Junior doctor time saved per discharge summary preparation for each inpatient Finished Admission Episode (FAE) (mins)

Meds	Operational Efficiency/ Improved Quality & Safety	Prescribing information held electronically.	Reducing time taken to complete drug rounds	Drug round efficiencies due to accuracy and completeness of prescription information including dosage/route/timing information. Junior nurse time saved per bed day (mins)
Meds	Operational Efficiency/ Improved Quality & Safety	Electronic MAR	Reducing time spent querying and clarifying information in pharmacy	Pharmacist time saved per day for each senior pharmacist due to a significant reduction in clarifications of unclear handwritten paper based records (mins)
Meds	Operational Efficiency/ Improved Quality & Safety	Electronic MAR	Eliminating expenditure on paper based drug charts	Annual stationary budget, eventually eliminated because no requirement for paper based charts (£). %age saving in overall budget when rolled-out
Meds	Operational Efficiency/ Improved Quality & Safety	ePMA implementation	Reducing unnecessary Length of Stay in hospital due to adverse drug events	Reduction in avoidable Length of Stay relating to preventable ADE/ADRs. Improved availability of accurate and legible drug and test result information at time of prescription and administration, reducing the likelihood of an adverse drug event that increases the length of stay to resolve (days)
Meds	Operational Efficiency/ Improved Quality & Safety	ePMA implementation	Eliminating requirement to transport drug charts around hospital	Grade of staff currently employed transporting drug charts around the hospital (if more than one and on different grades, please suggest best average). Technical support staff time saved per day per member of staff employed in this capacity due to all drug charts being readily available electronically, removing requirement to physically transport them around the hospital (mins)
Meds	Operational Efficiency/ Improved Quality & Safety	Safer Meds Management process	Reducing CNST premium	Contributing to reduction in CNST premium resulting from safer Medicines Management process. NHSLA benefit only achieved once all aspects of (non maternity) trust comply.
Meds	Operational Efficiency/ Improved Quality & Safety	Increase in Generic Drugs for prescribing in drugs catalogue	Reducing overall trust drug budget	Percentage reduction in drug budget due to strong encouragement of doctors to prescribe drugs from a standard catalogue (generic prescribing) (%)
Meds-TTO	Operational Efficiency/ Improved Quality & Safety	TTO printing stopped	Reduction in TTO printing costs	TTOs are currently printed (80,246 pages per year, 4 pence a page cost) and transcribe from paper to Pharmacy system, with interface in place the printing cost is saved.
Meds-TTO	Operational Efficiency/ Improved Quality & Safety	TTOs no longer transcribed	Reduction in TTO turnaround time	Another benefit of the bidirectional interface is the potential decrease in TTO turnaround time. When the TTO is ready sooner, it could lead to earlier discharge of patient and allow patient bed to be available sooner which has huge benefit to Inpatient capacity, with potential knock on effect of better

			meeting the ED 4 hour targets.
Meds-TTO	BEDFORD interface operational	Reduced transcription of TTOs	TTOs are currently printed (100,000 pages/year) and transcribe from paper to the Pharmacy system. Another benefit of this bidirectional interface is the removal of manual data entry/transcription of TTOs from EPR to Pharmacy system (called Bedford) resulting in time saved, and furthermore it removes transcription errors between EPR and Bedford. In addition the interface removes the need for any potential manual entry/transcription from Bedford to EPR of TTO status and details of what the final TTO dispensing was. The overall data quality is improved and Patient's EPR record is enhanced as it receives the TTO status and changes made to the TTOs in Bedford automatically.