

**DOES THE PROCESS OF IMPLEMENTING SERVICE LINE  
MANAGEMENT AFFECT THEATRE UTILISATION?**

by

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## **Abstract**

**Introduction:** The English National Health Service (NHS) is rationalising services to ensure healthcare remains sustainable. Implementation of Service Line Management (SLM) is recommended, as it is believed to empower clinical leaders to improve resource use and make cost efficiency savings in areas such as operating theatres (OT). The aim of this study was to examine if, how and why, SLM affects theatre utilisation.

**Methods:** A mixed methods multiphase process evaluation design was used. Three years of theatre utilisation quantitative data, 35 semi-structured interviews and focussed observations were undertaken. The study focussed on elective colorectal surgery in two English NHS hospitals.

**Results:** OTs were found to be inefficient. SLM implementation was minimal. Theatre data was not valued or used to affect performance and interviewees felt, in part, due to organisational structures, unable to control processes. Consequently, minimal impact on the cost effectiveness and efficiency of OTs was identified.

**Conclusion:** To improve the cost effectiveness of OT, NHS hospitals need to invest in data systems and develop organisational structures that devolve control to clinical leaders and promote staff collaboration. Without these elements, SLM cannot be implemented and its potential impact will not be established.

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## **List of Abbreviations**

BBC-CLAHRC	Birmingham and Black Country- Collaboration for Leadership in Applied Health Research and Care
CDAT	Clinical Director for Anaesthesia and Theatres (Urban Trust)
CDS	Clinical Director for General Surgery (Urban Trust)
CQC	Care Quality Commission
FT	Foundation Trust
HCA	Healthcare Assistant
KPI	Key Performance Indicator
NHS	National Health Service
NIHR	National Institute for Health research
ODP	Operating Department Practitioner
PLICS	Patient Level Information Costing System
QUIPP	Quality, Innovation, Productivity and Prevention Challenge
SLM	Service Line Management
TFA	Tripartite Formal Agreement
TPOT	The Productive Operating Theatre programme

# **CHAPTER ONE: INTRODUCTION**

## **Summary**

The National Health Service (NHS) is a large and complex organisation which provides health care for the general public of the United Kingdom (UK). It is a taxpayer funded healthcare system which, despite spending less per person than comparable European countries (including France and Germany), is required to make cost efficiencies to ensure the service is sustainable (Department of Health 2010a, Department of Health 2010b, OECD 2013). This need for NHS rationalisation has led to programmes and complex interventions being proposed to help hospital trusts make cost efficiency savings (NHS Institute for Innovation and Improvement 2009, Monitor 2009a).

One such intervention originating from industry is Service Line Management (SLM), which promotes the restructuring of health services into narrow 'LEAN' business units (Monitor 2009b, Monitor 2010b). This, in theory, provides a more strategic approach to decision making, by helping trusts to identify which service lines make or lose money. The aim is for clinical leaders within these service lines to be empowered to rationalise services, reduce waste, manage performance and, with the aid of financial information, make services more cost-effective and sustainable (Monitor 2009a, Monitor 2009c, Institute for Healthcare Improvement 2005).

Implementing an SLM approach to services that utilise expensive and complex hospital resources, for example operating theatres, could produce large cost efficiency savings. This can make changing the way surgical services are run an

attractive proposition when a hospital is looking to implement SLM and save money. The idea of creating cost efficiency savings within operating theatres is supported by The Productive Operating Theatre programme (TPOT), which claims performance and cost effectiveness can be improved by maximising operating time (NHS Institute for Innovation and Improvement 2009). However, unlike SLM, TPOT does not involve changing hospital structures or the use of financial data to deliver change.

Consequently, implementing SLM potentially adds further layers of complexity and although in theory implementing an SLM approach to services which utilise operating theatres should lead to cost efficiency savings, in practice improving theatre utilisation with this complex intervention is unproven (Waring and Bishop, 2010).

The aim of this study was to evaluate whether implementing SLM affects the way operating theatres are utilised, and if so how and why?

## **National Context**

The total NHS budget between the tax years 1999/2000 to 2009/2010 increased from £40 billion to over £102 billion equating to 7.7% of the UK economy's gross domestic product (GDP) (Department of Health 2010b). As a result of the global financial crisis, the economic climate has changed enormously, with the UK government taking radical steps (spending review 2010 (HM Treasury 2010)) to cut public spending and reduce the financial deficit in order to prevent economic collapse. Despite the NHS being given priority in terms of changes to spending cuts, NHS budgets are being put under intense pressure with the significant investment seen over the last decade not continuing. The Quality, Innovation, Productivity and Prevention Challenge (QUIPP

or Nicholson Challenge (Department of Health 2010b)) is to save £15-£20 billion of the NHS budget between 2011 and 2014 while maintaining safe and high quality healthcare in accordance with the essential standards set by the Care Quality Commission (CQC) (CQC 2010).

This challenge is made even greater by the requirement for new equipment, the cost of new treatments and an ageing population, who have a greater reliance on the healthcare system. This sets a huge leadership challenge, as the only investment that will be provided to improve services will be reinvestment of cost efficiency savings (Department of Health 2010b). As such, it is imperative that every healthcare professional now accepts a degree of responsibility and considers what cost efficiency savings can be made in their everyday work. Without a clinically-led concerted effort to radically reform services, funds will be severely limited to develop and provide quality healthcare in the future, potentially jeopardising the existence of the National Health Service (Ham, 2009, Darzi, 2008).

Reform underpins the spending review, with all public services, including complex healthcare services, having to be delivered in a different and cost-effective way (HM Treasury 2010). In healthcare, these radical reforms were described in the White paper and controversial Health and Social Care Bill (Gerada, 2012, Royal College of Surgeons 2012, Royal College of Physicians 2012) which was enacted in March 2012 (Health and Social Care Act 2012). Although these reforms are considered by some to be the first steps to NHS privatisation (Pollock et al., 2012, Iacobucci, 2012), fundamentally the expressed aim is to devolve responsibility for healthcare budgeting and provision away from central government, to local public organisations and publically funded NHS Foundation Trusts (FTs). In alignment with the spending

review, as part of the reforms and as part of the decentralisation process, all non- FT NHS trusts are expected to achieve FT status by April 2014 (HM Treasury 2010, Health and Social Care Act 2012, Department of Health 2010a, Department of Health 2011a). This means all hospitals will not only have greater responsibility and accountability for quality of health services, but also have greater control of the funds needed to provide them.

Monitor, established in 2004 is an independent regulatory body with the role of authorising and regulating FTs (Monitor 2010d). Since the Royal assent of the Health and Social Care Act, Monitor has been given extra responsibility and now regulates all providers of NHS services (Monitor 2010d, Health and Social Care Act 2012). It aims to ensure that healthcare services are 'economic, efficient and effective', that the quality of services is maintained or improved and that it will 'protect and promote the interests of patients by ensuring the whole sector works for their benefit' (Monitor 2013). Within secondary care, the role of authorising and regulating NHS Foundation Trusts remains important and consequently, it is Monitor which determines whether non-FTs will be granted FT status by the April 2014 deadline. The focus for non-FTs is to provide and demonstrate evidence that three main criteria, defined by Monitor, are satisfied (Monitor 2008):

1. **Is the trust well governed** with the leadership in place to drive future strategy and improve patient care?
2. **Is the trust financially viable** with a sound business plan?
3. **Is the trust legally constituted**, with a membership that is representative of its local community?

Despite this, as of October 2011, 113 NHS trusts did not hold FT status, 80% had financial issues and 20 were found to be neither financially or clinically viable (House of Commons Committee of Public Accounts 2011). As such, it is considered ambitious for all trusts to meet Monitor's criteria by April 2014, with a House of Commons report stating 'it is already clear that this will be extremely difficult to achieve' (House of Commons Committee of Public Accounts 2011). Nevertheless, all non FTs have signed a Tripartite Formal Agreement (TFA) committing themselves to obtaining FT status, which if achieved, will enable trusts to reinvest any financial surplus and borrow money to develop services (Department of Health 2011a, House of Commons Committee of Public Accounts 2011). This level of autonomy allows FTs more freedom in determining strategy and service provision, but in doing so makes them more accountable to healthcare commissioners for the services they provide.

Since 2007, Monitor has actively promoted SLM implementation (Hall, 2011), describing SLM as a 'combination of trusted management and business planning techniques that can improve the way healthcare is delivered' (Monitor 2009a).

Monitor considers that if this complex intervention is demonstrated to be 'established and starting to work well' (SLM framework- Level 3 (Monitor 2010c)), it is strong evidence that a trust is well governed and can manage its finances appropriately. As such, demonstrating effective SLM implementation satisfies key elements that non-FTs need to demonstrate, if they are to obtain FT status by April 2014 (Monitor 2008, National Audit Office 2011). Once authorisation has been obtained, Monitor also continues to oversee and regulate FTs, ensuring the trusts 'are well-led, that their leaders are focused on the quality of care patients get and that they are financially strong' (Monitor 2010a). Consequently, once FT status is obtained, trusts are still

required to regularly demonstrate they are well governed, operating cost effectively and within budget.

SLM is derived from industry, has resulted in variable benefits when applied in healthcare systems, with successful implementations requiring changes to organisational structure, information support, performance management and trust strategy (Monitor 2009a, Monitor 2009b, Monitor 2009c, Monitor 2009e, Jain et al., 2006, Hibberd et al., 1992, Hoff, 2004, Lambert et al., 2006, Waring and Bishop, 2010). Implementation aims to devolve decision making away from 'central' managerial staff to engaged clinicians or clinical leaders (Charns, 1997, Mannion et al., 2005). These clinical leaders, who work within the service lines, are considered to be in the best position to improve quality and cost effectiveness of hospital services and resources (Monitor 2009a, Department of Health 2010a).

What is known though is that the complexity of healthcare systems, embedded culture and the difficult but essential need for clinical engagement means successful SLM implementation is challenging (Greenberg et al., 2003, Greener et al., 2011, Rundall et al., 2004, Winyard, 2003, Naidu et al., 1993, Hall, 2011, Parker et al., 2001, Longshore, 1998, Jain et al., 2006, Turnipseed et al., 2007, Chaston, 1994). For trusts not achieving/ demonstrating these elements when required, Monitor has the authority to transfer or close down trust services and/or merge non-FTs with existing FTs. This makes obtaining and maintaining FT status a top priority for all NHS trusts and provides a degree of urgency to trusts which have not implemented SLM, to do so.

As a consequence, evaluating the process of implementation of this intervention and determining how and why approaches are effective or ineffective, especially in the current national context, provides valuable information to all non-FTs and FTs which need to implement SLM.

### **Context of Case Studies**

This study focused on two NHS trusts and to maintain anonymity they are referred to as i) Urban Trust and ii) University Trust. Urban Trust is a large district general hospital, which had approximately 1000 beds, serves a population of over 500,000 and has a budget of around £380 million. It was one of 113 non-FTs (National Audit Office 2011). University Trust with 1213 beds, is a regional 'teaching' hospital and trauma centre that has recently relocated to a new purpose built facility. In contrast to Urban Trust, it generates a significant amount of income from tertiary referrals and academic activity. University Trust obtained FT status in 2004, before evidence of effective and established SLM was required (National Audit Office 2011, Monitor 2010c).

Urban Trust was implementing SLM to help achieve FT status by the April 2014 deadline and had established a specific SLM management group to coordinate implementation of this complex intervention. The group included members of the trust board, directorate managers and clinical leaders, with the authority to drive the SLM implementation process and achieve the level required (SLM Framework-Level 3 (Monitor 2010c)) to obtain FT status. As part of its SLM implementation programme Urban Trust was planning a pilot study in General Surgery, that was to focus on both

time efficiency and cost effectiveness of operating theatres. If it was to succeed, the literature suggests it would require clinical leadership, active engagement and the aims of implementation to be understood by both the staff involved and those who affect the process (Hoff, 2004, Lambert et al., 2006, Turnipseed et al., 2007, Kelly et al., 1997, Parker et al., 2001, Holth, 1994, Jain et al., 2006).

In contrast, University Trust, being an established FT, did not have the same time pressure to implement SLM fully and did not have a specific SLM management group. Nevertheless, the finance department was already developing an information costing system (Patient Level Information Costing System (PLICS)) to support SLM implementation, which could be used to aid performance management and demonstrate financial viability (Department of Health 2011b). As such, the initial approach to SLM implementation did not engage clinical leaders and was more of an evolving process led by the financial management team. Barcoding of equipment in operating theatres had already been introduced and was providing data for PLICS. This data, could have been used to count the cost of an operation and attribute this cost to a service line. In reality, whether this data, in accordance with SLM implementation, was to be provided and used by clinical leaders to help improve theatre utilisation and make the resource more cost-effective, had not been established.

### **Aims and Objectives**

The two trusts, with differing strategies, priorities and FT status, provided an opportunity to evaluate the development and impact that, implementation of SLM

could have on theatre utilisation. This has enabled lessons to be learnt for all NHS non-FT and FTs, which need to implement SLM and/or need to reduce cost and improve operating theatre utilisation.

Despite the fact that both trusts were seeking to improve the efficiency and cost effectiveness of their operating theatres, they only defined and recorded theatre utilisation in terms of time, not cost. The definition of theatre utilisation in both trusts was:

- The total time between the first patient's anaesthetic time and the last patient's operation finish time (excluding recovery) as a percentage of the planned session time.

Consequently, the cost effectiveness of improving theatre utilisation and the effect of differing approaches to SLM implementation on this expensive resource within both trusts was unknown.

The objectives of this study were:

- To compare and evaluate how the two differing approaches to SLM implementation affected the way operating theatres were utilised.
- To determine the opinions of key staff (surgeons, anaesthetists, theatre management and other theatre staff within both trusts) on how operating theatres were being utilised and to record, how and why these opinions changed over the study period, if at all.

- To identify key factors which affected how operating theatres were being utilised within both trusts and to record, how and why these changed over the study period, if at all.

To identify the most appropriate methodological design to achieve these objectives, the current evidence and literature relevant to SLM implementation and theatre utilisation is examined in the following literature review chapter. The approach undertaken to capture relevant quantitative and qualitative articles for the review is also described and has enabled elements considered necessary to 'successfully' implement SLM and to improve operating theatre performance, to be reviewed in detail. The information obtained has provided the rationale for the mixed methods process evaluation approach described in the methods chapter and used to achieve the objectives listed earlier.

## **CHAPTER TWO: LITERATURE REVIEW**

### **Approach**

To identify relevant quantitative and qualitative articles for this research, a systematic approach was undertaken which enabled the identification, screening and eligibility of various documents and research material.

A systematic search located relevant journal articles from MEDLINE, PubMed and Web of Science databases. Citations were collated using EndNote Reference Manager (Version X4, Thomson Reuters). Search and/ or MeSH terms used included: Service Line Management; healthcare; implementation; plus theatre utilisation (Appendix 1). The final search was performed on the 21st October 2013. Identified article titles and abstracts were then reviewed by the researcher. Any article exclusions were made in accordance with the criteria set out in Appendix 1. Any relevant citations from reviewed articles which had not been identified using the search terms and databases described, were also obtained and reviewed.

On entering the search or MeSH terms Service Line Management (MeSH term- Product Line Management), utilisation/utilization and operating rooms together into MEDLINE, Web of science and PubMed databases, only five references were identified. These five articles were all from American journals, four of which are not research studies but descriptions, feature stories or programmes on operating room performance with the fifth article being a cost-benefit analysis of adding emergency general surgery to a trauma/critical care service (Mueller et al., 1995, Hoke, 1996, HFMA, 2002, Kaplan et al., 2005, Young, 2004). Consequently, there was a lack of

empirical research on Service Line Managements (SLM) effect on operating theatres, especially in the UK, which meant the approach taken to acquire literature relevant to this study has been sourced using broader search criteria and resources (Appendix 1).

A defined systematic review approach, in accordance with the PRISMA statement provides a rigorous framework to identify, screen and determine eligibility of research material (Liberati et al., 2009). It focuses on the hierarchy and quality of quantitative studies, such as randomised control trials (RCTs) and is a prerequisite for meta-analysis (Jadad et al., 1996, Higgins et al., 2011, Lau et al., 1997, Greenhalgh, 1997, Evans and Pearson, 2001). This mathematically aims to determine whether an intervention is effective or not, but in doing so excludes qualitative/descriptive studies and other resources that describe methodological approach, depth, context and solutions to more complex healthcare processes relevant to this study. Systematic reviews of programme implementation/ complex intervention studies are difficult as mathematical approaches to combining data from such studies have not been fully developed (Petticrew, 2003). Therefore, although the literature search was performed systematically, it was not conducted in accordance with the PRISMA statement, as relevant qualitative/ descriptive studies were included as part the literature review and used to inform the design and methodological approach of this study.

To gain an understanding of the national and local context in which the two studied NHS trusts function, information not available in journals was also reviewed. This information was obtained from government reports, NHS programmes on both SLM and theatre utilisation, and other publications related to these documents. These were accessed from various organisation websites e.g. Monitor, the Department of

Health, the NHS Institute for Innovation and Improvement (now NHS Improving Quality) and the King's Fund (Appendix 1). Hence, overall the following literature review could be described as integrative, as the information gained from journal articles has been complemented with information from varied data sources including websites and other published documents (Whittemore and Knafli, 2005).

### ***Layout***

As a combined literature search on Service Line Management (SLM) and theatre utilisation identified minimal and low quality research material, separate searches, as described above, were performed on SLM and theatre utilisation. All references gained have been used to describe elements required for SLM implementation, to describe how operating theatre performance can be measured and managed and describe programmes previously implemented to improve operating theatre performance. As this study aimed to determine how implementation of SLM affected theatre utilisation, accordingly the literature has also been analysed to provide guidance on methodological approach. Consequently, the following literature review is organised into three main sections based on the sources identified from searches on SLM and theatre utilisation and on approaches used to evaluate SLM implementation:

- Service Line Management
- Theatre Utilisation
- Evaluating Service Line Management implementation

## **Service Line Management**

### **Background**

Although applied in healthcare, SLM originated from industry and depending on context is also referred to as Product Line Management. Its principles align with 'LEAN' manufacturing and the Toyota production system which promote flow/efficiency and the elimination of waste by changing how a product/service line functions. The process is meant to focus on quality and the 'customer' (or patient in healthcare), and looks to only use resources that add 'value' to a specific process and make it cost-effective (Institute for Healthcare Improvement 2005). Industrial success led to implementation, of the product line/ service line structure within the competitive, business orientated American healthcare system in the late 1970s and 1980s, although not always successfully (Nackel and Kues, 1986, Hammon and Davis, 1989, Bowers and Taylor, 1990, Bradley, 1990, Harvey, 1991). The approach was mainly adopted to maintain financial viability of private healthcare organisations and neither focussed on quality or the patient, nor to fundamentally change the structure or function of hospital services (Jain et al., 2006). This may explain the lack of success during this period (Jain et al., 2006), although during the 1990s this changed, with hospitals using a service line approach to change organisational structure so that services were more cost-effective and quality focused (Jain et al., 2006). This led to 'successful' implementations in healthcare of this industrial approach being described and has led to SLM being more widely adopted in America

and the United Kingdom (UK) (Jain et al., 2006, Holth, 1994, Kelly et al., 1997, Parker et al., 2001, Monitor 2010c, Foot et al., 2012).

### **NHS Context: Monitor**

The publically funded health service in the UK is very different from the privately funded American system. Cost effectiveness, especially in the context of the Quality, Innovation, Productivity and Prevention Challenge (QUIPP Challenge) (Department of Health 2010b) is important, but hospitals in the UK (including England) do not need to maintain market position. Nevertheless, they do need to remain sustainable and prove financial viability to Monitor (Monitor 2010d). This is why Monitor, since 2007, has promoted SLM, as in theory, if this complex process is implemented successfully, financial viability can be demonstrated. The process also looks to engage with clinical leaders, make services effective, efficient and of high quality and ultimately can be used to demonstrate effective governance (Monitor 2010c).

Financial viability and effective governance are both key areas Monitor focuses on when authorising and regulating Foundation Trusts (FTs) (Monitor 2010d). Although elements (e.g. devolving decision-making) of SLM unrelated to finance have been adopted in NHS hospitals (Foot et al., 2012), only varying degrees of success have been shown in the sector worldwide. For example in an American healthcare context Greenberg et al found, during a 6 year survey study, that implementation improved some patient-level quality of care measures (e.g. reduced readmission rates) (Greenberg et al., 2003). This 'success' or impact was only shown following the first year of implementation with other desired outcomes, including a shift to greater

community-based care not having improved. Parker et al, who conducted semi-structured telephone interviews purely with senior executives, described improved clinical and managerial focus, but that desired outcomes varied between staff groups. They acknowledged that measures of successful SLM deployment varied between different people and that further studies should gain data from multiple staff to determine perceived success from different contexts (Parker et al., 2001, OECD 2013).

Within an NHS context and according to Monitor, how to 'successfully' deliver SLM is described in a series of toolkits (Monitor 2009a, Monitor 2009b, Monitor 2009c, Monitor 2009d, Monitor 2009e). 'Success' or desired outcomes are assessed according to a SLM framework, with four graded levels between level 1 (limited) and level 4 (full) being defined (Monitor 2010c). Level 3 is when SLM is considered to be 'established and starting to work well' and is the level Urban Trust was trying to achieve by April 2014 to strengthen its FT application. The toolkits describe approaches to SLM implementation and are designed to help NHS trusts focus implementation on four key but complex areas:

- Organisational structure
- Performance management
- Information management
- Strategy and service line planning

Within an NHS context, one study has focused on SLM implementation whilst the second on LEAN thinking applied to operating theatres (Waring and Bishop, 2010,

Foot et al., 2012). Other articles identified and used to critique Monitor's desired outcomes are mostly found within American healthcare management or financial journals and are written in a healthcare context that is different from this study. They are often descriptive, do not use robust methods to determine findings and express bias, as they invariably describe success, not failure (Holth, 1994, Kelly et al., 1997, Greenspan et al., 2003, Greenberg et al., 2003, Hoff, 2004, Lambert et al., 2006). Nevertheless, findings, opinions or themes are similar within this literature and do describe 'successful' healthcare implementation, albeit mostly in an American context.

The following sections of this literature review are organised into the four complex areas listed above. Each section describes how each area is defined by Monitor and outlines what elements they consider necessary for successful implementation (Monitor 2010c). These desired outcomes have also been compared to published data.

### **Organisational Structure**

Monitor's SLM framework states 'Service-lines are clearly defined and agreed, have identified leaders who are accountable for integrated service-line performance management. Service-line leaders are supported, incentivised and performance managed' (Monitor 2010c). The trusts should aim, to:

- Effectively communicate with all staff, so that they understand the changes taking place, the reasons for them, and provide opportunities to express concerns.

- Clearly define service lines (similar to business units).
- Define leadership roles and decision rights within the defined service line.
- Engage clinical leaders with service line managerial issues.
- Incorporate corporate, clinical and support staff into a service line team.
- Provide training and support for new roles.
- Have an effective service line team which works together to achieve service line objectives.

What is apparent is that when SLM implementation is considered successful by authors, but not necessarily by healthcare staff, individual services have often been specifically chosen to implement the complex process, rather than an entire organisation (Holth, 1994, Parker et al., 2001, Greenspan et al., 2003, Greenberg et al., 2003, Lambert et al., 2006). Cardiovascular services are a frequent example; being chosen due to high patient volume, revenue/marketing potential and in one article, already having a history of collaboration between doctors and managers (Greenspan et al., 2003). Parker et al found, from interviewing senior executives, that having too many service lines may decrease the impact of creating a service line structure (Parker et al., 2001). As such, selection bias makes findings from publications less generalisable and, in the context of single service line implementation, less supportive to Monitor's generic complex NHS trust implementation programme or intervention.

Strong board, administrative and managerial support, appears to be necessary for SLM success (Holth, 1994, Greenspan et al., 2003, Greenberg et al., 2003, Turnipseed et al., 2007, Lambert et al., 2006, Foot et al., 2012). These articles

describe the impact of strong project managers or champions who are supported by both senior management and administrative staff, two resources who are committed and focused on the implementation process within a specific service line. This is highlighted by Lambert et al, who describe individuals having a specific role within the service line to develop and summarise clinical outcome data for the service line team. Consequently, service line performance management is heavily supported, and is described to contribute to SLM success (Lambert et al., 2006). They also describe that 'unwavering' support of senior executive leadership and devolution of decision rights is needed, with one study partly attributing implementation failure to managers being unable to give up power and provide adequate support (Lambert et al., 2006, Hibberd et al., 1992, Foot et al., 2012). Although it has been acknowledged in an NHS context that executive, managerial and administrative support is required (Foot et al., 2012), it is unclear if it is being effectively provided within NHS hospitals.

A service line leader with a clearly defined job role and clear accountability has also been found to aid the implementation of this complex intervention, with service line leaders being described to report directly to high level management e.g. the Chief Operating Officer (Greenspan et al., 2003, Parker et al., 2001, Turnipseed et al., 2007). This suggests that successful implementation does require empowerment and devolving of decision rights to service line leaders supporting this element of Monitor's framework (Monitor 2010c).

The NHS historically has been organised into directorates in accordance with clinical specialties or departments, which have their own clinical leaders e.g. Anaesthetics, Operating theatres, General surgery. This structure can also create boundaries or silos, in which different healthcare professionals function not always allowing for

effective delivery of care, as meaningful interaction/ communication between multidisciplinary teams is reduced (Greenspan et al., 2003, Parker et al., 2001). These groups may also be accountable to different line managers, meaning for example, surgical leaders have no authority over operating theatre staff. This structure can hinder the rollout of new complex processes such as SLM, as the chain of authority, accountability, and thus group priorities, can compromise staff engagement and behaviour (Greenspan et al., 2003, Hibberd et al., 1992). Even when staff appear engaged with the change process, reverting back to old cultural habits, especially in pressure situations, can occur, and highlights that even if SLM is considered successful, sustaining behavioural or cultural change is not guaranteed (Waring and Bishop, 2010, Hoff, 2004, Foot et al., 2012).

An overview of services or processes in which different departments or specialties contribute can be provided by a service line organisational structure (Holth, 1994, Hibberd et al., 1992). The 'traditional boundaries' can be overcome, improving communication and coordination between staff groups which become part of the same service line team, rather than of different departments or directorates. This is a desired outcome described in Monitor's framework (Greenspan et al., 2003, Greenberg et al., 2003, Monitor 2010c). Nevertheless, this may require realignment of well established clinical roles and embedded culture. Especially within the NHS, creating effective service line teams which work to achieve service line objectives is likely to require significant and complex organisational restructuring (Greenberg et al., 2003, Waring and Bishop, 2010).

Communication, collaboration and teamwork are all strong elements linked to successful SLM implementation (Holth, 1994, Kelly et al., 1997, Parker et al., 2001,

Greenspan et al., 2003, Greenberg et al., 2003, Hoff, 2004, Jain et al., 2006, Lambert et al., 2006, Turnipseed et al., 2007, Waring and Bishop, 2010, Hibberd et al., 1992, Foot et al., 2012). The need for training, active clinician engagement, involvement and ownership of the process, along with a willingness to change practice, is strongly supported by the literature and described in Monitor's framework (Greenspan et al., 2003, Holth, 1994, Kelly et al., 1997, Parker et al., 2001, Hoff, 2004, Jain et al., 2006, Lambert et al., 2006, Turnipseed et al., 2007, Foot et al., 2012, Monitor 2010c). Without such participation, the behavioural change required for success is less likely to happen, as quality and safety of care for patients may be overlooked by non clinical staff and create conflict (Waring and Bishop, 2010). 'Successful' implementation described in one study which conducted semi-structured interviews at multiple levels, shows how clinician buy-in can be created by strong managerial leadership, if the focus remains on patient care rather than process. This is highlighted by a quote from a healthcare worker (Hoff, 2004):

*'He's a very talented leader. There's certain messages he has to convey. We all understand that. And they're not the most pleasant sometimes or what people want to continually hear. But I trust him and buy into it because I know he cares about the patients, about the care we give, and I have no reason to think otherwise. ... But he is someone who I think we all feel has the same values as us and who cares about doing the right thing. If we didn't feel that way, no one would listen to him.'*

Success is not guaranteed, even if clinicians are given leadership roles within the service line team, as they may require training to perform the role effectively (Waring

and Bishop, 2010, Foot et al., 2012). One study found, that despite clinicians being given leadership roles, other clinical staff remained concerned that priority was being given to efficiency and productivity rather than quality and patient satisfaction(Waring and Bishop, 2010). This demonstrates the need, expressed in Monitors' SLM framework, to incorporate leadership development and training when implementing SLM, as the leadership style and the skills they possess are perhaps as important as occupational background in obtaining buy-in from all clinical staff (Waring and Bishop, 2010, Hoff, 2004, Monitor 2010c).

Team cohesion and a clear service line mission are further elements which appear to be integral to successful implementation (Lambert et al., 2006, Hoff, 2004, Kelly et al., 1997, Parker et al., 2001, Hibberd et al., 1992). This was particularly demonstrated by one qualitative study which described success and in which clear aims were repeated by interviewees at multiple managerial and clinical levels (Hoff, 2004). Descriptions of clear managerial and professional cohesion, and descriptions of clinicians being integrated into the administrative planning and management of service lines, demonstrates that the principles of SLM similar to those described in Monitors' framework can in the right context lead to 'success' (Lambert et al., 2006, Hoff, 2004, Parker et al., 2001, Foot et al., 2012, Monitor 2010c). Nevertheless, variations in how 'success' is defined and/or measured, determines whether 'success' is achieved (Parker et al., 2001) (see Performance management section below).

## Performance Management

In accordance with Monitor's SLM framework, performance management 'enables the development of accountability and transparency in the progress made against specific initiatives and objectives'. Service lines should aim to have (Monitor 2010c):

- Performance review meetings supported by appropriate information and data.
- Defined key performance indicators which are regularly monitored and owned by front line staff.
- Clear accountability for performance with all relevant staff groups involved.
- Good or bad performance recognised and addressed with appropriate incentives in place to encourage good practice.

Despite this, when assessing performance, the aim or intention of the service line determines what perceived success is (Parker et al., 2001). For example, if the focus is to improve the start times of an operating list, resources may be specifically allocated to improve this key performance indicator (KPI) at the expense of other deliverables, e.g. care of ward patients; or an academic institution may judge achievement on the level of research activity whereas a non-academic institution may not (Kelly et al., 1997, Greenberg et al., 2003, Turnipseed et al., 2007). As such, the context of an organisation, or the specific perspective of an individual, can alter the way performance and achievements are viewed. A manager for example may see start times of an operating list improve and consider that a positive result. A surgeon or nurse, may have seen this 'success' compromise the level of care patients receive on the ward and therefore consider it an unacceptable outcome. Generally, within healthcare, the decision to implement SLM from a managerial

perspective has been as a result of the need to quickly improve financial viability and performance, with Monitor's SLM Toolkits and framework being written for either directors or managers (Young et al., 2001, Hoff, 2004, Monitor 2010c, Monitor 2009a, Monitor 2009b, Monitor 2009c, Monitor 2009d, Monitor 2009e). This can mean service line 'success' is not judged on clinical outcomes, quality of care and patient satisfaction (Jain et al., 2006). Healthcare professionals may have different objectives and measures from managers and without early healthcare professional engagement, managerial driven KPIs may not be valued by all relevant service line staff (Parker et al., 2001, Holth, 1994, Kelly et al., 1997, Hoff, 2004, Turnipseed et al., 2007). This can lead to conflict between all healthcare workers and managers, which can affect team cohesion and the willingness to change practice, decreasing the likelihood of successful SLM implementation (Hibberd et al., 1992, Waring and Bishop, 2010).

Greater engagement of healthcare professionals early in the implementation and planning process, can address this clinical/ managerial divide and enable measures of success and a clear mission to be defined, owned and reported in a way that is acceptable and relevant to both managers and healthcare professionals (Holth, 1994, Kelly et al., 1997, Parker et al., 2001, Jain et al., 2006, Lambert et al., 2006, Davies and Harrison, 2003, Degeling et al., 2003, Ham et al., 2009, Foot et al., 2012). Kelly et al for example describe three separate clinical, managerial and administrative groups being formed to reengineer a surgical service line. Although this is not an empirical study and only 'breakthroughs' are described, the authors considered early collaborative and integrated decision making between the groups to have been important to successful implementation (Kelly et al., 1997). As such, in accordance

with Monitor's framework, if early active collaboration is achieved, it is considered more likely different levels of staff will engage with SLM implementation and work effectively within a service line team, to make this complex intervention a 'success' (Hoff, 2004, Lambert et al., 2006, Turnipseed et al., 2007, Monitor 2010c, Kelly et al., 1997).

### **Information Management**

In accordance with Monitors' SLM framework, service lines should aim to have 'the provision of accurate integrated and comprehensive service-line information for improved decision-making' by having (Monitor 2010c):

- Relevant performance measures that are agreed by service line clinical and managerial leaders.
- Service line leaders, clinical and managerial staff who collaborate and improve the quality, integrity and validity of dashboard information.
- Service line integrated performance dashboards that are available to members of staff and inform improvement action plans.
- Service line financial information that is produced by an integrated system capable of analysis to point of delivery.
- Financial information related to the service line that is monitored, acted upon and available to all staff.

Thus, Monitor suggest that without appropriate integrated information systems, which incorporate financial and operational information, effective performance management and SLM implementation is not considered possible. This is supported by the literature (Holth, 1994, Greenspan et al., 2003, Turnipseed et al., 2007) with Lambert et al explaining an assessment of data systems early during implementation was required to support decision making (Lambert et al., 2006). However, if such information is available it also needs to be considered reliable and accurate, as well as accessible and trusted by staff who work within the service line (Hoff, 2004, Lambert et al., 2006, Foot et al., 2012). Hence, consideration of the resources required within finance and informatics to develop and deliver appropriate service line dashboards, has to be considered when implementing SLM, as without robust and transparent data, decisions are likely to be misinformed and undermine the process (Lambert et al., 2006, Greenspan et al., 2003, Foot et al., 2012). Within the NHS, Foot et al found that the quality of data is initially challenged and that resources and processes need to be put in place to improve the value of data as part of implementation (Foot et al., 2012). The belief is that if service line staff trust, understand and take ownership of the data they are more likely to act upon it (Foot et al., 2012, Kelly et al., 1997, Lambert et al., 2006).

### **Strategy and Service Line Planning**

Monitor's SLM framework summarises the aims of a service line structure in terms of strategy and planning: 'The service-line strategy is defined. Service-lines are

embedded in the annual planning process and service-line leaders are incentivised to deliver' (Monitor 2010c). Specific elements of this are described below:

- Service line leaders engage in development of the service line strategic plan and regularly review the plan.
- Service line targets and goals are quantifiable.
- Finance and performance teams work with clinicians to develop annual plans with the aim for the plans to be owned by front-line staff.
- Incentive and consequence frameworks are agreed and operational.
- Service line action plans are based on robust quality information and tracked by the service line team.

The desired outcomes above again highlight how pivotal Monitor consider clinical engagement to be, for successful SLM implementation in the long and short term; a view supported by the literature (Foot et al., 2012, Hoff, 2004, Lambert et al., 2006, Holth, 1994, Kelly et al., 1997). Foot et al, for example, found when conducting a series of semi-structured interviews in seven NHS trusts, that devolution of decision making to engaged clinicians was considered a key element of SLM success (Foot et al., 2012). However, trusts which participated in this study were selected by Monitor and so, were likely to have been chosen because SLM was considered to be established. Despite this, limited impact of SLM implementation was demonstrated (Foot et al., 2012). This may have been because devolution of decision making had not been achieved, although the study did not collect any performance indicators to demonstrate 'success' either (Foot et al., 2012).

The need for incentives and performance management, based on relevant and trusted data, plays a role in perceived successful implementation (Foot et al., 2012, Hoff, 2004, Lambert et al., 2006, Turnipseed et al., 2007). Lambert et al for example, describe monthly quality assessment meetings that were attended by clinicians, nurses and administrators to discuss cases and relevant data to improve performance (Lambert et al., 2006). However, significant cost, time and resource may be needed to deliver reports that produce robust, quality and timely information to front-line staff (Foot et al., 2012, Turnipseed et al., 2007). In an American healthcare context, Turnipseed et al describe administrative staff having a specific role to provide and develop quality performance data by collaborating with clinicians (Turnipseed et al., 2007), but in an NHS context, resources such as administrative support and/ or appropriate data systems may not be available (Foot et al., 2012). This can undermine the process of SLM with Foot et al finding NHS employees who questioned the quality and reliability of data to be reluctant to change behaviour. Interestingly though, they also found clinical engagement improved as data quality improved and recommended resources be allocated to improve data quality (Foot et al., 2012).

## **Theatre Utilisation**

### **Background**

Nearly seven million hospital operations are performed each year in England and Wales with operating theatres requiring an annual budget of > £1billion (Audit Commission 2003). Consequently, maintaining quality and improving the performance, efficiency and cost-effectiveness of this expensive resource, is important when trying to make cost savings and meet the QUIPP challenge (Department of Health 2010b, Peltokorpi, 2011, Marjamaa and Kirvela, 2007, Agnoletti et al., 2013). This means trusts which are seeking to achieve or maintain FT status, and need to demonstrate to Monitor financial viability, implementing SLM within specialties that utilise operating theatres is attractive, as it is considered, although unproven, that relatively large financial savings can be made (NHS Institute for Innovation and Improvement 2009, HFMA, 2002).

### **Patient Journey**

On the day of surgery, the patient journey is complex and involves a number of steps. Each step involves different healthcare professionals, whose job roles and skills interact to care for the patient, through this complex process. Generally these steps include the patient arriving at hospital, healthcare staff preparing the patient for surgery, the patient being transferred to the theatre suite, the patient being anaesthetised, the patient undergoing their operation, the patient being transferred from the operating room to the recovery area and once recovered, being transferred

out of the theatre suite to a ward (Al-Hakim and Gong, 2012, Pandit et al., 2012, Agnoletti et al., 2013). How efficient and cost effective this complex journey/ process is, depends on how the different healthcare professionals involved (e.g. nurses, surgeons, anaesthetists, theatre staff, theatre managers), who historically function within different departments or directorates, communicate and work together. The need to minimise costly inefficiencies/delays within this journey/ process, has led to various programmes and complex interventions being implemented in the UK and abroad to try and maximise this expensive resource with varied success (NHS Institute for Innovation and Improvement 2009, Porta et al., 2013, Hovlid et al., 2012, Does et al., 2009, Donahue and Mets, 2008, Association of Anaesthetists of Great Britain and Ireland 2003, Audit Commission 2003, NHS Modernisation Agency 2002). SLM could lead to organisational restructuring and incorporate these different health professionals into a clearly defined effective service line team (Monitor 2010c). Consequently, implementation within operating theatres could break down traditional departmental boundaries, encourage communication and teamwork, drive efficiency and improve cost effectiveness of this expensive resource (Greenspan et al., 2003, Parker et al., 2001, Greenberg et al., 2003, Lambert et al., 2006, Turnipseed et al., 2007, Hibberd et al., 1992, Young, 2004, Mueller et al., 1995). Despite this, there are no empirical studies that focus specifically on the impact of SLM on operating theatres. For example, both Young and Mueller et al described service line changes to improve the way theatres are used, but did not provide evidence these changes made any impact (Mueller et al., 1995, Young, 2004). The article by Young for example (a Professor of accounting and control) was a feature story in a financial management journal, but had no references supporting the advice given.

Kelly et al did describe how changes to an outpatient surgical service line improved performance measures including operating list start times (Kelly et al., 1997). These were reported to have decreased by 26%, with this improvement being attributed to improved preoperative planning (Kelly et al., 1997). Although this seems a reasonable assumption, no qualitative data from clinical staff or patients was obtained. As such, changes to quantitative measures may have changed due to factors/variables not described, making it difficult to directly attribute improvements to service line changes (Kelly et al., 1997).

### **Operating Theatre KPI's**

Besides delays in the patient journey, other aspects of operating theatre use or performance are a focus within the literature. These measures include the number of lists that start after the planned start time (Late Start), the number of lists that finish after the planned finish time (Late Finish or Overrun), the number of cases cancelled (Cancellation rates), the turnaround time between cases (Turnaround or Gap Time), accuracy of operating list scheduling and overall theatre utilisation (discussed below) (Hovlid et al., 2012, Fei et al., 2010, Sung et al., 2010, Van Houdenhoven et al., 2008, Sanjay et al., 2007, McGowan et al., 2007, Pandit and Carey, 2006, Pandit et al., 2012, Faiz et al., 2008, NHS Modernisation Agency 2002, Macario, 2006, McIntosh et al., 2006, Hartmann and Sunjka, 2013). These measures are all recognised in the NHS institute for innovation and improvement programme (now NHS Improving Quality), 'The Productive Operating Theatre' (TPOT) (NHS Institute for Innovation and Improvement 2009), which provides guidance to NHS trusts on

how they can improve the productivity and performance of operating theatres. The expected benefits of successful implementation are improved safety, improved efficiency, better patient care and financial gains; a 'win win win' scenario (NHS Institute for Innovation and Improvement 2009). Unlike SLM, TPOT describes financial benefits secondary to improved efficiency, whereas SLM looks to achieve desired outcomes by using financial information to directly affect service line performance and strategy (Monitor 2009c, Monitor 2009d, Monitor 2009e, NHS Institute for Innovation and Improvement 2009). Therefore, implementing SLM potentially offers a different/ financial perspective on how to measure and/or improve operating theatre use and performance (Monitor 2009c, Monitor 2009d, Monitor 2009e, Siegmüller and Herden-Kirchhoff, 2010). Nevertheless, as described above, and in accordance with Monitor's framework, if all measures or KPIs (including financial KPIs) are recorded, they need to be reliable, accurate, accessible, trusted and owned by staff who work within operating theatres, if good or bad performance is to be recognised and actively addressed (Hoff, 2004, Lambert et al., 2006, Foot et al., 2012, Monitor 2010c, Agnoletti et al., 2013).

Empirical literature from different countries including the UK, has focused on similar KPIs to those described in TPOT, including start times, overruns, cancellation rates, turnaround time and theatre utilisation (Faiz et al., 2008, Pandit et al., 2012, Pandit and Carey, 2006, Pandit and Tavaré, 2011, Pandit et al., 2007, Rai and Pandit, 2003, Westbury et al., 2009, Hovlid et al., 2012, Sung et al., 2010, Fei et al., 2010, Alvarez et al., 2010, Van Houdenhoven et al., 2008, Does et al., 2009, MacLellan et al., 2008, Sanjay et al., 2007, Macario, 2006, Hartmann and Sunjka, 2013). Nevertheless, the value of these KPIs in measuring performance and how they should be defined is

contested (Faiz et al., 2008, Pandit et al., 2012, Pandit et al., 2007, Siegmüller and Herden-Kirchhoff, 2010, Macario, 2006). Starting an operating list late is considered to decrease efficiency, with the time between the planned start time and the actual start time being considered an expensive waste of resource (NHS Institute for Innovation and Improvement 2009, Pandit et al., 2012, NHS Modernisation Agency 2002). The importance of starting on time, what constitutes a late start and the relevance of this KPI to overall operating theatre efficiency is also unclear (Pandit et al., 2012, Macario, 2006, Wong et al., 2010, NHS Institute for Innovation and Improvement 2009). The Royal college of Anaesthetists propose <10% of lists should start >10 minutes late (Royal College of Anaesthetists 2012), with Macario et al suggesting that starting up to 45 minutes after the scheduled start time does not affect performance (Macario, 2006). Despite this 45 minute figure appearing to have been arbitrarily chosen without substantive evidence, the belief that the start time is a poor indicator of performance is supported by Pandit et al. They concluded, after analysing data on over 7000 operating lists from two hospitals in England, that the start time 'is a poor indicator of theatre efficiency' (Pandit et al., 2012), as they found start times do not predict whether all cases will be completed or whether a list will overrun. Despite this, starting on time is considered to 'make sense' (Sneyd, 2012).

The TPOT programme and Macario et al suggest a set of performance markers or KPIs should be recorded (e.g. start times, finish times, turnaround times, cancellations). Nevertheless, having this quantitative information only highlights where inefficiencies in the patient journey may exist and not the information needed to make improvements (Macario, 2006, NHS Institute for Innovation and Improvement 2009). The causes for late starts, for example, are multi-factorial and

complex, with Wong et al highlighting 13 possible reasons for a late start (Wong et al., 2010). However, data for this study was only collected by one neurosurgeon, meaning, as acknowledged by the authors, further causes for delay involving other healthcare professionals may have been missed. This highlights the need to gain qualitative information from the different staff groups involved in the complex patient journey, to fully understand how and why inefficiencies/delays occur (Wong et al., 2010, Porta et al., 2013).

Timing information can be used to determine how many lists overrun and how many patients are cancelled. These performance markers can be improved by good patient pre-assessment/ optimisation and accurate operating list planning/scheduling (Rai and Pandit, 2003, Hovlid et al., 2012). Hovlid et al for example found by interviewing front line staff, improved planning, earlier patient assessment and greater patient involvement helped to reduce cancellation rates (8.5% to 4.9%). Changes to the planning process were a success because different staff groups communicated effectively, good information systems were available and administrative support was provided (Hovlid et al., 2012). As a consequence, although not intended, a desired outcome of SLM implementation was achieved, as traditional department boundaries were overcome to improve the planning process (Hovlid et al., 2012, Monitor 2010c).

Reliable list planning requires an understanding of how long operations are likely to take, as cases can then be matched and added to predetermined lists of specific length, in theory decreasing the number of lists that over and under-run (Pandit and Carey, 2006, Alvarez et al., 2010). Nevertheless, predicting the length of time an operation will take is difficult, with case complexity and unexpected findings affecting the length of an individual procedure (Schofield et al., 2005, Pandit and Carey, 2006,

Audit Commission 2003, Dexter and Traub, 2002, Hartmann and Sunjka, 2013). Data collected within hospital information systems, may provide more reliable length of procedure predictions than surgeons or other staff members (Pandit and Carey, 2006), although availability and accuracy of such timings may be limited or debated by front line theatre staff (Pandit et al., 2012, Foot et al., 2012). What is clear, is that without an understanding of how much operating time is required, it is difficult to appropriately staff an operating theatre and provide an adequate amount of theatre capacity/ time to ensure operating theatres are cost effectively and appropriately utilised (Westbury et al., 2009, MacLellan et al., 2008, Audit Commission 2003).

### **Theatre Utilisation: Definition and Value of this KPI**

Theatre utilisation is an indicator of theatre performance that was considered by the Audit commission and Modernisation agency, to reflect the overall usage of an operating list (NHS Modernisation Agency 2002, Audit Commission 2003). Definitions and methods of calculating this KPI vary slightly with some publications subtracting time between cases and others not (Audit Commission 2003, NHS Modernisation Agency 2002, Pandit et al., 2012, Marjamaa and Kirvela, 2007, Pandit et al., 2007, Faiz et al., 2008, Hartmann and Sunjka, 2013) An accepted definition is:

- The total time between the first patient's anaesthetic time and the last patient's operation finish time (excluding recovery) as a percentage of the planned session time.

The target is to achieve 100% theatre utilisation, which can be achieved if an operating list starts exactly on time, finishes exactly on time and there is no loss of

time in between cases (turnaround time). Nevertheless, it is accepted that in between cases some time will be lost, with the Audit commission suggesting each trust should decide what time loss and theatre utilisation figure is acceptable (Audit Commission 2003).

When using the definition of theatre utilisation above, a figure of greater than 100% can be achieved if a list overruns which, if misinterpreted, suggests, despite the overrun, that the list was well utilised (Pandit et al., 2007). As overruns are considered inefficient, (as they incur extra staffing cost and are a cause of case cancellations) (McIntosh et al., 2006, Pandit et al., 2007, Hartmann and Sunjka, 2013), the percentage theatre utilisation figure can be misleading, as a higher percentage can be achieved by overrunning lists (Pandit et al., 2007, Abbott et al., 2011, Faiz et al., 2008). Consequently, this KPI should not be used or considered in isolation when determining operating theatre 'efficiency' or performance as an appreciation of late start time, finish time, turnaround time, cancellation rates, and cost is needed for more accurate interpretation of overall theatre utilisation (Pandit et al., 2007, Macario, 2006, NHS Institute for Innovation and Improvement 2009, Royal College of Anaesthetists 2012, Faiz et al., 2008, Siegmüller and Herden-Kirchhoff, 2010, Abbott et al., 2011).

## **Finance and Operating Theatres**

Payment-by-results (PbR) was introduced to the NHS in 2004. By setting a national tariff/ fee for performing operations, PbR aimed to improve financial performance (Dixon, 2004). Mannion et al found implementation acted as a strong incentive to

service providers to improve efficiency and increase activity, as the cheaper they could perform an operation, the greater the profit made (Mannion et al., 2008, Abbott et al., 2011, Dixon, 2004). Although this study did not interview clinical leaders, it does suggest financial gain can, as suggested in Monitor's SLM framework, act as an incentive to improve efficiency (Mannion et al., 2008, Monitor 2010c).

TPOT proposes the cost of performing an operation can be decreased if its proposed efficiency measures are successfully implemented (NHS Institute for Innovation and Improvement 2009), with improved theatre scheduling/ efficiency also proposed to reduce overall cost (Mannion et al., 2008). Nevertheless, the trust will lose money if the set tariff is lower than the cost of performing an operation and as a consequence, an inaccurate tariff could act as a disincentive to perform particular procedures (Dixon, 2004, Hearnden and Tennent, 2008, Abbott et al., 2011).

Abbott et al, who reviewed the profitability of some common procedures, found that even if cases were performed efficiently, they would not be profitable (Abbott et al., 2011). This may be because, tariff accuracy relies on accurate costing information being submitted to the Department of Health (DoH) from NHS trusts (Abbott et al., 2011). As the availability of reliable costing information systems to procedure level, is low (Foot et al., 2012), the information provided to the DoH, is unlikely to be accurate. Consequently, unless trusts have or develop an integrated costing information system, that accurately records costs incurred throughout the patient journey, and that this information is subsequently used to calculate national tariffs, tariffs will be inaccurate (Foot et al., 2012, Abbott et al., 2011). As the development of an integrated costing system is a desired outcome of SLM implementation, SLM could help improve national tariff accuracy, but whether this can be achieved and

whether financial data systems can be used to improve the cost effectiveness of operating theatres is unknown (Foot et al., 2012, Monitor 2009c, Monitor 2010c).

### **Programmes affecting Theatre usage**

The aims of programmes described within the literature and considered to have affected theatre usage vary, with some looking to minimise delays by improving one or more steps of the patient journey and others on specific KPIs e.g. to reduce cancellation rates (Hovlid et al., 2012, Al-Hakim and Gong, 2012, Wong et al., 2010, MacLellan et al., 2008, Donahue and Mets, 2008, McGowan et al., 2007, Agnoletti et al., 2013). Although none describe the use of financial information and/or SLM implementation, in some of the studies, the approaches undertaken relate to elements that Monitor, and the literature, consider necessary for successful SLM implementation. Hovlid et al for example, describe a programme implemented within one UK hospital to reduce cancellation rates (Hovlid et al., 2012) which, similar to SLM, aimed to engage frontline staff in improving clinical processes. Four separate groups had been established to redesign elements of the complex elective surgical patient journey. The focus was on patient assessment, improved communication between staff, improved management and improved planning, with the study using semi-structured interviews to gain qualitative information from staff groups who were involved in the patient journey and redesign process (Hovlid et al., 2012). The authors considered the process a 'success' as the programme reduced the cancellation rate (8.5% to 4.9%) and increased the number of operations performed by 17%. These positive markers were attributed to the redesign process being

conducted across traditional departmental boundaries, to active group communication, to the provision of administrative/managerial support, to the provision of information support and to regular feedback being received; all elements considered necessary for successful SLM implementation (Hovlid et al., 2012, Monitor 2010c, Lambert et al., 2006, Holth, 1994, Greenberg et al., 2003, Turnipseed et al., 2007, Parker et al., 2001). McGowan et al similarly attributed 'successful' theatre programme implementation, although in an American healthcare context, to clinical engagement, administrative and senior management support, an organisational structure which facilitated communication between clinicians nurses and management and relevant information/data system support (McGowan et al., 2007, Hovlid et al., 2012); again elements also considered important for successful SLM implementation (Hovlid et al., 2012, Monitor 2010c, Lambert et al., 2006, Holth, 1994, Greenberg et al., 2003, Turnipseed et al., 2007, Parker et al., 2001). These elements are also similarly described within different international healthcare systems/ contexts (e.g. Finland and Australia) to be factors which strongly contribute to 'successful' implementation of programmes or complex interventions which focus on operating room performance (Marjamaa and Kirvela, 2007, Donahue and Mets, 2008, MacLellan et al., 2008). Therefore, the elements or factors considered important for successful theatre programme implementation and successful SLM implementation overlap and represent factors considered important for effective change management initiatives in a wider more general context (Donahue and Mets, 2008, Kotter J, 2002).

## **Evaluating Service line management implementation**

### **Process Evaluation**

The Medical Research Council (MRC) produced new updated guidance in 2008 for researchers evaluating the effect of programmes/ complex interventions (Craig et al., 2008, Anderson, 2008, Medical Research Council 2008). Complex interventions, are described as interventions that contain several interacting elements like SLM, although the term complexity can also be used to refer to systems as well as interventions (Shiell et al., 2008, Medical Research Council 2008). What is apparent is how, since the initial guidance was published in 2000, methodology in health services research has changed, (Craig et al., 2008) with a greater focus on how and why a programme or complex intervention is considered to be successful or unsuccessful in different contexts (Medical Research Council 2008, Anderson, 2008). Process evaluations are advocated, as they aim to analyse complex interventions and determine how and why interventions succeed or fail in different contexts, and thus provide a greater insight to the implementation process (Medical Research Council 2008). Programmes including SLM and TPOT aim to affect behaviour at different levels so that desired outcomes or changes are achieved. Without knowing the process or mechanism that has or has not led to change and the context in which that change has or has not occurred, it is difficult to directly attribute a complex intervention to desired outcomes (Hoff, 2004, Hovlid et al., 2012). Therefore, process evaluations are suggested to supplement outcome evaluations, as without defined

outcomes, it is not possible to describe how and why these outcomes were or were not achieved (Medical Research Council 2008).

### **Data collection: Longitudinal approach**

Despite similar factors being described by different authors, good quality evidence explaining how, why and in what context SLM implementation is 'successful' is lacking. The majority of articles on SLM implementation cited above, describe success from a managerial perspective and have not formulated conclusions from robust methodological approaches. Holth (a manager and the project leader) for example writes about her own project from her perspective adding significant researcher bias, making findings likely to be positive and unlikely to be objective (Holth, 1994). Other articles highlight the need for further research to understand the mechanisms in which SLM is implemented and how these mechanisms may affect processes of care and outcome measures (Greenberg et al., 2003, Parker et al., 2001). Turnipseed et al for example present results quantitatively (Turnipseed et al., 2007). This may be justifiable, but as no methodology has been used to show how and why these results were achieved it is difficult to attribute them directly to SLM. Hoff, however, conducted a study which adopted a mixed qualitative approach to gain a better understanding of how and why SLM implementation can be successful (Hoff, 2004). Data was collated over a 6 month period using semi-structured interviews, focus groups, observational and archival document analysis. This methodological approach enabled triangulation of data, which can add depth and validity to findings (O'Leary, 2010). However, the data was obtained within a single

time period during the implementation process and only provided a 'snapshot' rather than an evaluation of change over time (Hoff, 2004). Hovlid et al's study also used semi-structured interviews in evaluating a new pathway for elective surgery, but the qualitative information was obtained retrospectively and again during a single time period (Hovlid et al., 2012). The authors of both studies note these limitations with Hovlid et al stating they 'cannot prove causality between interventions and the observed outcomes' due to the study's retrospective design (Hovlid et al., 2012). They nevertheless believe their mixed methods approach, which unlike Hoff, included tracking quantitative performance measures, enabled them to identify elements that contributed to 'successful' programme implementation (Hovlid et al., 2012). Collating both quantitative and qualitative data at different points over an extended time period (longitudinal study) would have 'strengthened' findings from both studies (Hoff, 2004).

Charns defines clinical service lines as organisational units that incorporate/integrate different healthcare professionals (multidisciplinary) to deliver a group of healthcare services (Charns, 1997). As described above, this means the traditional directorate, departmental or speciality organisational structure within NHS hospitals, may need to be altered if theatre utilisation is to be affected by implementing SLM (Greenspan et al., 2003, Parker et al., 2001, Hibberd et al., 1992, Hovlid et al., 2012, Donahue and Mets, 2008, McGowan et al., 2007, Marjamaa and Kirvela, 2007). Consequently, to evaluate any change SLM may have on organisation structure, it is necessary to determine at the beginning of implementation the job roles and positions of individuals who work within the service line. If a service line structure was being implemented in accordance with Monitor's SLM framework, the expectation would be the team dynamic and individual job roles and responsibilities would change (Monitor

2010c). Information/data also needs to be collected following implementation from the same individuals by a longitudinal process evaluation approach to ascertain what changes, if any, have occurred to service line structure, job roles and the team dynamic, allowing changes to be more accurately attributed to outcomes (Hoff, 2004, Hovlid et al., 2012).

### **Data collection: Front line staff (Multi-level)**

Kelly et al describe an information sharing approach to SLM implementation and believe this enabled physicians to facilitate the complex implementation process (Kelly et al., 1997). Unlike Hoff's study though (Hoff, 2004), no formal data was obtained from physicians, so it is not possible to assess whether this approach worked in the way described. If physicians were formally interviewed would they have agreed? And if so, how and why did this approach work? One point made, is that in theory a new process may sound ideal to implement, but in practice if staff do not understand or engage with the process and it doesn't change staff behaviour accordingly, the process cannot be considered a success (Kelly et al., 1997). To evaluate whether the process has been successfully implemented, staff behaviour and understanding of the process before and after implementation needs to be ascertained. This needs to be done in an objective manner and with a qualitative method that allows multiple levels of staff to openly talk in confidence about their role and level of engagement with the change process (Parker et al., 2001, Greenspan et al., 2003, Hoff, 2004, Lambert et al., 2006). Different roles are performed by different individuals, who all have a different perspective of a complex process or pathway.

For example (as described above) any patient who undergoes an operation will embark on a journey which is influenced by numerous healthcare staff e.g. theatre managers, surgeons, anaesthetists, theatre staff, porters etc. All these individuals have a separate role within the patient journey/ pathway and view this process from a different perspective and can affect it in different ways. Consequently, to determine whether SLM implementation has, as intended, affected this patient journey or process of care within a defined service line, behaviour and understanding of all healthcare staff involved, needs to be formally evaluated.

To understand what changes may occur and enable measures of 'success' to be recorded and tracked appropriately, the intentions/ strategic aims of service line implementation on operating theatre performance should be determined. Determining perceived aims from both managers and front-line healthcare staff provides an indication of team cohesion and whether a clear mission and understanding of the process has been defined and effectively communicated. Also, understanding the intentions of implementation helps to understand how 'success' will be judged and what performance indicators or measures of quality will be considered important by the individuals involved (Parker et al., 2001). Ultimately, understanding how data is collected and presented provides an insight into how performance is managed and how performance indicators are used. Determining whether this data is considered accurate and reliable by front-line healthcare staff will provide further insight and allow an understanding of why staff behaviour does or does not change to improve performance indicators (Foot et al., 2012, Hoff, 2004, Lambert et al., 2006).

In the following methods chapter, a full justification for the methods used is presented in the context of the literature described above. This is followed by the methods used

to collect and analyse data for phases of this study, with findings being presented in the results chapter.

## **CHAPTER THREE: METHODS**

### **Rationale for Methodology**

#### **Determining Desired Outcomes of SLM**

To determine whether implementation of a complex intervention such as Service Line Management (SLM) affects theatre utilisation, a process evaluation has been undertaken. The output is an evaluation of what happens in a programme or complex intervention and aims to determine if, how and why desired outcomes of an intervention are achieved (Medical Research Council 2008). Desired outcomes, related to SLM implementation, are described in Monitor's SLM framework and are largely supported, although mainly in an American healthcare context, by the literature (Monitor 2010c, Hoff, 2004, Jain et al., 2006, Turnipseed et al., 2007, Kelly et al., 1997, Parker et al., 2001, Greenberg et al., 2003, Greenspan et al., 2003). As this framework describes what Monitor believes SLM should look like, it represents the desired outcomes for implementation when aiming to obtain (Urban Trust) or maintain (University Trust) Foundation Trust (FT) status. As such, data collection and analysis has focussed on these desired outcomes to determine if they had been achieved.

## **Data Collection: Qualitative**

Key elements needed to achieve 'success' or desired outcomes, as described in the SLM framework and literature are: the need for multi-level front-line staff engagement; for effective communication and teamwork between different staff groups; strong administrative support and an effective performance management structure (Parker et al., 2001, Kelly et al., 1997, Holth, 1994, Turnipseed et al., 2007, Greenberg et al., 2003, Greenspan et al., 2003, Lambert et al., 2006, Jain et al., 2006, Hoff, 2004, Monitor 2010c). These outcomes are also considered important when trying to improve the way operating theatres are utilised and represent factors considered crucial for effective change management (Donahue and Mets, 2008, Kotter J, 2002). As such, to determine if, how and why these desired outcomes have been achieved, qualitative data collection is required from different stakeholder staff groups, whose daily behaviour affects how operating theatres are utilised.

Methods of qualitative data collection include surveys, focus groups, observation and/ or one-to-one interviews, (unstructured, semi-structured) (Harrell and Bradley, 2009, Silverman, 2000, O'Leary, 2010).

Surveys can be used to gain opinions from large numbers of people anonymously, can be used to compare groups of individuals, can provide generalisable findings, and can provide qualitative data if open questions are used (O'Leary, 2010, Harrell and Bradley, 2009). Nevertheless, obtaining an adequate number of responses and determining how and why respondents have particular opinions, is difficult, with unexpected opinions also likely to be missed (O'Leary, 2010).

Focus groups are dynamic group discussions that can be used to collect information / opinions, including unexpected opinions, from groups of participants (Harrell and Bradley, 2009, O'Leary, 2010). The interviewer facilitates discussion and is able to collect data from numerous participants at the same time. For this reason, focus groups are considered efficient as they minimise the amount of time taken for data to be collected (O'Leary, 2010, Harrell and Bradley, 2009). Although the intention is for rich data to be obtained via open discussion, discussions are not confidential. This can affect the emphasis of responses and the willingness of participants to discuss particular topics in detail (Harrell and Bradley, 2009). For example, a theatre nurse may be less likely to discuss surgical behaviour, if a surgeon is part of the focus group.

Interviews can enable interviewees to provide information confidentially and allow in-depth rich information to be collected (Harrell and Bradley, 2009). A semi-structured interview approach allows the construction of an interview schedule that includes open questions, but also allows the researcher to direct the interview process, so that relevant information is obtained. Consequently, semi-structured interviews allow interviewees the freedom to openly and confidentially provide opinions on relevant topics, while enabling unexpected topics to emerge (Harrell and Bradley, 2009, O'Leary, 2010). This is in comparison to structured interviews in which the interview schedule contains more direct questions, which can compromise the depth and richness of information obtained. Fundamentally, unstructured interviews are more interviewee led and less focused on predetermined objectives (O'Leary, 2010, Harrell and Bradley, 2009).

Both Hoff and Hovlid et al collected data from healthcare professionals using semi-structured interviews, allowing interviewees from different staff groups at multiple levels to provide opinions openly and confidentially on predetermined topics (Hoff, 2004, Hovlid et al., 2012). This, as described above, is a strength of this approach, which can be used to gather information on staff opinions while providing detailed descriptions of factors that affect complex processes, such as a patient journey through an operating theatre, or the implementation of SLM (Harrell and Bradley, 2009). This is why as part of process evaluations, the Medical Research Council recommends semi-structured interviews, as they can be used to determine if, how and why outcomes to complex interventions have been achieved (Medical Research Council 2008). Consequently, semi-structured interviews have been used to collect data from multiple staff groups and levels as part of this process evaluation.

The intention of qualitative data collection including semi-structured interviews, is to reach a point whereby data saturation occurs (Morse, 1995, Creswell and Plano Clark, 2011). This represents a point during data collection when no new information is obtained (Guest et al., 2006, Morse, 1995). The sample size/ number of interviewees required to reach data saturation varies according to method of data collection, the research question and individual opinion (Guest et al., 2006, Creswell and Plano Clark, 2011). This study collects data from staff groups that affect a patient pathway/ journey and as such participants represent a purposive sample (Teddlie and Yu, 2007). One study which invited relevant participants to participate (purposive sample) (Teddlie and Yu, 2007) and obtained data from 60 semi-structured interviews, concluded analysis of 12 would have provided the depth of data required to reach saturation and analysis of 6 would have satisfactorily supported overarching

themes and conclusions (Guest et al., 2006). Similar sample sizes are considered appropriate for studies which use a purposive sampling method (Morse, 1994, Creswell, 1998). Consequently, to achieve data saturation, greater than 12 interviews were conducted during separate phases of this study.

A weakness of semi-structured interviews is that interviewees can describe how they behave, but actually behave differently (Pope and Mays, 2006). Observational methods can be used alone to accurately record behaviours/ culture (ethnography) within a healthcare setting and minimise this potential weakness (Pope and Mays, 2006), but the opinions and underlying reasons for actions, that can be gained from interviews, may not be established (Sim and Wright, 2000). As such, semi-structured interviews and focussed observational methods, can be used in combination to corroborate and strengthen (triangulate) findings from each qualitative data collection method (Pope and Mays, 2006, Sim and Wright, 2000, Ritchie and Lewis, 2003, Hoff, 2004, Creswell and Tashakkori, 2007). Consequently focussed observational methods, have also been used to collect data for this study.

### **Data Collection: Quantitative**

Quantitative data, including key performance indicators (KPIs), are considered to highlight efficient and inefficient elements of the patient journey and theatre utilisation (start times, overruns, cancellation rates, turnaround time and theatre utilisation) (NHS Institute for Innovation and Improvement 2009, Association of Anaesthetists of Great Britain and Ireland 2003, Macario, 2006, Pandit et al., 2012, Pandit et al., 2007, Rai and Pandit, 2003, McIntosh et al., 2006, Hovlid et al., 2012, Wong et al.,

2010, Alvarez et al., 2010, Sung et al., 2010, Does et al., 2009, MacLellan et al., 2008, Sanjay et al., 2007, Agnoletti et al., 2013). As these KPIs were routinely collected by Urban and University Trusts to measure operating theatre performance, they could be used to highlight if and where inefficiencies/ delays in the complex patient journey existed. It would also be expected that these KPIs would be improved, if theatre utilisation was improved by implementation of SLM, with fewer late starts, overruns and cancellations. As a consequence, quantitative theatre utilisation data was collected from both trusts as part of data collection for this process evaluation.

### **Mixed Methods**

Mixed methods research was defined by the Journal of Mixed methods 'as *research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or program of enquiry*' (Tashakkori and Creswell, 2007).

As both semi-structured interviews (qualitative) and theatre utilisation data (quantitative) were required to determine if, how and why SLM implementation affected theatre utilisation, a mixed methods design was used for this process evaluation (Medical Research Council 2008).

Different mixed methods designs were considered and are described below.

## **Mixed Method Designs**

Mixed methods designs include convergent parallel, explanatory, exploratory and multiphase designs (Creswell and Plano Clark, 2011). A convergent parallel design, uses both quantitative and qualitative data collection methods, with both sources of data being collected and analysed concurrently (Creswell and Plano Clark, 2011). This is in comparison to both explanatory and exploratory design approaches in which quantitative and qualitative data collection and analysis is conducted sequentially, with findings from one source of data (e.g. quantitative) being used to inform the other (e.g. qualitative). An explanatory design collects and analyses quantitative data initially, with the information gained then being used to inform qualitative data collection and analysis, thus enabling support and explanations for quantitative findings to be sought (Creswell and Plano Clark, 2011, Teddlie and Yu, 2007).

In contrast an exploratory design, collects and analyses qualitative data initially, with qualitative findings then being used to inform subsequent quantitative data collection and analysis (Creswell and Plano Clark, 2011). As such, an exploratory design can use quantitative data findings to support/ refute qualitative data findings (Creswell and Plano Clark, 2011, O'Leary, 2010). Nevertheless, similar to convergent parallel design, integration and interpretation of findings for explanatory or exploratory approaches is completed following both qualitative and quantitative data analysis, with integration of findings being a defining feature of all mixed methods designs (Bazeley, 2009, Tashakkori and Creswell, 2007).

Using more than one source of data to support, refute or corroborate findings (triangulation), is also considered a key feature of mixed methods design (Creswell and Plano Clark, 2011, Creswell and Tashakkori, 2007, O'Leary, 2010, Oakley et al., 2006). For example, Hoff used a combination of qualitative data collection methods (observation and interviews), to triangulate and strengthen findings, when determining the effects of implementing SLM (Hoff, 2004). Nevertheless, no quantitative data was obtained and data was only collected during one time period. Consequently, although different qualitative collection methods were used, the lack of quantitative data and the lack of a longitudinal/ multiphase study design, made it difficult to link SLM implementation to observed outcomes directly (Hoff, 2004). These limitations are present or described in other studies and weaken the evidence supporting SLM implementation, as although 'success' is described, the methodologies used do not prove if, how and why SLM implementation led to desired outcomes (Turnipseed et al., 2007, Kelly et al., 1997, Greenberg et al., 2003, Hovlid et al., 2012, Hoff, 2004, Parker et al., 2001). Kelly et al for example describe as part of preliminary findings of SLM implementation, that the number of tests being used was altered, but clinicians requesting the tests were not interviewed and consequently it is difficult to directly attribute this change to SLM (Kelly et al., 1997). The lack of evidence, is also highlighted by Parker et al, who describe the need, over time, to examine patterns of SLM implementation, so it can be determined if SLM actually alters utilisation parameters (Parker et al., 2001). Consequently, to enable any changes to be more directly attributed to outcomes and address the limitations of other studies, this study has used a multiphase mixed methods design (Creswell and Plano Clark, 2011).

A multiphase mixed methods design, allows data collection to be conducted at different time points and can incorporate different mixed methods designs (Creswell and Plano Clark, 2011). As such, a combination of convergent parallel, explanatory and exploratory mixed methods designs can be used as part of study design. As theatre utilisation quantitative data in both trusts could be used to highlight if and where inefficiencies/delays existed, explanations for quantitative findings could be sought. Consequently, for the baseline part of this study quantitative data was analysed first (explanatory mixed methods design), so that explanations for operating theatre performance indicators (e.g. Late starts) could be explored during subsequent semi-structured interviews and observation (Teddlie and Yu, 2007, Creswell and Plano Clark, 2011). A further benefit of this approach was that appropriate potential participants e.g. anaesthetists could be determined from quantitative data collection, allowing appropriate individuals to be purposively invited to participate (Teddlie and Yu, 2007).

As the second phase of data collection aimed to determine if any changes attributable to SLM had affected theatre utilisation and, as a consequence, operating theatre quantitative performance indicators, an exploratory mixed methods design was used. Semi-structured interviews were, therefore, conducted prior to quantitative data collection.

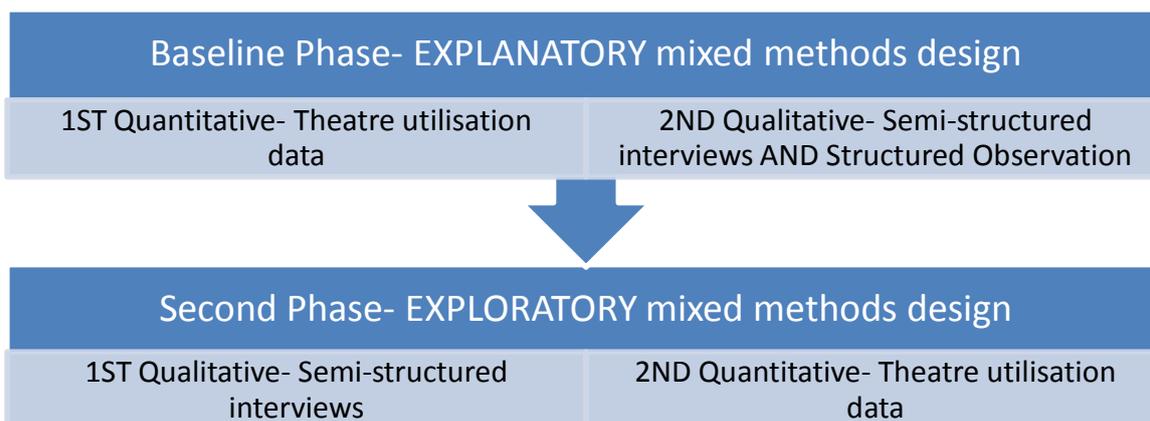


Figure 1: Multiphase mixed methods design used for this study.

Consequently, both explanatory (baseline) and exploratory (second phase) mixed methods designs were used as part of a multiphase methods design for this process evaluation (see Figure 1). This enabled both qualitative and quantitative data sources to be integrated during analysis and strengthened data interpretation to determine if, how and why the process of SLM implementation affected theatre utilisation (Bazeley, 2009, Tashakkori and Creswell, 2007). The following sections describe the methods used in detail.

### **Summary of Methods**

The mixed methods multiphase design employed in this research, involved collecting theatre utilisation data, conducting semi-structured interviews and focussed observations to gain and triangulate data. The study focused on elective colorectal surgery in two NHS hospitals in England.

Routinely collected quantitative/timing data on theatre usage was obtained on main elective colorectal operating lists for the two years (April 2010- March 2012) prior to first phase (baseline) interviews. Following analysis of the quantitative data, 22 semi-structured interviews were conducted as part of the explanatory mixed methods design. These interviews were conducted prior to a 12 week (July-Sept 2012) pilot study initiated by the SLM management group at Urban Trust and during the development of an information costing system for SLM implementation at University Trust. Staff involved in elective colorectal surgery were interviewed, including theatre managers, colorectal surgeons, anaesthetists, theatre staff and orderlies (porters). Observational work was also conducted to support/ triangulate findings following baseline interviews. Meetings relevant to SLM implementation were also observed and documented during the study. Second phase interviews were then conducted with 13 baseline participants, 6 to 9 months after the baseline interviews. Following analysis of these interviews, routinely collected quantitative data on theatre usage was obtained for the year in which this study took place (April 2012-March 2013) and was used to explore second phase qualitative findings (exploratory mixed methods design).

### **Information Gained prior to Baseline Interviews**

An initial interest in Service Line Management led to monthly meetings of the SLM management group being observed at Urban Trust (not an FT) from January 2012 to April 2013. A key objective of this group was to *'achieve 3 as a minimum level on*

*Monitor's self-assessment toolkit (i.e. significant implementation) within two years'* to support an FT application.

Measures of success included:

- demonstrable change in behaviour and positive impact on patient care
- improved use of resources
- improved quality outcomes across the trust

A perceived benefit of SLM was that it: *'drives highest quality patient care and operational effectiveness and efficiency'*. These measures of success and this perceived benefit, led to the SLM management group conducting a Theatre cross charging pilot project within elective General Surgery. All meetings relevant to this project were observed (observational methods are described below). The pilot study's objectives were:

- to introduce mechanisms for altering behaviour by introducing incentives
- to make more efficient use of resources in the trust
- to test whether cross charging improved utilisation of theatres
- to give the general surgery directorate more insight into its utilisation behaviours

This pilot study was an opportunity to evaluate how implementing SLM affected the way theatres were used in an elective surgical setting.

To broaden the study and make findings more generalisable, other local NHS trusts were contacted to determine if SLM was being implemented and whether evaluating

this process in the context of operating theatres was viable. University Trust was identified as a trust in which theatre utilisation was being reviewed and a Patient Level Information Costing System (PLICS) for SLM was being developed. A meeting with finance managers determined that elective general surgical theatres were linked to the development of this costing system, as barcoding of theatre equipment / consumables and the time spent within operating theatres was being used to attribute costs to patients and their operations. As such, University Trust also offered an opportunity to evaluate, albeit within a different context, how SLM implementation could affect operating theatres.

This prompted informal discussions with theatre management at Urban and University Trusts, to establish how operating theatres were used, what data was routinely collected on theatre utilisation, how theatre utilisation was measured and how this data could be accessed.

It became apparent that due to the size of University Trust that a General Surgical department similar to Urban Trust did not exist. General surgery at University Trust was split into subspecialties including colorectal surgery and upper gastrointestinal surgery, which functioned independently. The greatest number of general surgeons at Urban Trust had a specialist interest in colorectal surgery, with the number of colorectal surgeons working at both trusts (6v7) being comparable. One colorectal surgeon at Urban Trust was also the clinical director for general surgery (CDS) and a member of the SLM implementation group. Colorectal surgery is a department present in most NHS acute trusts, meaning this speciality provided an opportunity to obtain generalisable findings.

It also became apparent, that each trust had an allocated colorectal theatre within the main operating theatres and as a consequence had a team of theatre staff/potential participants that mainly worked within the specialty. Although some day case lists were regularly scheduled, these involved different theatre staff, did not involve all colorectal surgeons and took place in a separate Day-case unit. Consequently, qualitative data was only collected purposively from staff who could affect performance measures of the main colorectal operating theatres (Teddlie and Yu, 2007), with quantitative data also only being collected from operating lists performed in these main theatres.

Both trusts measured operating theatre performance in terms of start times, finish times, cancellations and theatre utilisation. Nevertheless, it was unclear if performance was being managed as described by Monitor's SLM framework (see Literature review: Performance management) and whether these KPIs were owned or acted on by front line staff to change how operating theatres were utilised (Monitor 2009b, Monitor 2010c). Both colorectal surgical departments had also relocated some or all of the main colorectal operating lists during the two years prior to baseline interviews (April 2010-March 2012). This had either been into a new hospital (University Trust - November 2010), or the moving of all colorectal surgery onto one hospital site (August 2011- Urban Trust). These changes had not resulted from SLM implementation. Consequently, data from operating lists performed in main theatres no longer used by the colorectal surgery departments, was excluded from further analysis. This was to ensure quantitative data collected during the second phase of the study (April 2012-March 2013) was comparable to baseline quantitative data (April 2010-March 2012).

University Trust (a FT) was developing a PLICS system to capture information and attribute cost to a patient episode. Barcoding of equipment/ consumables (as described above) had started in the main operating theatres, with the data collected being incorporated into the PLICS system. Nevertheless, what this PLICS system would be used for, and whether this data/ financial information would, in accordance with Monitor's SLM framework (Monitor 2010c), be used by service line teams to monitor and affect how operating theatres was being used, was unclear (see Literature review: Information Management).

At Urban Trust (non-FT) the urgency to implement SLM was greater, prompting the SLM management group as part of its complex implementation programme, to perform (as described above) a pilot study within General Surgery. This was to focus on time efficiency and cost effectiveness of operating theatres. Nevertheless, it was unclear how Urban Trust would measure or use financial information to determine pilot study outcomes.

### ***The Researcher and Funding***

This study was conducted by a single researcher who as a surgical trainee had worked within the colorectal surgical department, at one of the trusts (Urban Trust) being studied. The researcher was also known by a colorectal surgeon at University Trust but had never worked at the trust. During the study the researcher was employed and funded by Urban Trust as a general surgical research fellow, performing on-call/emergency duties only. These duties were in a hospital where no elective colorectal surgery took place. Nevertheless, having login details for the

Urban Trust intranet, enabled access to reports and data on theatre usage. Having an NHS mail e-mail account, also enabled e-mail addresses of potential staff participants in both trusts to be obtained.

The researcher also worked as part of the Birmingham and Black Country, National Institute for Health research (NIHR), Collaboration for Leadership in Applied Health Research and Care Theme 1 (BBC-CLAHRC- Theme 1: From structure to function) research team at the University of Birmingham. This team of experienced researchers was conducting health service evaluations using mixed methods, and provided support, guidance, training and expertise in the design, development and running of this mixed methods research study.

### ***Ethics***

A formal research proposal was submitted, and ethical approval and sponsorship for the study was obtained from the University of Birmingham in May 2012 (Ref-ERN\_12\_0284). The proposal was externally reviewed and accepted as part of the University registration process, and the study was also assessed by the Research and Development departments at Urban Trust and University Trust. The project was confirmed in writing by both trusts as a service evaluation that would collect data from NHS staff members only and that would not use any patient identifiable data. This meant NHS research ethics committee approval was not required. The project was also registered with the Clinical effectiveness unit at Urban Trust. All staff member details were rendered anonymous during the analysis process.

## **Quantitative Data- Baseline Phase**

### **Data Collection**

Following approval, routinely collected data, from trust operating theatre information databases (ORMIS- Urban Trust and Galaxy- University Trust), was obtained (Table 1- p64). During operating lists, theatre staff entered information into these databases prospectively. The data was acquired by the researcher either by personal request to the Informatics department (Urban Trust and University Trust) or by data mining from general reports available to Urban Trust employees.

As part of data collection, the names of surgeons and anaesthetists involved in the relevant operating lists was obtained. This enabled appropriate surgeons and anaesthetists to be invited to participate in subsequent interviews (purposive sampling) (Teddlie and Yu, 2007).

Measures of performance described by theatre management and/or defined by the trust and /or described in The Productive Operating Theatre programme (TPOT) were calculated and analysed prior to baseline interviews (Table 2- p65) (NHS Institute for Innovation and Improvement 2009). This sequential approach allowed the interview schedule to be designed in part, to determine explanations for quantitative findings (explanatory mixed methods design) (Creswell and Plano Clark, 2011, Teddlie and Yu, 2007).

## Analysis

To calculate performance indicators, data on timings (Table 1) from all elective theatre lists that had been attributed to a consultant colorectal surgeon, and that took place in the main operating theatres of both trusts, between April 2010 and March 2012 was collected. Data from emergency operating lists, lists not performed in main theatres or performed in operating theatres no longer used (as explained above), were excluded from further analysis. All data obtained was collated and analysed using both IBM SPSS Version 21 statistical software (IBM corporation 2012) and Microsoft Excel (2007).

A descriptive analysis was subsequently undertaken on all operating lists performed for each financial quarter and for the whole 2 year period.

Table 2 shows the definitions of operating theatre performance indicators calculated as part of baseline analysis. These definitions were taken from the Urban Trust intranet, nevertheless, discussions with theatre management, determined these definitions to be the same at University Trust. This included the definition of Theatre Utilisation (method 1), with performance indicators shown in Table 2 also aligning with those described in TPOT and empirical literature (NHS Institute for Innovation and Improvement 2009, Faiz et al., 2008, Pandit et al., 2012, Macario, 2006, Hovlid et al., 2012, Sung et al., 2010, MacLellan et al., 2008, Sanjay et al., 2007, Marjamaa and Kirvela, 2007, Hartmann and Sunjka, 2013)

As such the percentage of patients cancelled (Cancelled), the percentage of operating lists starting late (Late start), finishing early (Early finish) and finishing late (Late finish) were calculated. The Gap time was calculated by subtracting Patient

contact from the number of Utilised minutes for each list (Table 2), with the median number of minutes and interquartile ranges being determined for each quarter and the whole 2 year period. The percentage theatre utilisation (method 1) for each operating list was calculated, with the mean and standard deviations (s.d.) being determined for each quarter and the whole 2 year period. Baseline quantitative findings are presented at the beginning of the results chapter.

<b>Heading</b>	<b>Definition</b>
No. of cases completed	The total number of cases completed during each operating list.
Planned session time (minutes)	The total number of minutes allocated to the theatre session.
Utilised minutes	First patient's anaesthetic time to last patient's operation finish time (excluding recovery).
Patient contact (minutes)	The sum of each patient's anaesthetic time to operation finish time (excluding recovery).
Patient contact within session (minutes)	The sum of each patient's anaesthetic time to operation finish time (excluding recovery), but only counts operating time that occurred within the planned session times.
No. of cases cancelled	Total number of cases cancelled for each list.
Start Difference (minutes)	Total number of minutes either before (-ve) or after (+ve) the time anaesthetic was given to the first patient, relative to the planned start time. e.g. Planned start time 9am Actual start time 920am Start Difference= +20
Finish Difference (minutes)	Total number of minutes either before (-ve) or after (+ve) the operation finish time of the last patient on the list, relative to the planned finish time. e.g. Planned finish time 430pm Actual finish time 413pm Finish Difference = -17

Table 1 The titles and definitions of operating theatre timing data obtained from both Urban and University Trusts.

<b>Heading</b>	<b>Definition</b>
Late Start	Anything 15 minutes or more later than the planned start time.
Early Finish	Anything 15 minutes or more earlier than the planned finish time.
Finish On-time	Within 14 minutes (earlier or later) of the planned finish time.
Late Finish (Overrun)	Anything 15 minutes or more later than the planned finish time.
Gap time or Turnaround time	Total time between cases in which patient is not being anaesthetised or operated upon. (= Utilised minutes - patient contact)
Theatre Utilisation (Method 1)	First patient's anaesthetic time to last patient's operation finish time (Utilised minutes) as a percentage of the planned session time.
Theatre Utilisation (Method 2)	The sum of each patient's anaesthetic time to operation finish time within the planned session (Patient contact within session), as a percentage of the planned session time.

Table 2 Definitions of the performance indicators calculated.

## **Qualitative Research Methods**

### **Objectives of Interview Schedule- Baseline Phase**

An interview schedule previously designed by the BBC-CLAHRC research team for another unrelated service evaluation served as an initial template for design of the baseline interview schedule for this study. The schedule was discussed and modified by the researcher with support from the BBC-CLAHRC research team members. Questions were ordered and constructed to enable staff members to respond freely and openly. Leading questions were avoided. Prompts were added to aid the

researcher during interviews so that appropriate topics would be covered and explanations for baseline quantitative findings obtained (Creswell and Plano Clark, 2011, Teddlie and Yu, 2007). The specific questions and prompts included in the baseline interview schedule (see Appendix 2) were designed:

- To obtain the baseline opinions of key staff (surgeons, anaesthetists, theatre management and other theatre staff within both Trusts) on how colorectal theatres were being utilised.
- To determine factors in both Trusts that affected how colorectal operating theatres were being utilised and determine possible causes for late starts, late finishes, cancellations and delays between cases.
- To gain an understanding of organisational structure and staff group interaction within both colorectal surgery departments.
- To determine how information and performance were recorded, measured and used to affect how colorectal operating theatres were being utilised.
- To determine whether the aims of different staff groups who affected the use of colorectal theatres aligned.

### ***Participant Information Sheets and Cover Letter***

A participant information sheet (PIS) and accompanying cover letter were written to invite staff to participate in the study, to inform them of the purpose of the study, and what participation involved. The term Service Line Management was not included in descriptions as it was felt introducing this term prior to interview would influence knowledge and understanding of SLM and responses. The objectives described in

the PIS and cover letter focussed on how the study aimed to evaluate efficiency and cost effectiveness of operating theatres. Further information was provided on confidentiality, indemnity, the researcher's contact details and on how ethical approval had been obtained (see Appendix 3.1 and 3.2).

### ***Contacting Potential Participants***

The baseline quantitative data obtained provided information from Urban and University Trusts on the names of all colorectal surgeons and the anaesthetists most commonly involved in colorectal operating theatres. This data and informal discussions with theatre management, also provided information on which main theatres were most commonly used for colorectal surgery. This information and access to NHS mail enabled the researcher to purposively invite all colorectal surgeons and the six anaesthetists most commonly involved in colorectal operating lists at both trusts, to participate in baseline interviews (Teddlie and Yu, 2007). E-mails were also sent to theatre management at both trusts asking them to invite all theatre staff who worked in or supported (e.g. orderlies and recovery staff) the main colorectal operating theatres to participate in the study. The PIS and covering letter explaining the purpose of the study, as described above, were attached to all e-mail invites. Arrangements as to where and when interviews would take place were then made directly by the researcher with staff who agreed to participate.

## ***Interviews***

All interviews were audio recorded and conducted at the participants' work place by the researcher, either in a private office or in a separate private room within the operating theatre complex. The interview schedule was not shown at any time to participants, but the researcher did provide a brief outline of the study and gave interviewees the chance to ask any questions prior to interviews. It was explained that interviews would be audio recorded, that any direct quotations used in reports would be anonymised and that the participant could withdraw from the study at any time. Formal written consent was obtained prior to commencing all interviews.

## **Objectives of Interview Schedule- Second Phase**

The baseline interview schedule was used as an initial template for the second phase schedule. Nevertheless, whilst the structure was maintained, the second phase schedule evolved and extended from the baseline schedule, as its focus was to determine if and what changes had occurred in comparison to baseline findings.

Questions 1 to 4 (Appendix 4) were similar to questions asked during baseline interviews, as changes to opinions and factors on, or related to, theatre usage were sought. Questions 5 to 8 (Appendix 4) were different, with direct questions being used to determine any changes relevant to the four main areas of SLM (organisational structure, performance management, information management, strategy and planning). Any changes described were then explored during the interview to determine if, how and why changes attributed to SLM implementation had affected theatre usage. Similarly to the baseline schedule, this second phase

schedule was discussed and modified by the researcher with support from experienced BBC-CLAHRC research team members to ensure interviews would achieve objectives (see Introduction: Aims and Objectives). The specific questions and prompts included in the second phase interview schedule(Appendix 4) were designed:

- To determine whether opinions of key staff on how colorectal operating theatres were being utilised had changed and if so, how and why.
- To determine whether factors that affected how colorectal operating theatres were being utilised had changed and if so, how and why.
- To determine whether changes to the four main areas of SLM had occurred and if so whether these changes had affected the way colorectal operating theatres were being utilised.

### ***Participant Information Sheets and Cover Letter (second phase)***

The PIS and cover letter used for baseline interviews was modified to reflect participants previous involvement in the study (see Appendix 5.1 and 5.2).

Nevertheless, all other details were as described in the Baseline Phase: Participant Information Sheets and Cover Letter section above.

### ***Contacting Participants (second phase)***

The modified PIS and cover letter, were e-mailed to all surgeons, anaesthetists and theatre management who had participated in or who had supported the researcher to organise baseline interviews. These documents re-explained the purpose of the

study and re-invited previous interviewees to participate in second phase interviews. Theatre management were asked to re-invite all theatre staff who had previously participated on behalf of the researcher. Arrangements were then made as to where and when interviews would take place directly by the researcher with staff members who agreed to participate.

### ***Interviews (second phase)***

All follow up interviews were audio recorded and conducted as was described for baseline interviews. The researcher provided a brief outline of the study, provided an opportunity for interviewees to ask any questions and obtained formal written consent prior to commencing all interviews. Transcripts or audio files of individual baseline interviews were either read or listened to by the researcher within 24 hours prior to follow up interviews. This allowed specific questioning during second phase interviews on particular topics or points made by the same interviewee during baseline interviews.

## **Methods of Qualitative Analysis**

### **Overview**

Prior to commencing the study, the researcher working as part of the BBC-CLAHRC research team was trained to code, interpret and enter qualitative data into a framework. This was done under the guidance of experienced qualitative researchers

over numerous sessions in which coding and identified themes were standardised. The skills obtained were used to code and analyse baseline and second phase interview transcripts from this study with the aid of QSR NVivo version 9 software (QSR international limited 2010).

The qualitative data for baseline and second phase interviews was analysed using a 6 phase thematic analytical approach (Braun and Clarke, 2006, Creswell and Plano Clark, 2011, Silverman, 2000, O'Leary, 2010). Following interview transcription (Phase 1) and initial code generation (Phase 2), codes were collated, interpreted summarised and entered into frameworks. These frameworks provided analytical maps from which comparisons between trusts and interviewees could be made and from which initial reports were compiled. During construction of these frameworks and reports, initial themes were considered. As analysis continued these themes were refined, with transcripts being repeatedly checked to ensure accurate interpretation. As such, analytical frameworks and initial reports were used to search for, review and define themes (Phases 3,4, and 5). Initial reports were then integrated to produce final analytical reports on defined themes (baseline) or on the four main areas of SLM (second phase). These reports are presented in the results chapter, with the discussion chapter relating these findings to current literature (Phase 6). Full detail of qualitative methods is presented below:

### **Transcribing**

All interview audio recordings were transcribed by the researcher using Dragon naturally speaking speech recognition software (Version 11.5 Nuance

communications 2011). Recordings were played back and repeated verbatim to produce accurate transcripts with this transcription approach enabling the researcher to become familiarised with the whole dataset (Phase 1). Audio recordings and transcripts were anonymised and saved in password protected University of Birmingham files and were only accessible to the BBC-CLAHRC Theme 1 research team. The transcripts were repeatedly checked for accuracy, with audio files being replayed during the subsequent coding process to ensure no transcription errors or misinterpretation of the qualitative data. Five baseline and three second phase interview transcripts were independently checked and verified for accuracy by a member of the BBC-CLAHRC research team. Only minor grammatical errors were found with the occasional word, having previously been labelled as unclear, being added.

## **Coding**

Coding was not commenced until all baseline interviews were transcribed and uploaded into NVivo, (QSR NVivo version 9 software- QSR international limited 2010). This enabled the researcher to be familiar with the whole dataset prior to initial code generation (Phase 2). Second phase interviews were also all transcribed prior to second phase analysis. Details of the codes formed from both baseline and second phase interviews are described in the results chapter. Audio files continued to be used throughout the coding process to maintain the context of extracts, to gain a greater sense of interviewees answers and to ensure accurate transcription.

## **Generating Initial Codes**

The baseline interview schedule (Appendix 2) was used as a skeleton for initial code generation, with codes being added, modified and defined as each transcript was coded. NVivo software enabled all transcripts to be revisited and codes to be re-allocated to data extracts as all transcripts were coded and analysed. Repeated checking of descriptions and comments from different interviewees on the same topic was undertaken, to ensure reliable and consistent coding.

Transcripts were selected to aid the coding process with interviews that provided the broadest amount of information being coded first. Transcripts, where possible, were coded in pairs according to job role at each trust e.g. Clinical Director at Urban Trust and Clinical Director at University trust. This was to provide a more balanced approach to coding and prevent one trust having greater influence over data interpretation during either baseline or second phase analysis. This also allowed the differences between the two trusts to emerge more clearly.

The initial codes generated for both baseline and second phase analysis, were checked for validity and reproducibility, as described below (Process to ensure Reproducible Coding). However, as a coding framework for baseline interviews had been constructed prior to second phase interviews, the same coding framework was initially used for second phase analysis. As analysis progressed this framework was modified, as described below (Formation of Analytical Frameworks- Second Phase), to enable comparisons to be made and change to be determined.

## **Process to ensure Reproducible Coding**

As phase 2 of baseline and second phase analysis was performed by a single researcher, overall validity and reproducibility of findings could be questioned. Consequently to add rigour to the analytical process, two associates of the CLAHRC research team (CLAHRC associates) were asked independently to code two transcripts during baseline and second phase analysis. Transcripts and codes generated by the researcher and CLAHRC associates were discussed in detail. Titles allocated to codes that were slightly different (e.g. distribution of data compared to feedback of data) were discussed and altered as appropriate (e.g. 'External views' changed to 'External influences'). Nevertheless, some codes used by both CLAHRC associates, e.g. 'Facilities' and 'Financial Issues' were not used by the researcher. Further discussion determined that the relevant extracts had either been allocated more specific sub-codes e.g. 'Bed issues' and 'Resource availability (NOT beds)' or allocated a code such as 'Reference to SLR&SLM', which was deemed appropriate. 'Communication', however was different, as the researcher did not use this code in a consistent way to both CLAHRC associates. They considered communication via information technology and documents together with verbal communication between staff. This had not previously been considered and although the information had been separately coded, it was possible that an overarching theme would not emerge. The 'Ward factors' code was expanded to incorporate communication between theatres and the ward, including written documentation such as discharge summaries. A further sub-code was allocated to extracts relevant to communication between different staff/ colorectal theatre team members. This helped to collate more

information relevant to 'Communication' as did greater awareness of the potential theme as thematic analysis progressed.

Overall, interpretation was consistent between the researcher and both CLAHRC associates, with codes/themes from both baseline and second phase analysis being described in similar terms, although concern was expressed over the complexity of the initial baseline coding system. This was reflected in discussion, whereby CLAHRC associates described overarching themes, thereby simplifying analysis, whereas the researcher was more concerned about specifics. For example the large number of sub-codes created within the 'Factors' code, were simplified by the CLAHRC associates into codes such as 'Delays' and 'Capacity issues'. The majority (approximately 90%) of the data was, however, consistently interpreted and coded. This consistency is demonstrated by an extract allocated the code 'Trust culture'. Only one extract from the two reviewed baseline transcripts had been allocated this code, however, the extract and term trust culture was also identified and used by the CLAHRC associates. Similar consistency occurred during review of second phase transcript coding. Subsequently, no further comparison between transcripts was considered necessary, with the development and refining of themes being considered the next stages of the analytical process (Braun and Clarke, 2006, O'Leary, 2010, Creswell and Plano Clark, 2011).

### **Formation of Analytical Frameworks- Baseline Phase**

The coded data from baseline phase 2 analysis, in parts was vast and broad and could be analysed to gain information on topics (e.g. Emergency surgery) which were

not directly related to the objectives of this study. Therefore, baseline analysis was focussed to specifically address the baseline interview schedule and study objectives (see Designing the Baseline Interview Schedule above).

### ***Theatre Utilisation***

As quantitative findings had suggested elements of the patient journey were inefficient (see Results Chapter: Quantitative Data- Baseline Phase), the baseline interview schedule had been designed in part to determine opinions on theatre efficiency and factors that could explain quantitative results (Explanatory, sequential approach) (Creswell and Plano Clark, 2011). When determining the baseline opinions of key staff and the factors that affected how colorectal theatres were being utilised, extracts mainly obtained from questions three and four of the interview schedule and coded as Opinions or Factors (see Results Chapter: Qualitative results- Baseline Phase: Process of Thematic analysis (Codes)) were analysed.

The extracts coded as Opinions were collated, interpreted, summarised and entered into an Excel (Microsoft 2007) spreadsheet/ framework according to interviewee. However extracts from all interviewees, mainly coded as a factor sub-code (e.g. Bed issues (see Results Chapter: Qualitative results- Baseline Phase: Process of Thematic analysis (Codes)) were collated together according to trust rather than individual interviewee. As extracts referred to parts of the patient journey, they were interpreted and summarised according to the part of the journey they related to e.g. Ready for theatre or Recovery (Appendix 6). Therefore all factors throughout the

patient journey that could affect how operating theatres were being utilised in each trust were determined.

### ***Service Line Management***

Extracts that provided an understanding of organisational structure, on how information and performance were recorded measured and used and on trust or personal aims, were coded, collated, interpreted, summarised and entered into an Excel (Microsoft 2007) spreadsheet/ framework according to interviewee. Information provided by interviewees that was relevant to the four main elements of SLM (organisational structure, performance management, information management, strategy and planning) in the context of colorectal surgery and operating theatres was determined. The codes allocated to relevant extracts are described in the results chapter.

### **Observational Methods**

To support baseline interview findings and to add greater depth to understanding on how operating theatres were being utilised, focussed observational work was conducted at both trusts. This was conducted following Phase 1 of the baseline interview analysis. Elective colorectal patient journeys were followed from arrival on the morning of surgery through to patients returning back to the ward after their operation. Any issues that arose, any employed methods of communication, any relevant comments made by staff and descriptions of physical hospital layout were prospectively recorded. Questions were also asked of staff members involved in the

process to gain a clear understanding of what was occurring and to bridge any gaps in information gained from baseline interviews. The staff members observed were nurses on the wards or admission units, orderlies or healthcare assistants involved in collecting and transferring patients, theatre staff, surgeons, anaesthetists and recovery staff. This was done on one occasion at Urban Trust but on two separate occasions at University Trust due to the large size of the hospital and it not being possible to observe the entire process satisfactorily in one visit. At both trusts two colorectal operating lists were running simultaneously during all periods of observation. All prospective notes were summarised within 24 hours of observations. Findings were used to add context and support findings from interviews and thus are incorporated in reports presented in the results chapter (see Baseline Qualitative Reports: Themes).

### **Initial Reports- Baseline Phase**

Following completion of observational work and construction of analytical frameworks, separate reports on opinions, factors and the four main elements of SLM were written for each trust, in part to explain quantitative results. Nvivo software and the use of Excel frameworks enabled repeated checking of data, ensured reports were representative of findings and enabled illustrative extracts to be incorporated.

## **Theme development- Baseline Phase**

During and following completion of analytical frameworks and initial reports, themes were considered. Analytical frameworks and transcripts (using Nvivo software) were regularly revisited during this process to ensure accurate interpretation.

Information/findings of initial reports and relevant to potential themes, were presented and discussed with supervisors, adding rigour to theme development. Initial reports on opinions, factors and the four main elements of SLM were merged and edited as themes were developed. Reports on ten themes identified were initially written for each trust, however, as theme development continued three of these initial themes were merged with two others (see Results Chapter: Qualitative Results- Baseline phase: Defining and Naming Themes). This left seven themes being defined and described according to each trust as part of the final analytical report. These are presented in the results chapter with illustrative extracts being used to exemplify findings (see Baseline Qualitative Reports: Themes).

## **Formation of Analytical Frameworks- Second Phase**

The focus of second phase analysis was to determine what had changed compared to baseline data collection. Extracts were collated specifically to determine if, how and why changes had occurred.

The codes that were defined during baseline interview analysis and that are described in the results chapter (e.g. Opinions), were used as a framework to code second phase transcripts. Alterations/adjustments to this framework were made, for example, the Factors code was simplified into four sub-codes, which represented the

four patient journey elements (Ready for theatre, Ready to be anaesthetised, Undergoing procedure and Recovery) described in Appendix 6 and an SLM code with four sub codes was created. These four sub-codes were allocated to extracts relevant to the four elements of SLM (organisational structure, performance management, data, strategy and planning). Another code was also created (entitled Comments on change) and was allocated specifically to extracts describing change on how theatres were used, aiding analysis.

Following coding of all second phase transcripts, extracts allocated SLM or Comment on change code were collated, interpreted, summarised and entered into an Excel (Microsoft 2007) spreadsheet/ framework according to interviewee. This then enabled direct comparison to be made with baseline interview findings and determine if, how and why each trust's approach to the implementation of SLM affected theatre utilisation.

### **Reports- Second Phase**

Following construction of these analytical frameworks initial reports, summarising changes compared to baseline findings on how operating theatres were used and on the four main elements of SLM were written. As the main aim of this study was to determine if changes attributable to SLM implementation had affected the way colorectal operating theatres were used, these reports were merged. Second phase reports, presented in the results chapter, summarise changes to how operating theatres were used according to the four main areas of SLM. This is presented for each trust with findings being compared to baseline findings and desired outcomes of

SLM implementation according to Monitor (see Results Chapter: Summary of Changes) (Monitor 2010c). Illustrative extracts are again presented to support findings.

## **Quantitative Data- Second Phase**

### **Data Collection**

As for baseline quantitative data collection, second phase quantitative data was acquired by the researcher, either by personal request to the Informatics department (University Trust and Urban Trust) or by data mining from general reports available to Urban Trust employees. The definitions of the timings collected and calculated are shown in Tables 1 and 2 (see Quantitative Analysis- Baseline phase: Analysis above). No patient identifiable information was requested or obtained. Data from all elective theatre lists that had been attributed to a consultant colorectal surgeon and that took place in the main operating theatres of both trusts, between April 2012 and March 2013 was collected. Data from emergency operating lists or lists not performed in main theatres were excluded from further analysis. All data was entered into and analysed using both IBM SPSS Version 21 statistical software (IBM corporation 2012) and Microsoft Excel (2007).

Data was collected following second phase interviews to explore whether change described was reflected by performance indicators (e.g. Late starts) and also to allow any new performance indicators or relevant financial information to be collected.

## **Analysis**

Data collected on theatre timings (Table 1) was used to calculate performance indicators (Table 2), as described for baseline quantitative data. A descriptive analysis was subsequently undertaken on all operating lists performed for each financial quarter and for the whole 1 year period. Findings were then compared to baseline figures.

Other measures of performance described during second phase interviews and/or defined by the trust and/or described in TPOT were calculated, analysed and compared to baseline findings (NHS Institute for Innovation and Improvement 2009). This information was then integrated with qualitative findings, and used to strengthen second phase reports (Exploratory mixed methods design) (Creswell and Plano Clark, 2011).

All second phase quantitative results are presented at the end of the results chapter (see Quantitative Data-Second Phase), alongside baseline findings for comparison.

## **Observational Meeting Methods**

From January 2012 until April 2013, all but one (June 2012) Service Line Management monthly meetings held at Urban Trust were observed. The observer was introduced to the group and the reason for attendance was explained. No contribution to discussions was made except during a meeting in October 2012 when results of the Theatre cross charging pilot were discussed. All data was collected in note form contemporaneously. The data collected was:

- Information on attendees- including job title.
- Main topics covered.
- Service redesign methods/ approaches.

The data was then (within 24 hours) entered into a meeting observation pro forma previously designed and used by the BBC-CLAHRC research team (Appendix 7).

Following meetings, reflections and views on overall meeting success were documented. All available agendas and minutes from meetings were also obtained.

Other meetings considered relevant to the study were also observed. These included Theatre cross charging project meetings at Urban Trust and meetings on the development of Service Line Reporting (SLR) at University Trust. These were also recorded and documented as described above.

### ***Results chapter***

All results obtained by the methods described above, are presented in the following results chapter. The first section describes the layout, with baseline and second phase findings being presented sequentially.

## **CHAPTER FOUR: RESULTS**

### ***Layout of Results***

The following results chapter is organised according to baseline and second phase, data collection time points, with a summary of observed meetings and the Theatre cross charging pilot study at Urban trust being presented separately:

- Baseline
  - Quantitative
  - Qualitative- Themes
- Second phase
  - Qualitative- Summary of Changes
- Summary of meetings
- Urban Trust Theatre cross charging pilot
- Second phase
  - Quantitative
- Summary

Baseline quantitative data findings for both Urban and University Trusts are presented first, as the results were known to the researcher prior to baseline interviews being conducted. These results helped design the baseline interview schedule so that explanations for quantitative findings (explanatory sequential mixed methods design) could be sought (Creswell and Plano Clark, 2011).

The baseline qualitative findings are then presented, along with the coding process, formation of analytical frameworks, theme development and finally findings are described. Reports incorporate and summarise the opinions of key staff, the factors that affected how operating theatres were utilised and points relevant to SLM implementation at the time of baseline interviews (May-July 2012).

The qualitative findings from second phase data collection are presented as a summary, with the focus on changes to baseline data collection within operating theatres and which are related to SLM. If information gained from interviewees had already been described in baseline findings these descriptions were not repeated.

A summary of findings from attended meetings at Urban and University Trusts is then presented to either support or refute (triangulate) findings. Summaries relate to defining service lines, implementation progress and Patient Level Information and Costing System (PLICS) development. This is followed by presentation of the Urban Trust Theatre cross charging pilot with quantitative data, meeting observation, baseline and second phase interview findings subsequently being described.

Second phase quantitative data findings are then presented to demonstrate whether any changes described by interviewees (particularly in reference to SLM implementation) had affected the way operating theatres were utilised, and to enable operating theatre utilisation at Urban and University Trusts to be compared. These quantitative findings are also incorporated into second phase qualitative reports, as the data was used to explore findings of second phase qualitative analysis (exploratory sequential mixed methods design) (Creswell and Plano Clark, 2011).

## **Quantitative data- Baseline Phase**

### **Urban Trust**

A total of 523 elective operating lists were booked in the main operating theatres under the control and names of six colorectal surgeons from 1st April 2010 to the 31st March 2012. Ninety-nine of these were held in operating theatres no longer used by colorectal surgeons and were excluded from further analysis. During the remaining 424 lists, 1261 cases were completed and 103 (7.6%) cases were cancelled. Seven lists (1.7%) were not utilised at all due to cancellations. Of the 417 lists that were used, 103 (24.7%) started 15 minutes or more later than planned (Late start); One hundred and sixteen (27.8%) finished 15 min or more earlier than planned (Early finish) and 213 (51.1%) finished 15 minutes or more later than planned (Late finish). The median gap time per list was 19 minutes. Overall the mean theatre utilisation as defined by method 1 was 103.1% (standard deviation (s.d.)= 26.6%) (See Table 3). Table 3 presents quarterly, the quantitative data from the two-year period prior to baseline interviews with Figures 2-7 demonstrating quarterly changes to late starts, early finishes, late finishes, cancellations, gap time and theatre utilisation (according to method 1) as compared to University Trust.

Quarter	No. of lists	No. Cases Completed	No. Cases Cancelled	Cancelled %	Late Start %	Early finish %	Late Finish %	Gap time minutes (IQR)	Utilisation Method 1 % (s.d.)
Quarter 1 10-11	53	161	16	9%	30.8%	19.2%	57.7%	19 (0-50)	104.9% (34.3)
Quarter 2 10-11	42	123	10	7.5%	35.7%	21.4%	71.4%	22 (6.3-45)	106.4% (26.5)
Quarter 3 10-11	67	222	22	9%	28.4%	25.4%	46.3%	22 (2-43)	99.6% (22.2)
Quarter 4 10-11	49	145	19	11.6%	25.5%	34%	48.9%	19 (3-49)	104.4% (25.6)
Quarter 1 11-12	43	135	9	6.3%	9.5%	31%	61.9%	25 (5.3-39)	104.1% (28.9)
Quarter 2 11-12	52	133	4	2.9%	25.5%	31.4%	47.1%	13 (0-35)	105.3% (28.2)
Quarter 3 11-12	64	174	10	5.4%	20.6%	34.9%	41.3%	13 (0-45)	101.3% (24.6)
Quarter 4 11-12	54	168	13	7.2%	20.8%	24.5%	43.4%	20 (3-39.5)	101% (23.2)
<b>Overall</b>	<b>424</b>	<b>1261</b>	<b>103</b>	<b>7.6%</b>	<b>24.7%</b>	<b>27.8%</b>	<b>51.1%</b>	<b>19 (0.5-43)</b>	<b>103.1% (26.6)</b>

Table 3- Urban Trust baseline quantitative data. (Numbers shown for Gap time is the median number of minutes with the numbers in brackets being the inter quartile range (IQR). Numbers shown for Utilisation are the mean with numbers in brackets being the standard deviation (s.d.)).

## University Trust

A total of 694 elective operating lists were booked in the main operating theatres under the control and names of seven colorectal surgeons from 1st April 2010 to the 31st March 2012. Two hundred and seventy-nine of these were held between April and November 2010 in operating theatres no longer used and were excluded from further analysis. During the remaining 415 lists, 1278 cases were completed, 143 (10.1%) cases were cancelled with 2 lists not being utilised at all due to cancellations. Of the 413 lists that were used, 219 (53%) started 15 minutes or more later than planned (Late start), 116 (28.1%) finished 15 min or more earlier than planned (Early finish); 240 (58.1%) finished 15 minutes or more later than planned (Late finish). Despite start times and finish times for operating lists appearing accurate, the total patient contact time with either an anaesthetist or surgeon did not. This was because 37/413 (8.9%) of lists had a recorded patient contact time greater than the utilised minutes. Consequently, as data was considered unreliable, these 37 lists were excluded when the gap time was calculated, with the median gap time from remaining lists being 24 minutes. The overall mean theatre utilisation as defined by method 1, was 100.7% (s.d.=27.2) (See Table 4). Table 4 presents quarterly, the quantitative data from the two-year period prior to baseline interviews with Figures 1-6 demonstrating quarterly changes to late starts, early finishes, late finishes, cancellations, gap time and theatre utilisation (according to method 1) as compared to Urban Trust.

Quarter	No. of lists	No. Cases Completed	No. Cases Cancelled	Cancelled %	Late Start %	Early finish %	Late Finish %	Gap time minutes (IQR)	Utilisation Method 1% (s.d.)
Quarter 1 10-11	-	-	-	-	-	-	-		-
Quarter 2 10-11	-	-	-	-	-	-	-		-
Quarter 3 10-11	35	107	15	12.3%	65.7%	34.3%	54.3%	27 (10.8-82.5)	95.6% (24.6)
Quarter 4 10-11	81	271	33	10.9%	44.4%	23.5%	63%	23 (12.5-45)	101.3% (20.8)
Quarter 1 11-12	74	229	19	7.7%	50%	27%	55.4%	24 (12-49.8)	103.2% (31.9)
Quarter 2 11-12	73	222	23	9.4%	57.5%	23.3%	65.8%	26 (11.5-56.5)	102.9% (19)
Quarter 3 11-12	73	239	29	10.8%	56.2%	32.9%	50.7%	28 (12-48.8)	97.9% (19.8)
Quarter 4 11-12	79	210	24	10.3%	51.9%	31.2%	57.1%	21 (7.5-38)	100.7% (39.3)
<b>Overall</b>	<b>415</b>	<b>1278</b>	<b>143</b>	<b>10.1%</b>	<b>53%</b>	<b>28.1%</b>	<b>58.1%</b>	<b>24 (12-49.75)</b>	<b>100.7% (27.2)</b>

Table 4 University Trust baseline quantitative data. (Numbers shown for Gap time is the median number of minutes, with the numbers in brackets being the inter quartile range (IQR). The figures shown for Theatre utilisation are the means according to method 1 with the standard deviation (s.d.) being shown in brackets).

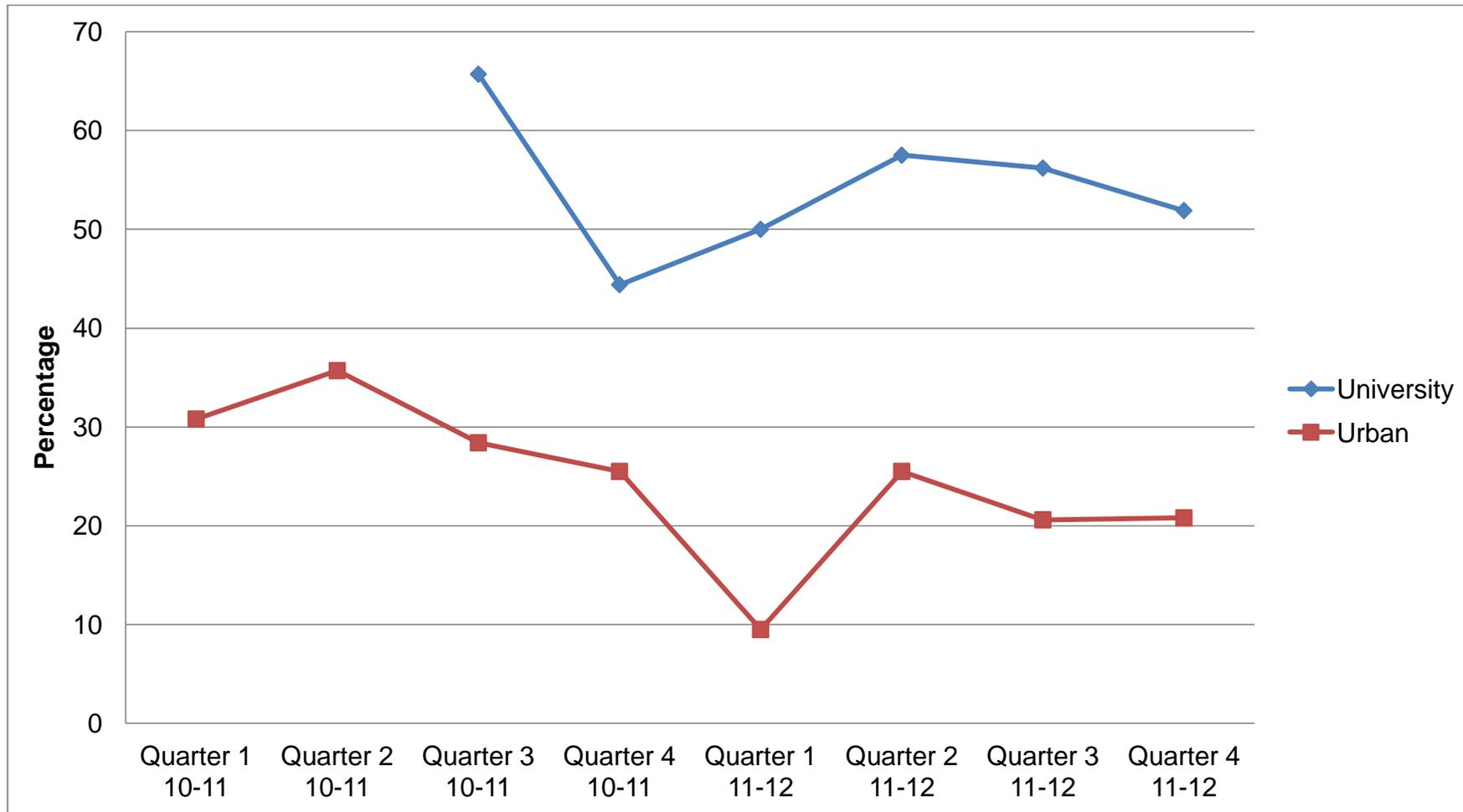


Figure 2 Line graph to show baseline quarterly figures of the percentage of **Late starts** for Urban and University Trusts.

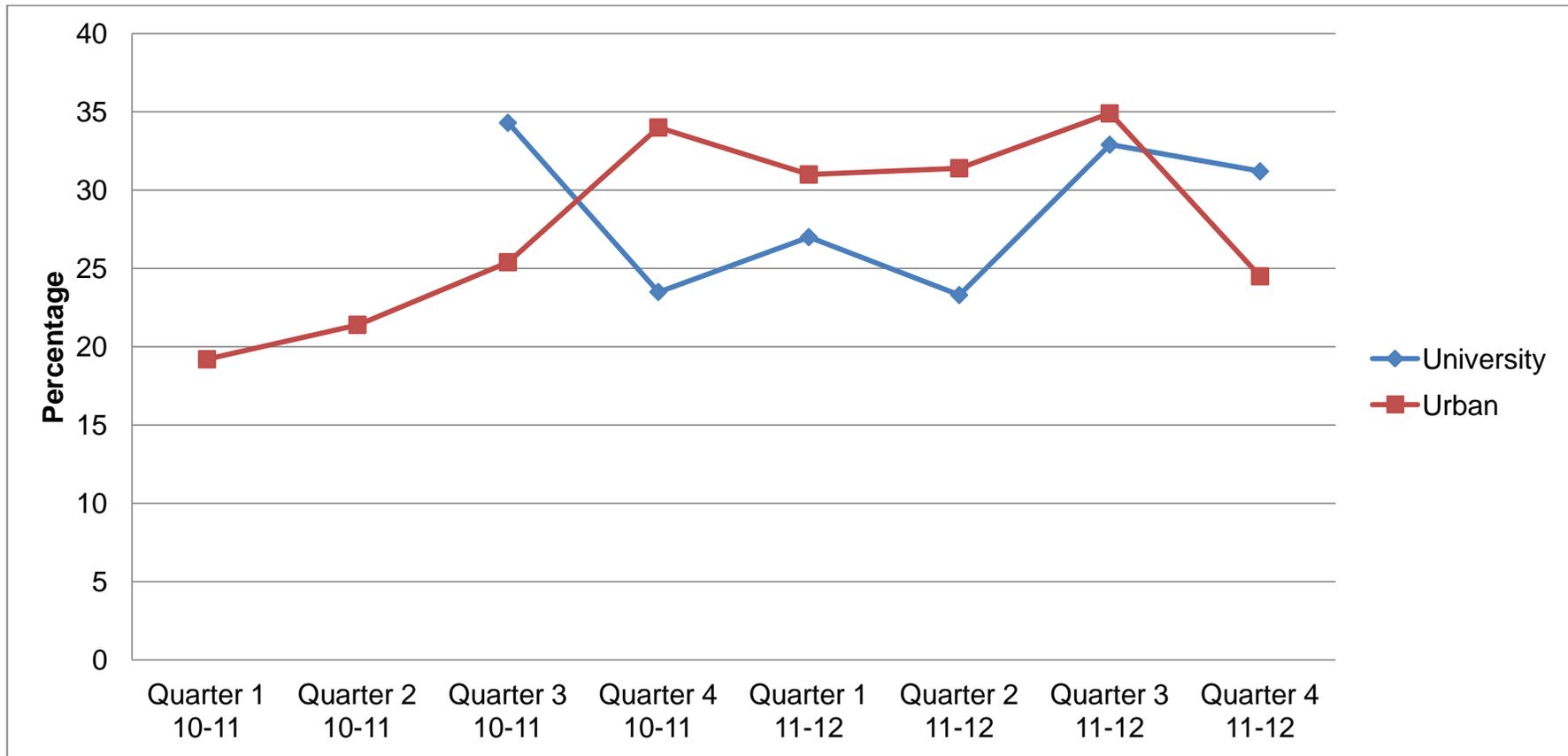


Figure 3 Line graph to show baseline quarterly figures of the percentage of **Early finishes** for Urban and University Trusts.

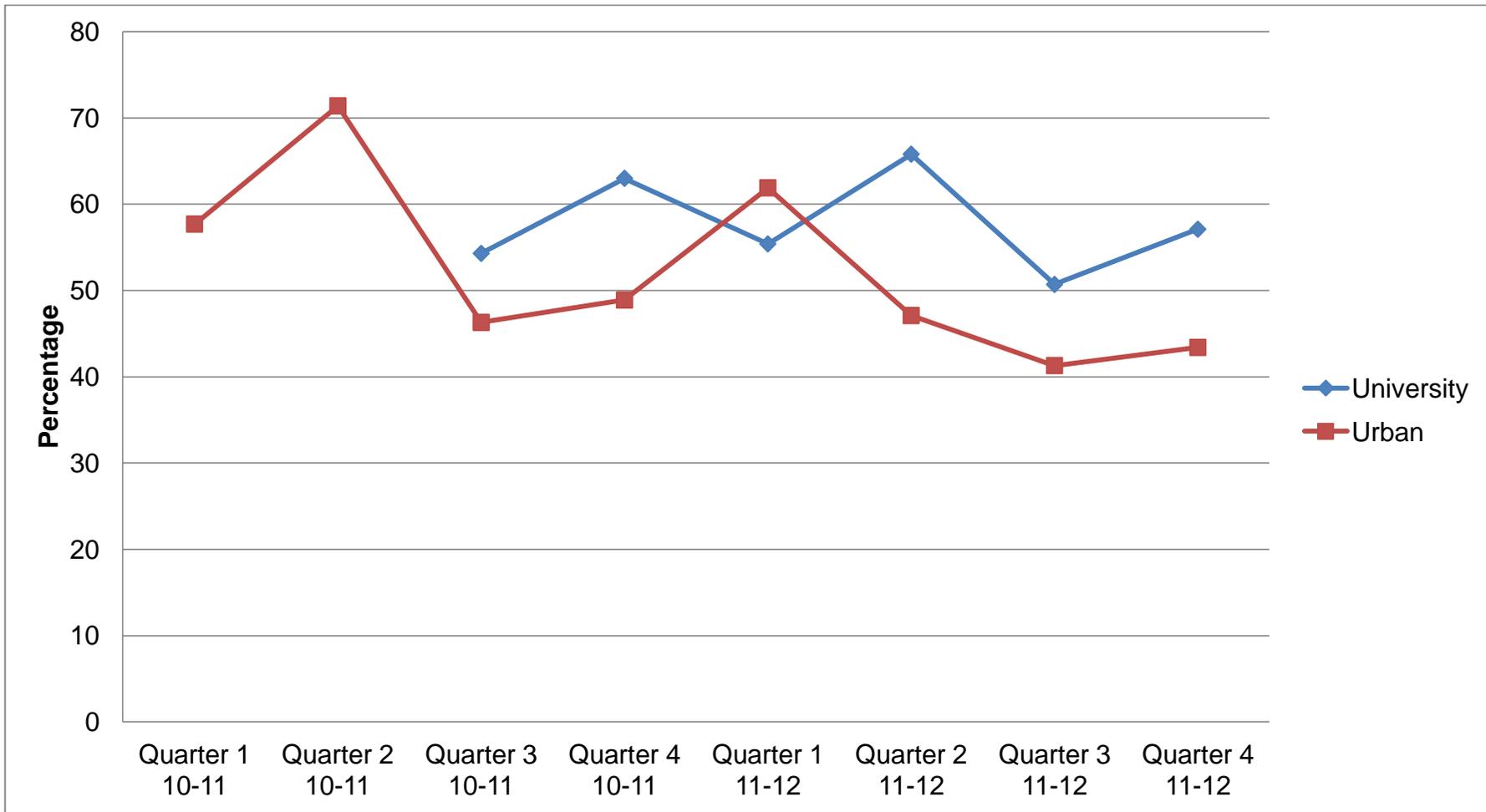


Figure 4 Line graph to show baseline quarterly figures of the percentage of **Late finishes** for Urban and University Trusts.

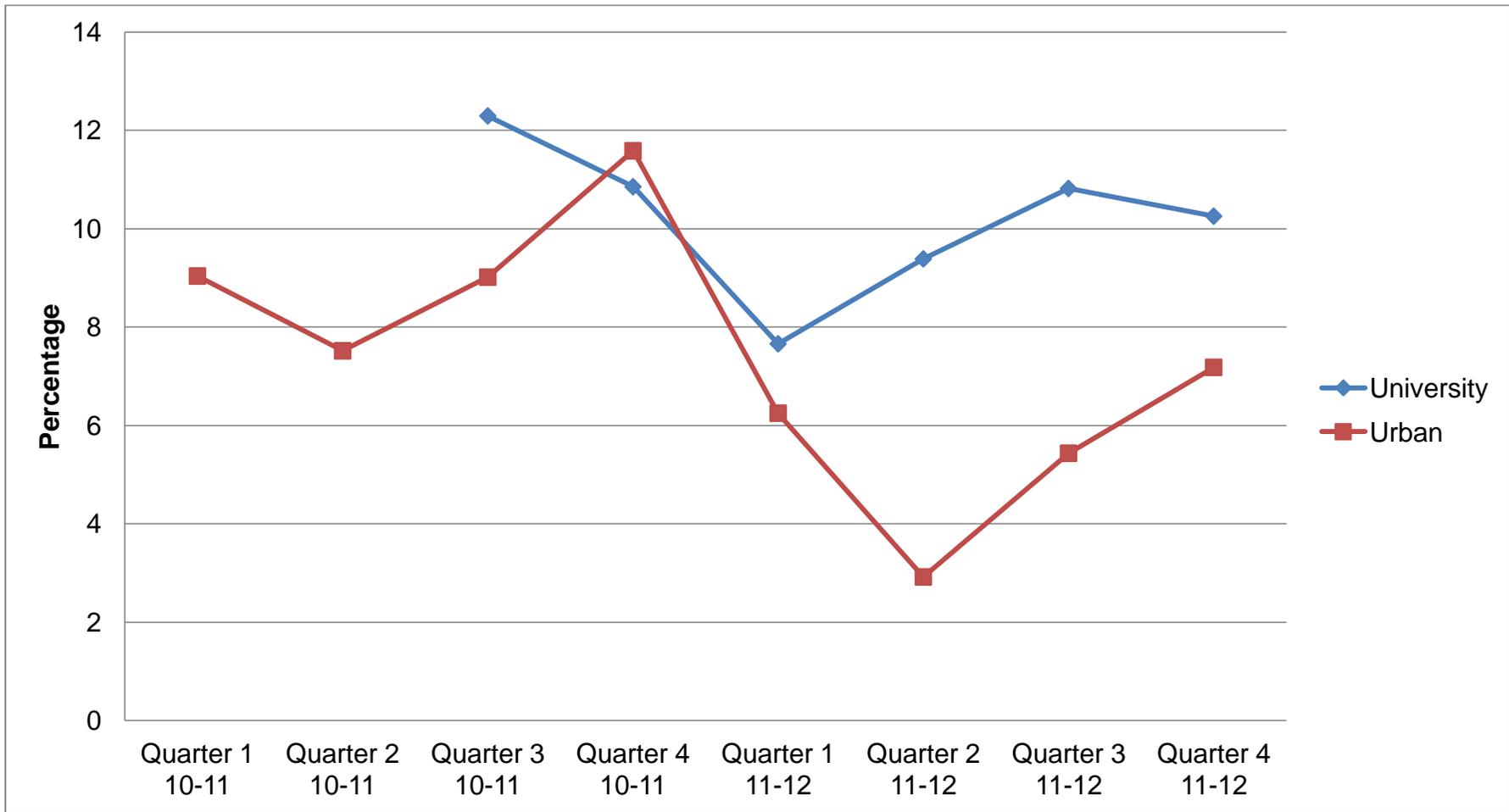


Figure 5 Line graph to show baseline quarterly figures of the percentage of case **Cancellations** for Urban and University Trusts.

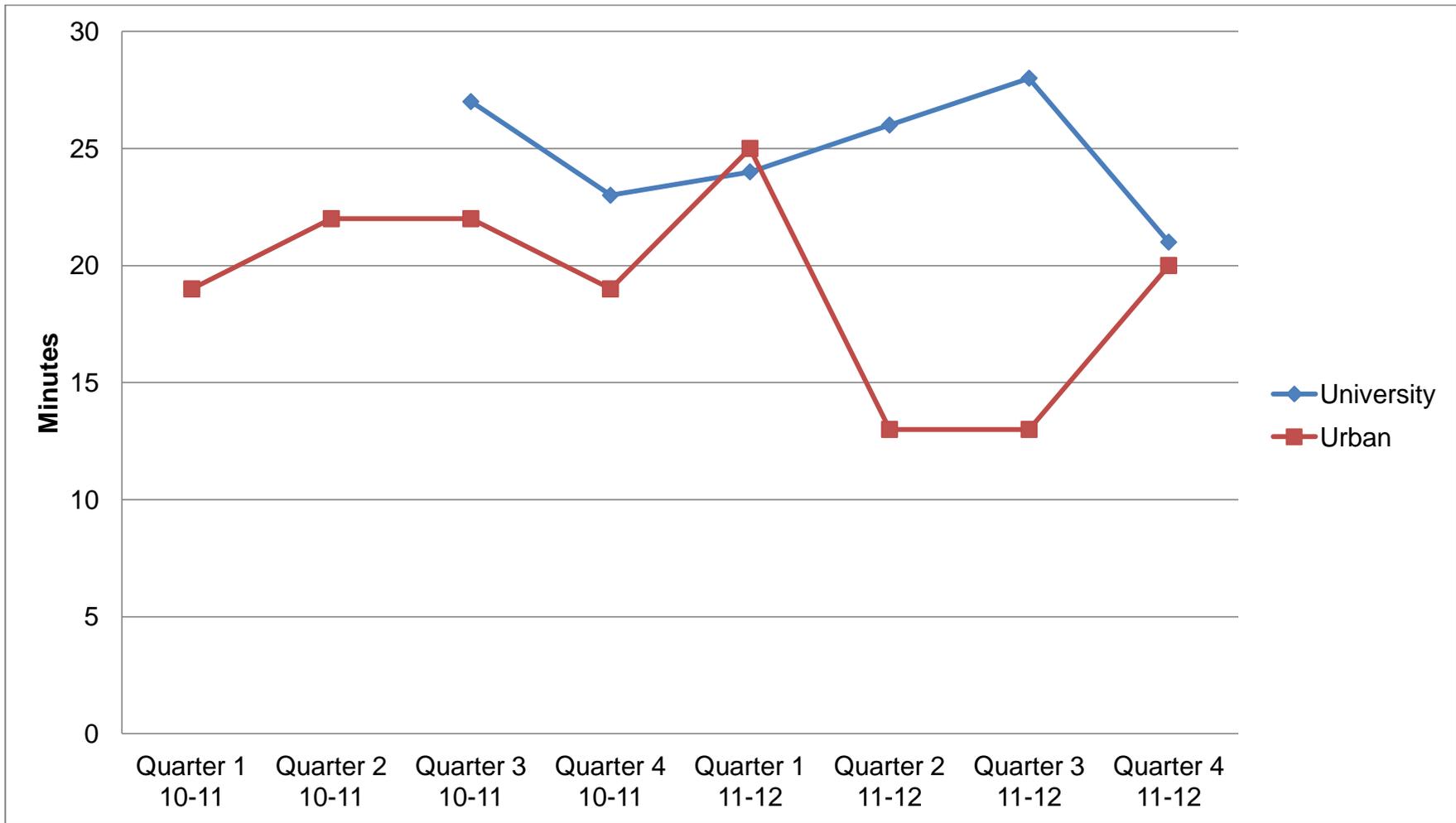


Figure 6 Line graph to show baseline quarterly figures of the median **Gap time** (See Table 1 for definition) for Urban and University Trusts.

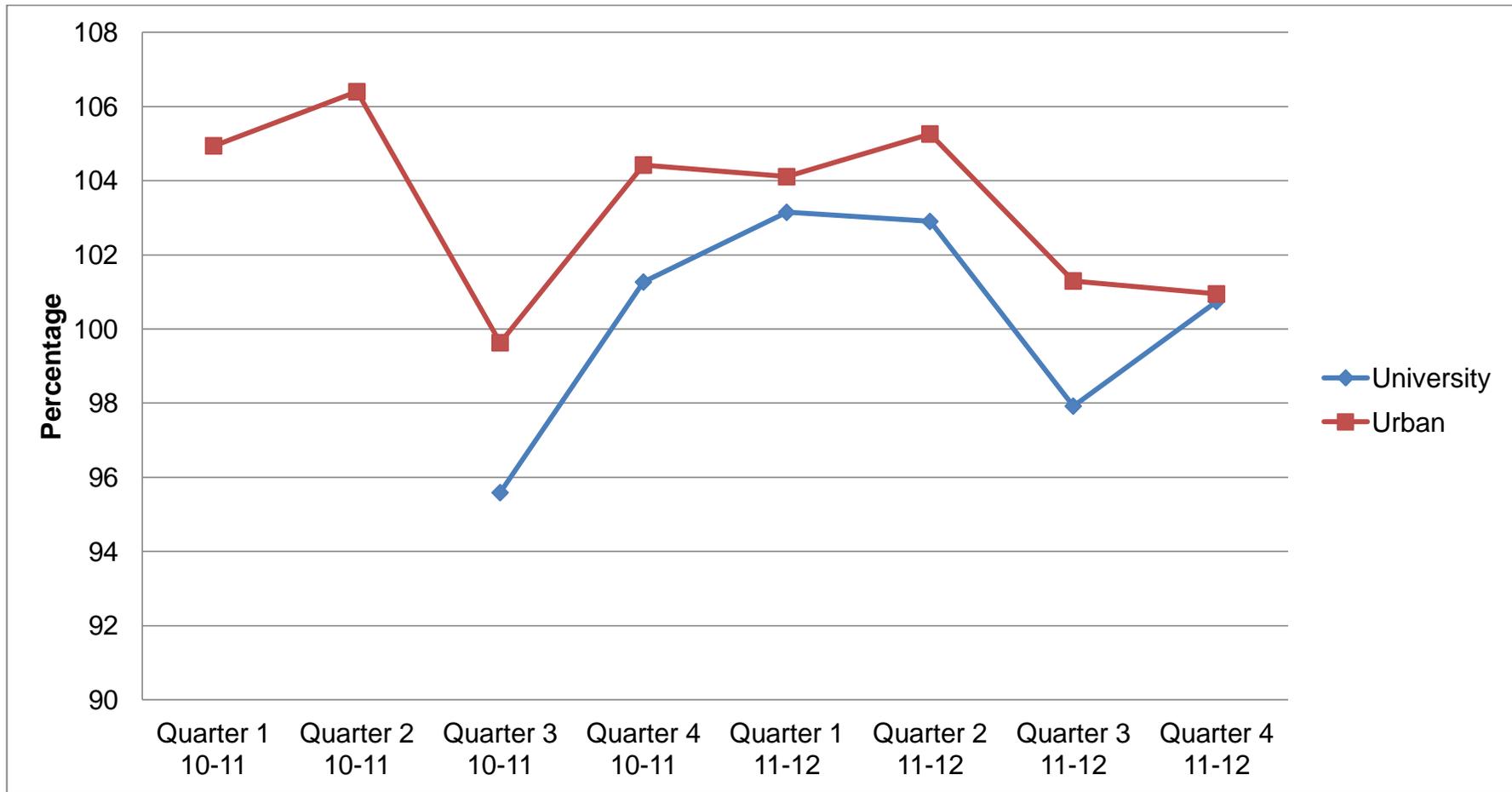


Figure 7 Line graph to show baseline quarterly percentage figures for **Theatre utilisation** as calculated by method 1 (See Table 1 for definition) for Urban and University Trust.

## **Interpretation of Quantitative Data- Baseline Phase**

### ***Urban Trust***

This initial quantitative data analysis suggested the colorectal main operating theatres were being used effectively at Urban Trust, as theatre utilisation defined by method 1 had been greater than 100% in seven of the eight quarters prior to baseline interviews (Table 3 and Figure 7). However, deeper analysis showed that nearly 1 in 4 operating lists started late, that more than 1 in 2 operating lists finished late, only a small proportion of lists finished on time (21.1% overall) and that cases were being cancelled (7.6%). A median of 19 minutes of time per list was being lost between cases (Table 3). Some improvement in the number of late starts, late finishes and percentage cancellations were apparent between 2010-2011 and 2011-2012 (see Figures 2,4 and 5), but data from the last quarter prior to baseline interviews (1st January- 31st March 2012) still showed 20.8% of lists started late, 43.4% of lists finished late and 7.2% of cases were cancelled. As a result, despite the initial theatre utilisation figure suggesting theatres were being used effectively, other markers of performance suggested otherwise.

### ***University Trust***

The theatre utilisation figure for all but two quarters was above 100%, with the mean for the six quarters in which data was analysed being 100.7% (Table 4 and Figure 7). This was despite greater than 1 in 2 lists starting late (53%), greater than 1 in 2 lists finishing late (58.1%), over 1 in 10 cases being cancelled (10.1%) and there being a

median gap time of 24 minutes per list (Table 4). Overall only 13.8% of lists finished on time.

Although concern over data accuracy was demonstrated when calculating gap time, these performance indicators (including gap time) had remained relatively stable with no indicator showing any sustained improvement during the 2 years prior to baseline interviews (Figures 2-7). However, theatre utilisation was notably lower in both quarter 3 of 2010/11 and 2011/12 compared to quarters 1,2 and 4 (Figure 7) with the percentage of late starts and the median gap time being notably higher as compared to Urban Trust.

### ***Summary***

Despite the percentage theatre utilisation figure in both trusts suggesting theatres were being used effectively, other markers of performance suggested otherwise.

What emerged from this initial data analysis was that within both trusts:

- the calculated theatre utilisation figure can be misleading if other performance indicators are also not considered.
- the start and finish times of operating lists frequently did not align with planned theatre schedules.
- patients had their operations cancelled.
- there existed time between cases (gap time/ turnaround time) where neither an anaesthetist or surgeon is actively managing or treating a patient.

## Qualitative Results- Baseline Phase

A total of 22 interviews were conducted for the baseline interviews between May and July 2012. 12 interviewees were staff from Urban Trust and 10 from University Trust. The number of interviewees according to job title and trust is shown in Table 5.

<b>Job title</b>	<b>Urban Trust</b>	<b>University Trust</b>
Theatre manager	1	-
Theatre Sister	1	1
Theatre Scrub nurse	1	1
Healthcare assistant (HCA)	-	1
Operating Department Practitioner (ODP)	1	1
Recovery staff	1	1
Orderly (porter)	1	-
Clinical Director	2 (CDS,CDAT)	1
Consultant Colorectal Surgeon	3 (Surgeons A,B,C)	2 (Surgeons A,B)
Consultant Anaesthetist	1 (Anaesthetist A)	2 (Anaesthetist A,B)
<b>Totals</b>	<b>12</b>	<b>10</b>

Table 5 The number of interviewees according to job title and trust (baseline phase).

## **Process of Thematic Analysis (Codes)**

### ***Phase 1-Transcribing***

All 22 interview audio recordings were transcribed by the researcher as described in the methods section using Dragon naturally speaking speech recognition software (Version 11.5 Nuance communications 2011). This transcription approach enabled familiarity of the whole dataset (Phase 1 of thematic analysis) before initial codes were generated (Phase 2) (Braun and Clarke, 2006, Creswell and Plano Clark, 2011, O'Leary, 2010).

### ***Phase 2 - Generating Initial Codes***

The interview schedule itself (Appendix 2) was used as a skeleton for initial code generation. The titles of the initial codes created were:

- Opinions on the way theatres are used
- Factors affecting how theatres are used
- Trust or personal aims
- Data
- References to SLR and SLM
- Trust culture
- Views on trust

Three of these initial codes (Trust culture, Views on trust and References to SLR and SLM ) were not taken directly from the interview schedule (Appendix 2). Instead, they

reflect the first transcript which was coded, in which comments on service line management and on a wider context are made.

The Trust culture code was allocated to extracts which described the managerial approach within the trust:

*'... they[management] can't see it because, they are too self interested in what they think is right rather than what people at the front think is right' (CDS)*

The Views on the trust code was allocated to staff opinions towards the trust in which they worked:

*'... particularly in our trust I would say, I think there is a great track record at taking on initiatives and failing at them' (CDS)*

The references to SLM and SLR code is described in more detail below. However comments on SLM and SLR were initially allocated this code:

*'I don't think service line reporting has got any way near where it should have been in over two and a half years' (CDS)*

All the initial codes listed above were continuously modified and refined as each transcript was analysed, with codes being added, removed or modified as analysis progressed. Coded extracts from all transcripts were repeatedly compared to ensure consistency. Details of codes and how they were refined, to the point in which all

transcripts had been coded, is described in the following section. Illustrative extracts are shown in italics:

### Opinions

This code was allocated to baseline opinions and comments made by interviewees in terms of their perspective on colorectal operating theatre efficiency to achieve one of the study's objectives (see Introduction Chapter: Aims and Objectives):

*'I don't think there are any intrinsic problems within theatre that cause the late starts'* (Consultant anaesthetist A University Trust)

Causes or factors deemed to affect operating theatre utilisation were coded separately (see Factors below).

As a result of answers given to question three and because of follow-up/probing questions during the interview process, a large amount of information/data extracts were labelled with this initial code. This reflects the knowledge gained from the pre-study quantitative data analysis, which suggested that there were issues related to time related performance indicators. Verification and explanations for these findings were sought during interviews (see Tables 3-4 and Figures 2-7). However during analysis, more detailed information was also sought and to aid analysis, extracts labelled with this initial code (Opinion) were subdivided into Opinion sub-codes entitled:

- Overall efficiency
- Starting operating lists
- Finishing operating lists

- Patient cancellations
- Turnaround and transfer

This allowed qualitative data to be more easily integrated and interpreted with quantitative findings.

### Factors

This code was allocated to comments made on what was happening at the time of baseline interviews and neither what had happened in the past nor could happen in the future. Extracts allocated with this code, provided information on which factors at the time of baseline interviews, affected how colorectal operating theatres were being utilised. The majority of these extracts were provided in response to question four of the baseline interview schedule (Appendix 2). The coded extracts frequently related to the patient journey and factors that affected patient flow through the process:

*'... because very often people go down to get patients from the wards, the patient is not ready because the patient is not ready, or there is no nurse to accompanying the patient up to the ward'* (Consultant surgeon C Urban Trust)

Numerous factors were identified as affecting the patient journey:

*'Theatre usage/utilisation is very complex it is a multifactorial model in which many many things can interrupt smooth flow'* (Consultant surgeon A University Trust)

Therefore, extracts initially coded as Factors were subdivided into numerous sub-codes. These were regularly refined, modified and merged as considered appropriate by the researcher. The titles of these sub-codes created after all transcripts had been coded were:

- Bed issues
- Equipment issues
- Patient pathway (ready for theatre)
- Patient pathway (after operation had been completed)
- The planning of operating lists
- Theatre staff factors (including surgeons and anaesthetists)
- Clinical care factors
- Colorectal specific factors
- Cost
- Patient preoperative assessment
- Physical hospital layout
- Resource availability (not beds)
- Specific case issues (during surgery)

Details and examples of extracts allocated these sub-codes are shown in Appendix 8.

#### Trust or personal aims

Data allocated with this code was taken mainly from direct responses to question 6 of the baseline interview schedule (Appendix 2) and was used to determine whether the

aims or mission of different staff groups who affect the use of colorectal theatres aligned:

*'I suppose an institutional level to try and improve theatre efficiency and utilisation overall. With the aim that if we can be better at what we do, we can use less theatre time to do the same thing and therefore save costs.'* (CDAT, Urban Trust)

### Data

Question eight of the interview schedule asked about data collection that was relevant to theatre usage and how it was used. Extracts were therefore initially coded as Data, but it became apparent that besides information on data collection methods and use interviewees commented on data accuracy, on how accessible it was, on how data was fed back and provided overall opinions on the value of data in the context of operating theatres:

*'... unless you have some involvement in the output of that data it's more of a stick rather than a carrot'* (Consultant surgeon B Urban Trust)

Therefore, sub-codes were created and allocated to relevant extracts to reflect these different aspects of 'Data'. These were entitled:

- Thoughts and attitudes
- Collection and accuracy
- How data is used and accessed
- Feedback

### References to SLR&SLM

The first coded transcript included unprompted comments on SLM and reporting (SLR). This code was therefore allocated to these comments and was initially entitled References to SLR and SLM. Deliberately, the interview schedule did not include a direct question on SLM, as the researcher was looking to determine if this process, would be mentioned unprompted by interviewees in the context of how operating theatres were used. Significantly, the interviewee (CDS) who referenced SLM was a member of the SLM implementation group at Urban Trust. No other interviewee referenced SLM directly, with those who were asked whether they had heard of the process showing no awareness of its existence:

*'It sounds like a question that I ought to know the answer to and I don't think I do. So I think I'll have to say I don't think I have come across that.'* (Consultant surgeon A, University Trust)

As the aim of this study was to determine if, how and why SLM implementation affected the way operating theatres were utilised, extracts that related to the four key areas of SLM were sought and coded in all transcripts. This was to enable a baseline level of SLM implementation to be determined and enable comparisons to be made with follow up interviews. Therefore, the title of this code was changed to Inferences to SLR&SLM, with extracts relevant to SLM (e.g. on organisational structure) being allocated this code:

*'It would make more sense if anaesthesia and surgery were all in the same division so we are all pulling together'* (Consultant anaesthetist A University Trust)

### ***Further codes***

As all transcripts were coded and analysed, further codes were added to the coding matrix to ensure appropriate labelling of extracts. These further codes are described below:

#### Process of change

Comments emerged from interviewees describing how changes were made within their trust and their attitude to these change processes. Some comments were historical and provided a sense of trust culture, while others described ongoing change processes unrelated to SLM, which the researcher needed to be aware of as part of the evaluation process:

*'... it is a transformation programme and so the timelines will be short'* (Theatre manager Urban Trust)

#### Ward factors

A small number of comments did not fit into any previously described Factor code or sub-code, but did describe factors related to the wards that affected the patient journey and therefore how operating theatres were used. Having not interviewed ward staff as part of this study, this information did not represent a balanced viewpoint and so was interpreted with caution and considered separately to the factor sub-codes described above. However, the information obtained did demonstrate some interviewees perception of ward issues:

*'... the ward doesn't seem to know basically what is happening with the patients'* (Recovery nurse University trust)

### Attitude to management

This code was created due to comments made by surgeons at both Urban and University Trusts regarding managers and the surgeon's attitude towards them. As successful SLM implementation is considered to require an effective engaged service line team, these extracts were considered important when considering SLM's effect on operating theatres:

*'There are hospitals where your lists are predetermined for you. Managers select and put patients on the list. Here we don't do that, here the control of the list is still within the operating surgeons hands. I think it's a bad idea to move it out of the operating surgeon's hands, into some non clinical person's hands, because they do not have a clue.'* (Consultant surgeon C Urban Trust)

### **Process to ensure Reproducible Coding**

Following initial generation of the code framework described above, the process to improve reproducibility and overall validity of findings described within the methods chapter (Methods Chapter:Process to ensure Reproducible Coding) was completed prior to starting further analysis.

### **Formation of Frameworks**

Further baseline analysis (see Methods Chapter: Methods of Qualitative Analysis: Formation of Analytical Frameworks- Baseline Phase) focussed on baseline interview schedule objectives (Methods Chapter: Qualitative Research Methods: Objectives of

Interview schedule-Baseline Phase). Extracts allocated a sub code of the Opinion or Factor codes were interpreted and summarised to help explain baseline quantitative findings. However, extracts allocated the code or sub code of Data, Attitude to management, Views on trust, Trust culture, Trust or personal aims and the Inferences to SLM &SLR codes were interpreted and summarised to enable information relevant to the four main elements of SLM (organisational structure, performance management, information management, strategy and planning) to emerge.

Summaries of the Opinions codes and on the codes relevant to SLM were entered into a framework (Microsoft excel 2007 spreadsheet) according to interviewee. As factors that affected how operating theatres were utilised related to different elements of the patient journey, extracts were collated and analysed according to these elements (Appendix 6).

### ***Initial Reports- Baseline Phase***

Following construction of these analytical frameworks, initial reports were written in combination with observational findings as described in the methods chapter (Methods Chapter: Initial Reports-Baseline Phase).

### **Defining and Naming Themes (Phase 5)**

During and following completion of these initial reports, information/findings relevant to potential themes were considered and collated. Initial reports were therefore merged and edited, which prevented repetition and allowed the overall picture of each theme to be presented.

As reports were written and to strengthen explanations of findings, information allocated to three initial themes (Engagement, Complexity and Unpredictability) were merged with two others (Separation / Disconnection and Control). The titles of themes and the information they incorporated was:

- Value of Data
  - Majority of information was incorporated from both the data code and sub codes, with the theme also incorporating information relevant to performance and information management.
- Communication
  - incorporated information on communication between staff and departments that affected the patient journey, but also on how information technology was used to communicate information.

- Planning
  - incorporated information on scheduling and planning of operating lists, pre-operative assessment and equipment issues.
- Control
  - incorporated information on interviewee's opinions on their degree of control over either predictable or unpredictable factors which affected theatre utilisation, and on relevant elements of organisational structure.
- Capacity and Resources
  - incorporated information relevant to bed and staffing issues and hospital layout.
- Separation/ Disconnection
  - incorporated information on organisational structure, interviewee autonomy and how this affected interaction between staff groups.
- Cost and Finance
  - incorporated information on the use of financial information within operating theatres.

Planning was a theme that emerged mainly from Urban Trust data and although planning elements were mentioned by interviewees at University Trust this was not a focus of responses. Consequently, the theme entitled Planning is only reported below for Urban Trust.

The seven themes listed above provide the structure for the reports presented in the following section with each trust being considered separately. A background to Urban and University Trusts operating theatres is presented first with summary

points being made following reports on each theme. Summary points of all baseline findings according to themes and trust can also be found in Appendix 9.

The majority of illustrative extracts (indented and in italics) used throughout the presentation of the following qualitative findings reflect the consensus view provided by interviewees in each trust. Topics in which a consensus was not apparent, in which interviewees disagreed or in which only one or two interviewees commented is stated within the text.

## **Baseline Qualitative Reports: Themes**

### **Background**

#### ***Urban Trust***

Urban trust had three areas where patients for elective colorectal surgery were admitted. This included a ward for elective admissions and a short stay ward for patients who were likely to stay no more than one night. The Day-case unit was also used, although patients undergoing surgery in main theatres were only asked to wait there if no beds were available on an appropriate ward.

The intention was to commence both morning or all day operating lists at nine o'clock, with a directive having been made for theatre staff to send for the first patient at 8:45am. All patients were advised to arrive at 8am on the day of surgery for either a morning or all day operating list, which gave 40 minutes for nurses, anaesthetists and surgeons to complete tasks not completed as part of pre-assessment.

## Layout

The main colorectal theatres were on the third floor with both the main admission and short stay wards being on the second floor in the same hospital block. The Day-case unit was in another hospital block at the other end of the hospital.

## ***University Trust***

Elective colorectal surgery patients were admitted to three separate areas within the hospital, dependent upon bed availability and whether patients were likely to require a long period of inpatient stay.

## Layout

Patients who would require an inpatient stay were received by two wards either pre-operatively, if a bed was available on the morning of surgery, or post-operatively if a bed became available. Both these wards were on the seventh floor and were directly above the second floor main operating theatres.

The Admissions unit was another area where patients were admitted on the day of surgery. This area was located along the corridor on the same floor (second floor) as the main operating theatres. Patients who did not have a bed available on the day of surgery were directed to this area and prepared for theatre, with the hope that a post-operative bed would become available for them.

The Ambulatory care unit was another path of admission again only on the day of surgery. This unit was used for day case procedures or patients who required an overnight stay, therefore patients could return to this unit post-operatively. It was situated on the ground floor directly below main theatres.

## Value of Data

### ***Urban Trust***

Discrepancies in opinions on overall operating theatre efficiency were expressed. Various causes for inefficiencies were described by all interviewees with the majority feeling that operating theatres were inefficient and needed to be used more efficiently:

*'Theatres are used eight hours out of 24, five days of the week, most of them. That is not necessarily an efficient and effective way to use a very expensive piece of real estate. Theatres are not necessarily efficiently used when they are working'* (Consultant surgeon A)

These inefficiencies were highlighted further by comments made on operating lists starting late and not finishing on time, yet despite these timing parameters being different from those planned, theatre utilisation could still be acceptable. This was supported by baseline quantitative findings (Table 3, Figures 2-7) with theatre utilisation averaging at 103.1%, despite 24.7% starting late and only 21.1% finishing on time:

*'I do have some overruns and have some under runs but the overall utilisation I think is pretty good and there is some evidence for that'* (Consultant surgeon A)

Despite inefficiencies, weekend waiting list initiatives which provided both financial and time incentives were described to positively impact on how operating theatres were used. Although baseline quantitative data showed only 2/424 operating lists to have taken place at a weekend, one of these lists, which completed seven cases and

finished early, had a theatre utilisation figure of only 65.7%. Consequently, an operating list that is considered to be and appears to be efficiently used, is according to the current method of measuring theatre utilisation poorly utilised:

*'... if you look at a waiting list initiative run at a weekend, the incentive is people are paid more, when they're finished they can go home early and they work harder'* (Clinical director of general surgery (CDS))

Within operating theatres, data on theatre timings was collected using the ORMIS information system. This system did not collect financial information, but timings could be used to calculate quantitative measures. Performance was not being actively managed using this information despite measures of performance, (e.g. number of overruns) occasionally being displayed on boards and utilisation reports being accessible on trust intranet dashboards (Clinical data archive (CDA)). Whilst such reports were accessible, interviewees explained that no direct feedback on performance was given, unless there was a problem:

*'It is not brought up at a meeting as such, unless it is bad and then people are told sort of thing to be more careful and get everything sorted.'* (Recovery nurse)

*'... you can go out and find on CDA your theatre utilisation figures ... but it's not fed back to you on a regular basis in a formal way saying this is your theatre utilisation '* (Consultant surgeon C)

Despite a theatre manager considering the current data collected to be to be more accurate than it was in the past, the accuracy, reliability and value of theatre reports was disputed by others. The CDS for example considered reports to be of little value

and reflect the corporate/ high managerial view, while others considered the data to be informative and useful to know. Despite such contradictions, what was clear was that theatre utilisation data was not affecting or changing behaviour. This was largely due to no structure existing to enable front-line staff to modify theatre timings/performance indicators:

*'... there is no mechanism or channel or lines of communication of how I may change you know, affect that data.'* (Consultant surgeon B)

*'No not really it [data] doesn't change anything so therefore, you know, it's no affect on anything I do, it's not particularly useful.'* (Consultant surgeon A)

*'The ORMIS system is meant to provide us with theatre rapports, however it is very limited into start time, finish time, numbers of cases ... it's a trust dashboard which is setup to keep the exec team happy but actually has no relevance to the directorate itself '* (CDS)

The conclusions from the above analysis indicate that:

- colorectal operating theatres were considered inefficient
- theatre timing performance indicators were of limited value to interviewees
- data was accessible
- data was not being used effectively to change interviewee behaviour or performance

### ***University Trust***

Despite the baseline theatre utilisation figure being greater than 100% (Table 4), operating theatres, similar to Urban Trust, were not considered to be efficient. The

view of inefficiency was however reflected by other baseline quantitative findings, with finish times and particularly late starts being an issue (Table 4, Figures 2,3&4):

*'... there are definite areas within theatres that could do with looking at and to make it more efficient and to get more patients done during the day, not overrunning, all that sort of thing.'* (ODP)

The data collected on theatre timings was entered into the Galaxy information system by theatre staff. However theatre staff interviewed described no feedback of data unless there was a problem, with them not knowing how the data was used or how it could be accessed. Colorectal surgeon A did describe how aspects of theatre utilisation were discussed, although the same surgeon did not consider surgeons to control theatre processes or to be in a position to affect the data. Similar to Urban Trust, theatre timing information was not being used to affect front-line staff performance or behaviour:

*'I know we put all the information in and it just goes away somewhere but I don't know exactly what they do with it'* (ODP)

*'... the only time we are really spoken to is if we've done something wrong or things aren't going right'* (ODP)

*'I would say further that surgeons have a very limited role in the running of theatres. And the reason is that they are only part-time theatre users the full-time theatre users are the theatre staff and the anaesthetists and surgeons dive in and out of theatre ... in fact they [surgeons] are peripatetic users of theatre facilities.'* (Consultant surgeon A)

Accuracy and reliability of recorded theatre timings was questioned, with published operating lists (theatre sheets) compiled from data entered into the Galaxy system, being disputed. These theatre sheets were useful, to recovery staff, as they used them to prepare for expected patient throughput. They were not considered accurate or reliable by other members of staff, with the stated patient location and predicted procedure times often being very inaccurate. Consequently even if operating lists were predicted to finish late, changes to operating lists that could prevent this happening were not always made:

*'I don't really get what they're doing with it ... they are taking all this down on Galaxy about how long the procedures take, how long the anaesthetics take, ... yet it doesn't seem to bare any relevance to reality really.'* (ODP)

*'... the anaesthetist or somebody will e-mail me or something and say this comes up as finishing late and then I will look at it. Usually, like the other day it was saying I was going to finish at eight o'clock, but I looked at it and it said an inguinal hernia was going to take three hours, which clearly isn't the case. I think the list ran half an hour late or something, but it wasn't excessively late.'*  
(Clinical director)

The conclusions from the above analysis indicate that:

- colorectal operating theatres were considered inefficient
- data collected was not accessible or reliable
- data was not being used effectively to change interviewee behaviour or performance

## Communication

### *Urban Trust*

Patient cancellations were described to occur, supporting presented quantitative findings (Table 3 and Figure 5). However, they were not considered to happen frequently with a theatre sister believing that the planning of operating lists by surgeons had improved. Despite this statement cases taking longer than expected and other unpredictable patient related factors could have contributed to cases being cancelled. Furthermore, a theatre manager considered a lack of communication between staff groups involved in pre-operative assessment and in the planning of operating lists to be partially responsible:

*'We have people that are cancelled because of mishaps at pre-assessment, poor communication. We also lose people occasionally because of something like a latex allergy... which is sad because it's avoidable. There's occasionally a blip that you need a specialist piece of equipment or something like that we can't have. Again communication has probably broken down.'* (Theatre manager)

Knowing what equipment and having equipment readily available for an operation (especially laparoscopic kit) was considered important, with effective communication during team meetings indicated as being helpful to theatre staff preparing for individual cases/ patients. Nevertheless, delays were still described to occur during an operation, as time was spent looking for equipment; poor communication prior to surgery, may have contributed to these delays:

*'... team meeting first, if that runs smoothly with everybody there who's supposed to be there, everybody knows what's expected any problems with patients. If that runs and goes according to plan then we can bring the first patient up and if it follows nice and smooth, there's no problems'* (Recovery nurse)

*'... a major issue at least it is, the surgeons flag it up to me, is what kits available. Depending on some teams that falls into the predictable or unpredictable because they may not have actually let the rest of the theatre team know that they expecting to use a piece of kit'* (Consultant anaesthetist A)

The conclusions from the above analysis indicate:

- poor communication and knowledge transfer between staff groups could cause delay throughout the patient journey
- staff groups involved in the patient journey were disconnected and not always working as an effective team

### ***University Trust***

A lack of bed availability/capacity on the morning of surgery was considered by interviewees as an uncontrollable but major issue affecting operating list start times. If no bed was available on the main wards, patients would be asked to go to the Admissions unit. Operating lists were published prior to the day of surgery and used to communicate planned admission locations of elective patients. If changes to these locations were made but not communicated, surgeons and anaesthetists could spend time looking for patients on the morning of surgery, causing delay:

*'... listed on the ward sheet, theatre sheet sorry... as being on ward [name] actually if you go look for them they are not there and then they're in the Admissions unit ... So you need time to walk down there and then find your patient ... So that does delay the process'* (Consultant anaesthetist B)

Managerial meetings which did not include interviewees, were described to take place in which bed issues were discussed. As these meetings did not finish until between 9 and 9:15am, with the outcome not being known until after operating lists were planned to start, some cases were commenced prior to bed availability being known. Evidently communication between managers and theatre staff was important in starting operating lists and minimising delays:

*'I have to say here at the moment it's a bit of organised chaos in that you don't know for definite you are going to have the beds to do the patients until you've already started the cases ... The communication isn't great because they don't do the bed meeting till about nine, you don't know, you assume there will be enough beds.'* (Clinical director)

The number of staff within the recovery area was described to affect the way the recovery area ran, with the trust at the time of baseline interviews aiming to increase recovery staff numbers. It was believed doing so would improve patient flow and minimise turnaround time, as it was felt recovery staff would be able to communicate more effectively with theatre staff and have more time to collect and transfer patients themselves. Communication being considered key:

*'So it's just communication from theatres because sometimes there seems to be, even though we're all part of the same department, it seems to be like theatres and then recovery, it is a little bit separate'* (Recovery nurse)

The conclusions from the above analysis indicate that:

- information communicated via published operating lists was unreliable
- lack of effective communication negatively impacted patient flow
- managers, theatre staff and recovery staff were disconnected and not always working as an effective team

## **Planning**

### ***Urban Trust***

It was acknowledged that operating lists sometimes started late, supporting the baseline quantitative findings (Table 3, Figure 2), although, the scale of the problem was disputed. What became apparent was that tasks not completed as part of pre-assessment had to be completed on the morning of surgery by various different health care professionals. This was considered difficult to achieve with surgeons, anaesthetists and ward staff all individually wanting to complete different tasks simultaneously. Consequently, before the planned start time, there was numerous tasks to complete and therefore numerous opportunities for delays to occur:

*'I think late starts is a problem that is often, it is so multi-factorial ... for example this morning there is no bed available so I am trying you know, organise finding a bed for patients to consent them ... Sometimes it is*

*anaesthetic dependent ... Again in theatres you know turn up to do time out and try to find the appropriate team members to do that can often delay things. So it's so difficult to pinpoint because it can be a different problem on a different day' (Consultant surgeon B)*

Patients were also described to sometimes arrive late, which did not help the process of completing these tasks and could lead to the planned order of the operating list being changed. This also caused delay, as having a list order that was correct enabled ward staff to prioritise getting the first patient ready and enabled theatre staff to prepare equipment and plan for the correct operation:

*'... if you change something that has to cascade through each member of the theatre team and there will be inherent delays as it's cascaded and people need to change tack, people don't change tack seamlessly. So, on average if you make a significant change to the start of the list you incur at least a 20 to 30 min delay' (CDS)*

The operating list planning process was also considered influential on list finish times, although it was accepted that procedure duration was difficult to predict. Consequently, operating list finish times, as supported by quantitative findings (Table 3, Figures 3-4), were variable with some lists finishing early and others finishing late:

*'... if you find yourself sort of finishing early very frequently, then that's a problem with not designing an appropriate list, or if you finish too late or you've overrun your list, that's also a problem with loading the list with too much' (Consultant surgeon C)*

*'... you get some cases they take a bit longer than anticipated and it only takes one of those cases to run on a bit and then you're looking at an overrun'*

(ODP)

The staff skill mix was also considered important, however theatre lists were not finalised before the previous day, which made planning resources difficult. This lack of time to plan meant that at times there were either not enough senior staff allocated, or that staff were performing tasks which less skilled staff could do:

*'... at the moment the lockdown time for a list is two o'clock the day before. So that doesn't give you very long to get any specialist equipment or to ensure that you have the right skill mix.'* (Theatre manager)

The conclusions from the above analysis indicate:

- unpredictability of procedure times made planning of operating lists difficult
- lack of planning could cause delay throughout the patient journey

## **Control**

### ***UrbanTrust***

The focus to improve late starts was put onto theatre staff, with them being told to send for the first patient at 8:40am and collect the patient from the ward themselves. Whilst it was their responsibility to ensure the operating theatre was equipped and prepared for the first case to start, they were not involved in patient pre-assessment, nor was it their responsibility to complete ward tasks or ensure beds were available.

Therefore, certain factors that affected start times and how operating theatres were used were not considered controllable by interviewees:

*'Start times we generally try to start on time, sometimes that is out of our control like shortage of beds in the morning or patient is not coming up, or in on time, or they are not prepared.'* (Theatre sister)

*'I am trying to be efficient all the time as is the rest of my team, you know. If it's not efficient then I don't really see that it's because of anything that I'm doing wrong, it's because of the system as a whole.'* (ODP)

*'... most of what happens with the patient pathway and the way theatres are run is not under my control and there's not much influence I have on it on a day-to-day basis.'* (Consultant surgeon A)

Colorectal surgeons controlled the planning of operating lists and along with anaesthetists were willing to stay late, finish cases and minimise cancellations, with theatre staff also acknowledging that once a case had started it had to be finished. However, as theatre staff worked specific shifts and had less flexible working hours than anaesthetists and surgeons, the unpredictability/ lack of control theatre staff had over finish times could create difficulties, especially as colorectal lists regularly overran (51.1% (Table 3, Figure 4)):

*'if the staff are in that theatre that traditionally overruns, they tend to get quite disillusioned, which means that when you are getting to a point at which you probably could squeeze in a case ... you are met with fairly solid resistance'* (Consultant anaesthetist A).

*'if you looked at operating lists, most of them, surgeons, anaesthetists would prefer to work through a list and come to, and finish all the cases, whereas nurses have got set break's and things. So there in lies a problem'* (Consultant surgeon C)

The conclusions from the above analysis indicate that:

- planning processes did not involve all staff groups who managed colorectal surgical patients
- conflict in staff shift patterns could impact on how operating theatres were used
- interviewees did not feel they had control over processes that affected how colorectal operating theatres were used

### **University Trust**

Interviewees described being able to start operating lists on time as a major problem. This was supported by baseline quantitative findings, with the overall late starts percentage (53%) being more than twice that of Urban Trust (24.7%) (Table 3, 4 and Figure 2). This was reflected by interviewees who considered starting as the worst part of the day, with long patient transfer times being considered an important explanation for the problem. However, the length of time taken was not considered to be controllable by interviewees, as the time taken for transfers was affected by the size of the hospital and where the patient was coming from:

*'I think one of, the commonest cause of a late start is the delay in getting a patient to theatre ... One factor is that all the patients are on a different floor so they involve a vertical journey in a lift as well as a horizontal journey. It's a big*

*long hospital, it's quite a long way away from one end to the other, some of the surgical wards are the other end from theatres'* (Consultant anaesthetist A)

Nevertheless, once a patient arrived in the operating theatres it was considered that processes ran reasonably well. Inefficiencies that affected patient flow, were mainly considered to be outside of interviewees control or area of work:

*'I feel like from the ward to theatre actually into the anaesthetic room, is on a daily basis is a constant battle all the time... I know you are going to have hiccups along the way but it is a big problem, it 's very frustrating for everybody'* (HCA)

*'... we are no doubt inefficient ... But I see largely the problems caused within theatre are extrinsic to theatre, so there delays are outside of our control'*  
(Consultant anaesthetist A)

Two colorectal surgeons who also considered patient flow to be out of their control, acknowledged that the process/ patient journey was complex and that there were lots of factors to control if operating theatre efficiency was to be improved:

*'Theatre usage/utilisation is very complex it is a multifactorial model in which many many things can interrupt smooth flow, from unexpected complexity in the procedure/in doing the operation is an obvious one. But actually day-to-day the real ones are bed availability, patient availability, house officer off sick, nursing staff levels, Porter availability to get the patient to theatre, ODA, theatre staff there are many many factors.'* (Consultant surgeon A)

Patient cancellations were not considered to happen very often although they were acknowledged to occur, with baseline quantitative data having shown 1 in 10 patients (10.1%) being cancelled (Table 4, Figure 5). Delays earlier in the day, a lack of bed capacity and unexpected difficulties during an operation explained why. Whilst theatre staff did not want to cancel cases, they frequently felt obligated to work later than their shift finish time to prevent this from happening:

*'It's like being forced to do overtime because normally if, if the anaesthetist agrees to stay on to the end, to the end of the list, then we feel obliged to also agree to stay on as well, because if we then say we can't stay, there is a surgeon there is an anaesthetist the onus is on us. Then we just feel like, we can't have a patient not have their operation having been starved all day to go home. So we feel compelled to stay.'* (Scrub nurse)

Similarly to Urban Trust, the fact theatre staff worked in theatres most days and that operating lists frequently finished later than fixed shift patterns (58.1%- Table 4 and Figure 4), meant theatre staff felt discontent:

*'... they are not happy obviously they are not happy to be doing overruns because surgeons are visitors once-a-day in our theatres but the staff are there five days a week working with different surgeons all the time and we could be working over five days a week as well and to me it is not fair for the staff'* (Theatre sister)

Despite this, the same theatre sister felt working relationships were good. However not all theatre staff agreed with an ODP feeling powerless and unhappy:

*'I think our theatres are very surgeon led and the management is very obliging to the surgeons as it were, so what we feel and what we want is pretty much, not of that much interest as it were.'* (ODP)

The conclusions from the above analysis indicate that:

- theatre utilisation was very complex
- theatre staff felt disconnected and powerless
- interviewees did not feel they had control over processes that affected how colorectal operating theatres were used

## **Capacity and Resources**

### ***Urban Trust***

A lack of bed availability on the morning of surgery was considered to affect operating list start times. This led to patients being moved unpredictably, and sometimes inappropriately, to the short stay ward or the Day-unit rather than being admitted onto the main elective ward. If patients were admitted onto the main elective ward, a lack of ward nurses to prepare patients for theatre was also considered an important cause for delay, with ward staff having other surgical patients to care for:

*'... people tend to be scheduled to come in on the day of surgery and it's chaos on the wards. Generally due to staffing issues with the nurses who I don't think there necessarily enough of them... to allow patients to come in and be seen and preped and got ready for surgery.'* (Consultant anaesthetist A)

The transferring of patients was also considered to be a problem, with porter/ orderly staff availability, physical hospital layout and ward staff shortages all being considered responsible for delays. However, as ward staff were supposed to accompany patients to and from the operating theatres, their availability was described to affect transferring of patients the most:

*'That is the main problem in the elective area it's getting the patients down and getting them back. Quite often you can't get them back because often they haven't got a nurse to release to come and collect the patient which means you quite often get a delay starting the next one.'* (ODP)

*'... we realise now that the ward staff expect us to not only fetch the patient in the morning but take all the patients back to the ward once they are recovered. Which sometimes, you know, it's really difficult. If we don't take the patient back we are there waiting 15 min, half an hour or more'* (Theatre sister)

Staffing levels within theatre were also described to affect how operating theatres were utilised with baseline staffing levels considered to be tight. Although considered expensive, extra staffing was also sometimes required for evenings and overruns. Despite operating theatres occasionally being short staffed, theatre staff tried to minimise delays by missing breaks, although there were occasions when operating lists would stop to enable people to have lunch:

*'We try and manage possibly with less people than we should do but to keep the list going. We will go out of our way you know and carry on.'* (Theatre sister)

The conclusions from the above analysis indicate that:

- bed capacity could affect operating list start times
- staffing capacity on the wards was affecting start times and patient transfers
- staffing levels in theatre could affect how well operating theatres were used
- interviewees could not affect the capacity issues that affected how operating theatres were used

### ***University Trust***

As highlighted above, patients not being ready for theatre was described as an important cause for delay, with a shortage of ward nursing staff, similarly to Urban Trust, being considered partially responsible and therefore an issue theatre staff could not affect:

*'One of the biggest delays that we have is first thing in the morning, the patient not ready for theatre, for whatever reason' (Scrub nurse)*

*'There just doesn't seem to be enough nurses ... There should have more staff, maybe more staff on an early shift, to get the first cases on the list ready for theatre, because quite frequently they are just not ready.'* (Consultant anaesthetist A)

It was acknowledged that ward nursing staff had other patients to care for, other problems to manage and therefore other concerns than just preparing patients for theatre:

*'... for them [patients] to leave the ward they need to be ready and they need to be checked off and that needs to be done by the nurses and the nurses are*

*often doing other things and they may or may not regard getting a patient ready for theatre as high on their list of priorities'* (Clinical director)

Further problems were described when staff found patients on the Admissions unit, with many arriving from different surgical specialties at similar times. This meant the capacity/room required to see patients was limited, meaning tasks took longer to complete than was necessary:

*'... the Admissions unit that we have, there is not enough beds, so what you find is that the nurses on Admissions unit want to see the patient, the doctors want to see the patient ... And we all there queuing literally queuing to see the same patient'* (Consultant surgeon B)

The setup of the Admissions unit was therefore not considered ideal, especially as patients could not return there after surgery. This meant the unit did not solve the lack of bed capacity, as other patients still needed to be discharged from the main wards, before a bed space became available:

*'The admissions block as I see, has been a quick fix solution I think to try and get patients into the hospital who need an operation, it doesn't actually solve the crux of the problem which is the discharge of patients out, to free up a bed for them to go into'* (Consultant anaesthetist A)

The turnaround time between cases was considered to be reasonable, as despite the long transfer times, patients were sent for in advance to minimise delay. Difficulties arose following surgery when trying to transfer patients back to either the ward or intensive care from the recovery area, as beds were often not available or ward staff were too busy to collect patients. Communication between recovery staff, bed

managers and the ward was therefore considered important to minimise delays. At times, the recovery area had no further capacity, consequently blocking patient flow. This had resulted in patients being recovered within operating theatres, delaying the start of the next case:

*'I think it needs to start even from the ward level, why is it taking so long for a patient to transfer back to the ward to accommodate a patient that is coming through. Potentially what happens sometimes recovery is full and we have to phone theatres and say right we cannot, basically if any patients are coming through you will have to recover them in theatre because recovery is full.'*

(Recovery nurse)

There was an acknowledgement that even if patients were able to go home or move out of intensive care, that there were difficulties in promptly discharging patients. If ward beds were not available an intensive care bed could not be made available either, as intensive care relied upon a ward bed being available to transfer patients into. This knock on bed capacity issue between the wards, intensive care, recovery and operating theatres was considered to regularly affect transfers and therefore patient flow:

*'...the way it works is they [intensive care] know the patient is coming through the system but they are waiting for a patient to step down back to the ward ... it is like a chain of events that has to happen because a lot of it as well is when I ring they are saying it is not us we are waiting for the ward'* (Recovery nurse)

If ward beds were available, ward nurses were expected to collect patients from recovery, but they may not have been able to do so immediately. Consequently, recovery staff would communicate with ward staff and sometimes transfer patients to the ward themselves, although this process did not always work efficiently and could cause the recovery area to be short of staff:

*'... if they are really short staffed then we take the patient back to the ward ...  
But then you have, there are different issues within that as well, because  
sometimes you are going upstairs and then even though they know we are  
bringing the patient then that nurse isn't available for you to handover to.'*  
(Recovery nurse)

The conclusions from the above analysis indicate that:

- bed capacity was a major problem that affected start times and patient flow throughout the day
- staffing capacity on the wards affected start times and the transferring of patients out of recovery
- interviewees could not affect the capacity issues that affected how operating theatres were used

## **Separation/ Disconnection**

### ***Urban Trust***

Urban trust was not organised into a service line structure that was orientated around operating theatres, with Colorectal surgery having a different budget and being part of a different directorate than Anaesthesia and Theatres. A theatre manager also

explained how staff groups worked independently from each other, that operating theatres were separate from the hospital and that managers at a higher level may have criticised performance, but did not enquire about root causes of poor performance. Boundaries between staff groups were described to affect team-working:

*'I think everybody within hospitals works in silos so actually you never see, there's not a whole team approach to something like formulating an operating list.'* (Theatre manager)

*'... to some degree theatres is behind a closed door and people will step away rather than come and I won't say challenge us because we do get slated, but they don't want to know the finer details of beyond here.'* (Theatre manager)

Urban Trusts structure was also not considered to give front-line staff responsibility, nor enable them to make decisions and implement efficiency changes in their department. The CDS believed that this was because the trust was not willing to devolve responsibility and give directorates ownership/ control of projects; decisions were considered to be made at a high managerial level and led to unexpected consequences:

*'... they are just going to turn up to work do what they have been asked to do and go home again and sod it, I'm not responsible and that's part of the problem of the NHS, there's no level of responsibility down at the bottom to say this is our department, this is how we make it better'* (CDS)

However, although interviewees neither felt in control nor to have responsibility, an interest was shown amongst different interviewees to engage with change processes:

*'In terms of the staff within theatres again, it would be nice if everybody had more involvement in how to improve you know on a day-to-day basis, what's going on ... I don't think that's actually with the front-line staff you know they are not particularly empowered to do that.'* (Consultant surgeon B)

A theatre transformation project team, including the CDAT and theatre manager interviewed in this study, had been formed to make cost savings. No other interviewees were involved, with the team having been set up independently of SLM. The main aim/drive expressed was to make cost savings by improving, quality, safety and theatre efficiency/utilisation, but due to the national economic climate, the cost saving targets were considered priority and imposed from higher up in the trust's management structure:

*'The party line is that we are in improving quality and safety but it's saving money'* (CDAT)

Further clinical separation in planning processes was highlighted by the CDS, who explained that front-line staff would be told what changes were to happen, rather than having any control or involvement in the change process themselves:

*'I think the trust would like theatres to be utilised more efficiently. I'm sort of watching on the sidelines to see which way the trust will go because they could go in several directions ... they might say these are your theatre*

*sessions use them every week or lose them. They may say we just want each session filled ' (CDS)*

The conclusions from the above analysis indicate that:

- the organisational structure did not facilitate the utilisation of colorectal operating theatres
- traditional boundaries affected staff group collaboration
- front line staff were not empowered
- decision rights were not devolved to interviewees

### ***University Trust***

No interviewee at University Trust commented on service line management (SLM) directly, with none being aware of the process if specifically asked. This showed a lack of interviewee involvement in the development of the patient level costing system (PLICS) and any intended SLM implementation process at the time of baseline interviews.

This separation/ disconnection was reflected by the organisational structure which was not built into service lines around the use of operating theatres. Instead it was considered that the trust was arbitrarily subdivided, with surgery and anaesthesia being in different divisions having separate clinical leadership, separate funding and making separate decisions. This divisional separation meant surgery and anaesthesia were not considered to be working together to improve perioperative services:

*'... it would make a lot of sense for hospitals to design their processes around theatre utilisation and if you look at divisional structure in hospitals that mitigates against it because you've got different components of theatre utilisation in different divisions. So, they are not controlled by one organisation and they are therefore competing.'* (Consultant surgeon A)

*'... we should have a director of perioperative services, who is quite high up the chain at the level of chief operating officer or just below, but can then oversee all the various aspects of theatre management, on the wards, outpatients, everywhere, and has the clout to actually do something about it. I don't believe at the moment we can manage it effectively the way the trust is structured'* (Consultant anaesthetist A)

Clinical engagement with managerial processes or issues varied, although there was a general acknowledgement that operating theatres were an expensive resource and that they should be used cost-effectively. Again, separation of theatres within the trusts structure was considered to hinder change processes:

*'It is the most expensive component in the hospital machine, I understand and as such it would make a lot of sense for hospitals to design their processes around theatre utilisation '* (Consultant surgeon A)

*'It's difficult to isolate theatre out of the whole picture, so in this hospital obviously theatres have one division the wards and the patients are in another division so the funding is separate in the division.'* (Clinical director)

Front-line staff did not describe themselves as being actively involved in a strategy or planning process to change the way theatres were being utilised or to implement

SLM. Descriptions of how targets, decisions or changes were made demonstrated a managerially led top-down approach meaning interviewees were disconnected from the process:

*'My manager will be involved in making that decision. We will be told that this has been decided. I think this way the staff gets a bit annoyed that they are not involved with this discussion they are just approached and told that this is what's happening ' (Theatre sister)*

This was further demonstrated as aims expressed by interviewees related to theatre utilisation varied, with no clear mission being described. However, a recovery nurse hoped to breakdown boundaries by improving how theatre staff and recovery staff communicated.

The conclusions from the above analysis indicate that:

- the organisational structure did not facilitate the utilisation of colorectal operating theatres
- organisational structure hindered how operating theatres were managed
- traditional boundaries affected staff group collaboration
- front line staff were not empowered
- decision rights were not devolved to interviewees

## **Cost and Finance**

### ***Urban Trust***

No interviewee mentioned using financial information to directly affect change, but the CDS did believe that service line reporting (SLR) was needed and that a balance

between quality and cost had to be found. Despite this opinion, the development of a financial costing system was considered to have been too slow, in part due to lack of devolving decision making and resources to front-line staff:

*'... if they want service line reporting to work you need to devolve certain amount of trust, your resources downstream to directorates to allow them to develop it themselves ... they'll take on board what you want to measure, they might modify what you think is a key performance indicator, so no I think we should be measuring this instead, it's a better measure and we'll do it.'* (CDS)

Incentives, including financial, were thought to make waiting list initiatives more efficient. Nevertheless, cost was not considered to affect the way standard operating theatres were used, with it being difficult to incentivise staff appropriately and in a way that would encourage desired behaviour:

*'I think if you worked in chambers and your salary was dependent on your profit, then you'd soon, you'd see a great sea change in how you used things. I think, we see it in waiting list initiatives which is a kin to a private agreement, to perform surgery your job in that the efficiency is far greater.'* (CDS)

The conclusions from the above analysis indicate that:

- incentives affected theatre efficiency
- financial information was not available to affect the cost effectiveness or use of operating theatres

## **University Trust**

Although there was a general appreciation that operating theatres were an expensive resource that needed to be used cost effectively, financial information, was not being used by front-line staff to change the way operating theatres were being used, similar to Urban Trust. In contrast though, University Trust was collecting data on the use of equipment and instrument trays by scanning unique barcodes. These barcodes could count what equipment was used for each operation and provide costing information. Despite a theatre sister considering the barcoding of equipment to be a good idea, certain items did not have a barcode to scan and thus not all data was able to be collected. It was also unclear to theatre staff and how the barcoding information was being analysed or used, with no awareness of the PLICS system being expressed:

*'... we have got certain items that we can barcode, there are certain items are not on barcode. So we are just losing the issues straightaway. If you want barcode it should be everything or nothing ... It's like rough costage.'* (Theatre sister)

The conclusions from the above analysis indicate that:

- financial information was not being used to improve the cost effectiveness or use of operating theatres

A summary of all baseline findings according to themes and trust can be found in Appendix 9.

## Qualitative Reports- Second Phase

A total of 13 interviews were conducted for the second round of interviews between January and March 2013. Six interviewees were staff from Urban trust and seven from University trust, with all interviewees having been participants during baseline interviews. The number of interviewees according to job title and trust is shown in Table 6.

### **Process of Thematic Analysis**

The focus of second part analysis was to determine what, if anything, had changed which was relevant to SLM and if, how and why this had impacted on the utilisation of operating theatres. Consequently, transcripts were analysed to evaluate how differing approaches to SLM implementation affected the way operating theatres were utilised.

<b>Job title</b>	<b>Urban Trust</b>	<b>University Trust</b>
Theatre manager	1	-
Theatre Sister	1	1
Recovery staff	-	1
Clinical Director	2 (CDS,CDAT)	1
Consultant Colorectal Surgeon	1 (Surgeon A)	2 (Surgeons A,B)
Consultant Anaesthetist	1	2 (Anaesthetist A,B)
<b>Totals</b>	<b>6</b>	<b>7</b>

Table 6 The number of interviewees according to job title and trust (second phase).

### ***Transcribing and Coding***

All 13 interview audio recordings were transcribed by the researcher as described in the methods section using Dragon naturally speaking speech recognition software (Version 11.5 Nuance communications 2011). This transcription approach, as was the case for baseline interviews, enabled familiarity of the whole dataset (Phase 1 of thematic analysis) (Braun and Clarke, 2006, Creswell and Plano Clark, 2011, O'Leary, 2010). The codes that were defined during baseline interview analysis, described above, were used as a framework to code second phase transcripts (Qualitative Results- Baseline Phase: Process of Thematic Analysis (Codes)). Alterations/adjustments to this framework, as described in the methods chapter (Methods of Qualitative Analysis: Formation of Analytical Frameworks- Second Phase), were made to allow change to be clearly identified and described. This approach has enabled direct comparison to be made with baseline interview findings and determine whether each trust's approach to the implementation of SLM affected theatre utilisation.

The second phase reports summarise change in relation to the four main elements of SLM in each trust, with findings being compared to baseline findings and desired outcomes of SLM implementation described in the literature review chapter (Monitor 2010c). Summary points are made at the end of each section, and can also be found in Appendix 10.

Consistent with the presentation of baseline findings, unless otherwise stated, illustrative extracts (indented and in italics) have been selected to convey the consensus view provided by interviewees in each trust. Topics in which a consensus

was not apparent, in which interviewees disagreed or in which only one or two interviewees commented is stated within the text where appropriate.

## **Summary of changes**

### **Organisational Structure**

#### ***Urban Trust***

Overall no service line organisational change within colorectal surgery had taken place. This finding was supported by observing SLM management meetings (see Summary of Observations: Urban Trust below), although within the operating theatres themselves, some reorganising had occurred with new senior nurses having been appointed. Their role was to look at theatre efficiency and manage/control defined areas within the theatre suite. A theatre sister considered this change to have been positive, as it had taken some of the workload off theatre staff. Notably, at the time of second phase interviews, this change had only recently been implemented:

*'I now have one band seven who looks after surgical day unit, have one who looks after colorectal and Gynae ... So, there is now more of an ability to micro manage these areas, but that structure's only come in place in the last few weeks. So, we don't see the benefit yet.'* (Theatre manager)

The drive for this reorganisation was to improve efficiency and help deliver performance indicators set by the Theatre transformational team, which included two

interviewees from this study (CDAT and theatre manager). Other introduced changes aimed to improve and control the planning process, with theatre scheduling meetings and changes to the booking system having been made. Although both the CDAT and theatre manager showed an awareness of SLM being introduced in the trust, they considered the changes to have been implemented due to the Transformational team and not SLM implementation. This was despite the acknowledgement that changes to the scheduling process were decided following a theatre cross charging meeting organised by the SLM management group (see Urban Trust Theatre Cross Charging Pilot below). The CDAT further explained that it was unclear how SLM structural change would affect operating theatres, believing implementation would perhaps be happening soon:

*'As far as I'm aware ... the service line management is a thought for the future and will be brought in over the next year ... I think it's more the structure of the directorates and divisions within the trust as a whole. I don't think it's going to go, yeah well I don't actually know how it'll affect us.'* (CDAT)

*'... we've reshuffled and restructured our existing teams and partly because to drive efficiency and to deliver the other KPI's and the other targets that they have, such as our transformation programme type stuff.'* (Theatre manager)

As well as a lack of structural change, the clinical director for colorectal surgery (CDS), despite being involved in the SLM implementation group, considered no devolving of decision rights to have made. Therefore, despite being the CDS and being engaged in SLM implementation, the CDS did not feel more empowered than at the time of baseline interview. In contrast, a theatre manager described more

involvement in making decisions and greater ownership in managing projects, interestingly, this was attributed to the amount of work needing to be done rather than SLM implementation. Despite these differences, both considered there to be a lack of resources and information support to aid decision making and implement change :

*'... I suppose we're involved as managers we've begun to be involved more and more in decision-making processes.'* (Theatre manager)

*'... some of the decision-making has a huge amount of money or impact attached to it and although I know this is my area of expertise, you feel a bit stand-alone sometimes '* (Theatre sister)

*'I don't think there's enough resources in allowing directorates enough time to do it or resources to get the data so they can plan, what there going, you know, realise what their demand and capacity is and look at the money and work out where the flows are or to set the quality indicators'* (CDS)

The conclusions from the above analysis indicate that:

- Some devolving of decision rights to a manager had occurred, but this was not attributed to SLM and was not considered the case by a clinical leader.
- Support and resources to implement change was lacking.
- The organisational structure had not changed to affect the utilisation of colorectal operating theatres.

## **University Trust**

No organisational restructuring was described, although some staffing changes had been made within the recovery area and a new senior lecturer in colorectal surgery had been appointed. Divisions were described, similar to baseline interviews, with theatres still having a separate budget to colorectal surgery.

Consultant surgeon A and B both described an organisational structure that worked against having efficient operating theatres, with nobody having centralised control over the separate, disconnected staff groups who affect it. Consequently there was no clearly defined service line team to change how colorectal operating theatres were being used:

*'... there is a complex line management in theatres that makes for efficient running of theatres, the theatre block, compromises it, because you've got surgeons, nurses, and anaesthetists, porters, ancillary staff all under different line management and clearly that is an inefficient system, because nobody has influence over all those parties to make them work more effectively.'*

(Consultant surgeon A)

*'... everything's controlled by different people. I understand the principle of that, but also behind all of that is it just means that things don't quite work because everything's working, things are working against each other.'*

(Consultant surgeon B)

This lack of control/empowerment was reflected by a theatre sister, who did not feel able to make changes and try to improve theatre utilisation. The clinical director also felt that despite being the lead for colorectal surgery, and his line manager being the

lead for general surgery, that neither role provided influence or control of other staff. Therefore interviewees, including the clinical director of colorectal surgery, did not have defined leadership roles or decision rights within an effective service line team:

*'... everybody has a line manager but it is, it is much less clear cut in medics than it is in the other profession's. So, in theory I'm, in theory I'm the lead for colorectal but it's not an actually a trust post. I don't actually have any authority over any of my colleagues. My line manager would be the CSL for general surgery... but he is, is not actually in a position to really to say anything'*

(Clinical director)

Within the recovery area, changes had been implemented with an interviewee (recovery nurse) having been pro-active in initiating change. Changes had led to more recovery staff having been employed, shift patterns having been altered, a link with colorectal wards having been established and job roles having been reorganised. These changes were considered to have improved patient flow and communication between recovery, theatre, managerial and ward staff:

*'... I says right I'll establish the links that I know with people on the ward and we'll arrange meetings and to see. Cause, like I said we didn't want it to be like them and us, we work within the same, within the same hospital. We wanted to see whereby we could help one another out and then just understand each other's area'* (Recovery nurse)

*'... we've now got recovery nurses coming into theatre, 5-10 minutes before the end of the procedure ... I think that has been helpful, because I think it allows us to give our hand over to the recovery nurse, while we're waiting for*

*the patient to be ready to move, which saves 5,10 minutes and so that's been a good thing. ' (Consultant anaesthetist B)*

The conclusions from the above analysis indicate that:

- organisational structure still hindered how colorectal operating theatres were managed.
- decision rights had not been devolved to interviewees.
- communication across traditional staff boundaries had been improved by a pro-active leader.

## **Performance Management**

### ***Urban Trust***

Although data remained accessible via the trust intranet, reports were still perceived to be generated for the benefit of executive teams, with theatre timings still being used to measure performance. On the trust intranet, the definition of theatre utilisation had been changed to method 2 (Table 2) and as such did not include operating time outside of the planned theatre time. This meant theatre utilisation figures had decreased on average 18.9% per quarter (Table 8a and 8b p172-173), however no interviewee was aware of this change:

*'... reports are still being generated and still being looked at by executive teams rather than actually focusing on an activity that would produce a benefit ... are we going to use it to generate a change? and what change do we want to generate?, they're just saying the data says you're wasting time.'* (CDS)

No formal performance review meetings had been introduced, but a performance related document had been distributed to theatre staff and a board had been erected to display utilisation and infection control measures. Despite these changes, no impact was found, with a theatre sister explaining that feedback of information provided no incentive to change behaviour :

*'I don't think it does, cause we can work as hard as anything and they still say we were not working hard enough'* (Theatre sister)

*'... a quality review paper gone out today, but that's just to tell us off, that we're not doing our jobs properly anyway. But they do have charts every so often that says how performance is doing ... it's just that I haven't read up on it lately.'* (Theatre sister)

The CDS also explained that no incentives to improve theatre usage, and therefore performance, had been introduced, with there being no clear accountability for good or bad performance:

*'... there doesn't seem to be any key reward I mean, for doing, for looking at your usage, in other words how many in hours or out of hours or late starts, early finishes, overruns that you had.'* (CDS)

A theatre sister considered late starts to be more frequent due to a lack of bed capacity, with gap times still being attributed to a lack of ward nurse availability. Patient cancellations were also considered to still occur because of unpredictable procedure time, although an increase over the winter period was attributed to a lack of surgical bed capacity and a Norovirus outbreak (quarter three 2012-13). Quantitative data supported this qualitative information with a rise in patient

cancellations being demonstrated during quarter three of 2012-13 (10.3%, Table 8b and Figure 11). Consequently, minimal improvement in how operating theatres were used was identified, with factors considered responsible for inefficiencies still being regarded as outside of interviewees control:

*'I think they're being used the same. I've not seen any significant change or there's been no significant change come in that I've noted.'* (CDS)

*'... we've had a spate where it has been worse because of the bed shortage. So, for the past few weeks there has been some cancellations, I mean it's not just bed shortage, there was that Norovirus issue as well.'* (Theatre sister)

*'I think the biggest inefficiencies in theatre in the last couple of years have been from outside theatre ... even yesterday at 12 o'clock the third patient on the list wasn't ready for theatre ... So we had an hours gap ... It wasn't theatres fault, and actually it's not the ward nurses fault, it's a sheer resource issue.'*  
(Consultant surgeon A)

When second phase and baseline quantitative data was compared this apparent lack of improvement or impact of intended change was supported:

- The percentage of patient cancellations slightly decreased (6.5% v 7.6%, Table 8a, 8b and Figure 11)
- The percentage of late starts had increased (35.4% v 24.7%, Table 8a, 8b and Figure 8)
- The percentage of early finishes had increased (34.4% v 27.8%, Table 8a, 8b and Figure 9)

- The percentage of late finishes had slightly decreased (48.7% v 51.1%, Table 8a, 8b and Figure 10)
- Minimal change to the median gap time and interquartile ranges (20 minutes v 19minutes, Table 8a, 8b and Figure 12)
- The percentage theatre utilisation had decreased slightly for both definitions used, with standard deviations remaining similar (Method 1- 99.8% v 103.1% and Method 2- 81.2% v 82.5%, Table 8a, 8b and Figure 13)

The conclusions from the above analysis indicate that:

- Issues affecting how colorectal operating theatres were used remained outside of interviewees control, with no incentives or accountability for performance being found.
- Data collected was still not being used in a meaningful way to manage performance or affect the way colorectal operating theatres were used.
- Intended implementation of SLM had made minimal impact on theatre utilisation.

### ***University Trust***

Interviewees considered operating theatres to have become more inefficient over the winter period (since November 2012), with a lack of bed capacity affecting patient flow and a change to the location of the Admissions unit adding further delay. As demonstrated during baseline interviews, interviewees felt unaccountable and disconnected from these issues as they did not control them:

*'I think it's the most important thing because if you haven't got a bed for the, physical bed for a patient there's nothing anybody can do and we're sitting around, sitting waiting for phone calls and cancelling the lists'* (Theatre sister)

*'... many of the patients don't actually have in-patient beds on the wards, and so we can't send for them until we've got a guarantee that the patient has a bed. And some of the discharges from recovery ... are somewhat delayed and this causes log jams in recovery ... So I see those as factors, that are largely outside of theatres control of working, but obviously reflects badly on theatre utilisation.'* (Consultant anaesthetist A)

Over the winter period of 2012, late starts were thought to have increased due to a lack of bed capacity, and unlike at the time of baseline interviews, patients were considered to be frequently cancelled. Overruns were also mentioned, however not as many were believed to be occurring due to cancellations:

*'... at the moment a major issue is bed pressure and so for the past few months really ... we've been struggling to get patients into beds and therefore fairly routinely cancelling patients'* (Clinical director)

Second phase interviews took place during quarter 4 of 2012-13 and when second phase and baseline quantitative data was compared, especially during quarter 4, this apparent worsening of how theatres were being used was supported:

- The percentage of patient cancellations had increased (13.2% v 10.1%, Table 9a, 9b and Figure 11)
- The cancellation rate was the highest for two and a half years (19.1%) during quarter 4 of 2012-13 (Table 9b and Figure 11)

- The percentage of late starts had decreased slightly (49% v 53%), although a notable increase was shown in quarter 4 of 2013 (Late starts- 59.7%, Table 9a, 9b and Figure 8)
- The percentage of early finishes had increased (36% v 28.1%, Table 9a, 9b and Figure 9)
- The percentage of late finishes had decreased (49.9.% v 58.1%, Table 9a, 9b and Figure 10)
- The median gap time had slightly increased and inter-quartile ranges widened (26 minutes (10-58.25) v 24 minutes (12-49.75), Table 9a, 9b and Figure 12)
- The percentage theatre utilisation had decreased ,with standard deviations remaining similar (Method 1- 95.3% v 100.7%, Table 9a, 9b and Figure 14)

This quantitative data remained inaccessible and unknown to most interviewees. No change in the way data was used to manage performance was found, with data being considered to disappear. One performance meeting, led by management staff for managerial clinical staff, had taken place to specifically discuss theatre usage, however the clinical director did not feel information at this meeting had either been communicated effectively or changed anything. As it was not supported by useful information, this performance meeting did not effectively address good or bad performance:

*'... they were trying to go through lists, or trying to raise issues, trying to look at start times and finish times and whether lists were being adequately used and whether they were being overrun. But the data wasn't presented in a way that was particularly meaningful ' (Clinical director)*

The same clinical director felt there was minimal management of clinicians and that clinicians had some control over their own performance. This control was considered to act as an incentive and encourage good practice:

*'... in many ways our, our activity is fairly unregulated ... that's probably a good thing'* (Clinical director)

*'I have an incentive to try and get the patients ... I've seen on a list and the patients I've put on a list, operated on. And if you somehow made it more generic then I would lose that incentive ... So, there are advantages in having independent isolated practice in terms of actually drivers to make you do things'* (Clinical director)

The conclusions from the above analysis indicate that:

- Despite the intention to improve theatre efficiency, the utilisation of colorectal operating theatres had worsened; mainly because of bed capacity issues.
- Issues affecting how colorectal operating theatres were used remained outside of interviewees control, with some incentive but no accountability for performance being found.
- Data collected was still not being used in a meaningful way to manage performance or affect the way colorectal operating theatres were used.

## Information Management

### ***Urban Trust***

Both the CDS and the CDAT mentioned the need for a PLICS (patient level information costing system), with the CDS considering SLM not to have been implemented to a level where financial information could be interpreted to inform decision making and/or change processes as the data was not available. Similarly the CDAT considered the trust wanted to implement SLM within operating theatres, but were unable to do so due to lack of information support and data availability:

*'I think they want to do service line management regards with time, because theatre's a provider, so every specialty should be able to sort of buy from us whatever they want ... So we want patient level reporting or recording of everything that is used in theatre and those costs are part of a bundle of what it would cost ... We don't have the system to do that, so all we are functioning in at the moment is time.'* (CDAT)

The conclusions from the above analysis indicate that:

- Financial information was not available and so was not being used by interviewees to improve either the cost effectiveness or utilisation of colorectal operating theatres.

### ***University Trust***

The barcoding system had not changed since baseline interviews, with the barcode inventory only incorporating 30% of equipment used. This costing information was still not being fed back to interviewees and was not being used to affect how theatres were being utilised. No awareness of a PLICS system being developed was found, with this finding being supported by observation of meetings (see Summary of meetings: University Trust below).

The conclusions from the above analysis indicate that:

- Despite the PLICS system continuing to be developed, financial information was not being used by interviewees to improve the cost effectiveness or use of colorectal operating theatres.

### **Strategy and Planning**

#### ***Urban Trust***

Uncertainty was expressed by interviewees as to strategy and planning with comments being made about the trust as a whole rather than directorates, divisions or operating theatres. It was also considered that everybody was focused on their separate area, that things were not done cohesively and that not enough resources were available to help plan what needed to change. This meant no evidence for a clear strategic plan and no evidence of an effective service line team was found:

*'... we're struggling to see where we want to be in four or five years and I think ... everybody just fire fights their own corner and that, it's not like there's a big*

*vision out there at the moment and some of the project work that we're doing needs a vision.'* (Theatre manager)

The conclusions from the above analysis indicate that:

- Interviewees were not working within an effective service line team to affect how operating theatres were used.

### **University Trust**

No changes were described in how strategy and planning was developed, owned, defined or communicated:

*'... most of it's about communication. Would be one observation not very, you know, not Rocket science. So to that extent if the trust has a way of looking at theatre utilisation with an expectation that things are improved, then communication of that, the way they are looking at it would be helpful '*

(Consultant anaesthetist B)

The conclusions from the above analysis indicate that:

- Interviewees were not empowered.
- Interviewees were not working within an effective service line team to affect how operating theatres were used.

A summary of all second phase findings according to trust and the 4 main areas of SLM, can be found in Appendix 10.

## **Summary of Meetings**

The following section summarises findings from meetings attended throughout the study at both Urban and University Trusts.

### **Urban Trust**

Information gained specific to the Theatre cross charging pilot is summarised separately in the Urban Trust theatre cross charging pilot section below. As such, this section is focussed on further information gained from SLM management or other relevant meetings. Data was collected as described in the methods chapter (Methods of Qualitative Analysis: Observational Methods). As discussions during meetings were broad in the context of SLM and the trust as a whole, only pertinent points to this study, and not relevant to the pilot study, are presented below:

#### ***Defining service lines***

Clinical directors (clinical leaders) were asked to define their service lines by the SLM management group. Although this information took months to be compiled, divisions and directorates remained the same, with service lines being defined according to speciality. This meant the Colorectal and Upper gastrointestinal surgery directorates were combined into two service lines entitled General surgery and Emergency surgery. However the Anaesthesia and theatres directorate were separated into service lines entitled Anaesthesia and Theatres.

### ***Training day- December 2012***

Different levels and groups of clinical staff attended a training day on SLM, which aimed to increase awareness of implementation. The CDAT and theatre manager interviewed for this study were present. Attendees were asked what they wanted SLM to look like. This information was then recorded and compared to the SLM management groups aims to ensure that what front line staff wanted was included in the implementation plan. Therefore, this training day only raised awareness of SLM and ensured the implementation plan, which had been drafted at least 10 months before, was in line with what front line staff wanted.

This demonstrated that a lack of progress in implementing SLM had been made since baseline interviews, which took place 6-9 months previously. This was supported by subsequent second phase interviews, especially as the CDAT believed SLM implementation was being implemented in the future rather than at the time of interviews (see Summary of Changes: Organisational structure: Urban Trust above).

The conclusions from the above analysis indicate that:

- following baseline interviews, no structural change that integrated colorectal surgery, theatres and anaesthetics was made, supporting second phase qualitative findings.
- a lack of progress in implementing SLM was found.

## **University Trust**

The researcher was not aware of any specific SLM meetings having taken place during the study. The PLICS system continued to be developed by the finance department, with the researcher being in regular contact with the developers and observing some of their meetings personally.

Specific findings as of February 2013 are summarised below:

- Progress had been made in the development of the PLICS system with more sources of patient level data being integrated since April 2012.
- Staff developing PLICS were unclear how, when and for what purpose the system was to be used within the trust.
- The system had been demonstrated to other colleagues within the finance department, however it was not accessible to front line clinical staff.
- The system had started to be used for financial benchmarking against other NHS trusts.
- Although development was continuing, the financial system was not being used to aid decision making or implement change.

## **Urban Trust Theatre Cross Charging Pilot**

The observed SLM management group at Urban trust were aiming to achieve a minimum of level 3 implementation according to Monitors' self-assessment toolkit (Monitor 2010c) by April 2014.

As part of implementation a theatre recharging pilot was proposed in January 2012, with the initial proposal being to initiate a crude charging system in which the general surgical directorate could buy theatre sessions. The concept of a nectar point system was introduced with the aim being:

*'... to encourage responsibility for theatre usage and positive behaviours to make best use of allocated theatre time' (Minutes- 8/2/2012).*

A Theatre cross charging project team was subsequently created with meetings being observed and documented as described in the Observational meeting methods section.

### **Project meeting (27th February 2012)**

#### **Attendees**

The first meeting was chaired by the project coordinator (an administrator for the SLM management group) and attended by 6 other staff members. Attendees included, a member of the informatics team and three interviewees from this study (Clinical director for anaesthesia and theatres (CDAT), clinical director for general surgery (CDS) and the theatre manager).

## Main topics covered

The requirements of the meeting were initially read out by the chairperson:

*'A proposal is required to define a measurable, tradable commodity to produce and manage behavioural change of efficiency within theatre usage for both provider and user of theatres. This should cover a pilot phase to be used within General Surgery; ... The first meeting should be used to define the commodity and agree its use rather than defining value.'*

The meeting was very open with SLR and SLM concepts being discussed. However, the conclusion was that Urban Trust did not have the data systems to calculate cost to a level (patient level), which attendees felt was necessary for cross charging and SLM implementation. Other currencies, such as theatre sessions and theatre minutes, were considered, but attendees were not interested in incentivising theatre efficiency with points rather than money.

On taking a step back, discussion focussed on improving the utilisation of theatre lists in a different way. The scheduling of lists was considered a problem as theatre management and the anaesthetic department ideally required 6 weeks advanced notice of list cancellations. Informatics input determined existing data systems could be used to collate such information and as a consequence, the consensus reached was:

1. Theatre sessions were to be booked 6 weeks in advance – a template/plan was to be sent to the CDS to ensure accuracy of planned general surgical operating lists. This template would then be used as a base line.

2. All additional sessions booked less than 6 weeks in advance were to be noted.
3. All cancellations within 6 weeks were to be noted and monitored.

### Reflections

A clear drive to improve operating theatre efficiency and cost effectiveness was expressed, however it was not felt this could be done without robust information support (PLICS) and genuine financial incentives. This meant the group found it difficult to define a pilot study around theatre utilisation, with attendees not seeing how factors outside of their control would be recognised and recorded (e.g. surgical beds being occupied by medical patients). Thus, as data systems could be used to collate the timing of when sessions were booked or cancelled, the uncomplicated consensus above was reached.

### ***SLM management group meeting 26th March 2012***

The head of financial planning, fed back on the proposed pilots progress, with the plan being described in terms of the three consensus points above. The Chief Operating Officer highlighted an overlap and clear link between the SLM cross charging project and an ongoing theatre project (Theatre transformation project (TSP)) naming an individual to engage with.

### ***Theatre Cross Charging Project meeting (19th April 2012)***

#### Attendees

This meeting had only 4 people attend including the lead for the Theatre Transformation Project (TSP). No clinicians or other interviewees attended .

#### Main topics covered

Potential financial incentives around operating theatres were discussed and described as complex and led to operating theatres being described as a free resource. Ultimately it was thought that PLICS was needed to provide the information necessary to achieve objectives, but that a scheduled session could be used as a unit of currency for the project.

#### Reflections

This meeting did not help to progress the project as was hoped. This was partly due to poor attendance and partly due to it becoming apparent the TSP lead was changing in the near future. What was also clear was the lack of reliable and accurate information, especially costing information needed for effective SLM implementation and to help improve the cost effectiveness of operating theatres.

### **SLM group meeting (26th June 2012)- Pilot Methods and Objectives**

The information described below was obtained from the minutes of the meeting and the Theatre cross charging pilot charter document as the researcher was unable to attend.

## Attendees

There were 10 attendees, which included the clinical director for general surgery CDS. No other interviewees attended.

## Objectives of Theatre cross charging project

The theatre cross charging pilot charter was discussed. The objectives of the project were:

- to introduce mechanisms for altering behaviour by introducing incentives
- to make more efficient use of resources in the trust
- to test whether cross charging improved utilisation of theatres
- to give the general surgery directorate more insight into their utilisation behaviours

## ***Urban trust Theatre cross charging pilot- Methods***

The CDS provided operating theatres with a 12 week plan (2nd July- 21st September 2012) of elective theatre usage for all general surgical consultants, six weeks in advance of the start date. The actual use of theatres during the 12 week time period was monitored prospectively in comparison to the plan by theatre management. Data on the number of planned routine sessions, planned extra/backfill sessions, sessions transferred to other directorates and sessions not used were collected. A financial value (incentive/cross charge) was attached to outcomes by the head of financial planning. A historical comparison was made with the same 12 week period from the previous year by the researcher.

## **SLM group meeting (23rd October 2012)- Pilot Results**

The results of the Theatre cross charging project were presented by the head of financial planning and the researcher. The information provided below is from observational documentation, minutes or directly from the Theatre cross charging pilot report.

### Attendees

There were nine attendees including the head of financial planning. Other members of the theatre cross charging group including the CDS, CDAT and theatre management were not present.

### Presented Results (report)

The cost of a theatre session was calculated using direct costs (e.g. theatre staffing ), indirect costs (e.g. sterilisation of equipment) and overheads (e.g. light and power). This derived an average cost of £4039 per theatre session (half day list).

Data for 2011 was less clear than that for 2012 with the data from planned sessions not used, having been difficult to obtain. Based on the data in Table 7 (next page), 93% of sessions were utilised in 2011, compared to 95% in the 2012 sample period. Data collected suggest that no sessions were transferred to other directorates. A larger proportion of sessions appeared to have been picked up in 2012 by surgeons within the general surgical directorate (19%v12%) compared to 2011.

	<b>4th July-September 23rd 2011 (Historical comparison)</b>	<b>2nd July- 21st September 2012 (Theatre cross charging pilot)</b>
Planned routine sessions	198	205
Planned extra/backfill sessions	23	38
Sessions transferred	0	0
Sessions not used	15 (19%)	10 (12%)
<b>Cost of sessions not used (£)</b>	<b>4039 *15= £60,585</b>	<b>4039*10= £40,390</b>

Table 7 Quantitative results of Theatre Cross Charging Pilot at Urban Trust.

#### Conclusions (report)

Data suggested that the theatre cross charging pilot increased the proportion of lists picked up/ backfilled by surgeons within the same directorate, but that some planned lists were still cancelled at short notice (< 6 weeks). This may have been due to the sample period (covering the summer months when a greater amount of downtime is normally planned), or due to the application of financial information at the end of the pilot rather than at stages during the pilot.

#### **Interview findings (Pilot)- Baseline Phase**

Interviewees were asked whether they were aware of any national or trust programmes related to operating theatre usage. No interviewees commented on the Theatre cross charging pilot described above, despite the CDS, CDAT and theatre manager attending the Theatre cross charging meeting in February 2012 and were

involved in organising the pilot project. An awareness of TPOT and the TSP was only expressed by some interviewees.

The conclusions from the above analysis indicate that:

- The Theatre cross charging pilot was not important to interviewees

### **Interview findings (Pilot)- Second Phase**

Interviewees at Urban trust were directly questioned about the pilot study during the second phase of interviews, with nobody commenting on the study unprompted. Consultant colorectal surgeon A and a theatre sister were totally unaware of the study, with the CDAT and theatre manager being unaware that the planned pilot went ahead. However, the CDAT explained how the theatre cross charging project meeting in February 2012 had led to changes to the scheduling and planning process:

*'... some of the things that are going on are some of the things that were picked up there [cross charging meeting] as in, keeping a monthly track of sessions that are used. That's yeah that's our scheduling work that is still going on, and the advance scheduling meetings' (CDAT)*

Counting the number of sessions used and comparing it to scheduled/expected activity was also considered to have been initiated following the cross charging meeting. This was to enable sessions that were cancelled at short notice to be counted as a funded operating session. No interviewees, including surgeons,

mentioned this change with it being unclear whether any surgeon had incurred a penalty:

*'... if a session is cancelled with less than two weeks notice, you know, it counts as one of your sessions because we've already staffed ... whether anyone's sort of been penalised and lost a session yet because of it, I don't know.'* (CDAT)

Despite other interviewees being unaware of the pilot having taken place the CDS who had constructed the 12 week plan theatre plan, believed the study had worked. This was despite the pilot evaluation report not having been fed back to the CDS, CDAT or theatre manager. The CDS felt the project had encouraged operating lists to be backfilled and helped maintain activity over the study period, which supported the pilots quantitative findings. The perceived success had led to the idea of continuing the process and seemed to have altered the CDS's behaviour and provided an insight into theatre efficiency:

*'It seemed to work quite well, not seen the evaluation of it but my gut feeling was, it worked quite well when we were doing it. So, I'm going to try and do it for a year'* (CDS)

However, the pilot had been conducted by the CDS alone without support and without colorectal colleagues being aware. Despite this colorectal colleagues were described to have willingly utilised available sessions to shorten waiting lists, which were their responsibility. Therefore they had an incentive to utilise the available theatre capacity:

*'They didn't notice, it was all below the radar. They were just told to do stuff and they did it ... I would tell people and say well you're going on holiday do you want an extra operating list when you get back to catch up. They went yes please ... and they were happy to do that because it would sort their waiting list, their particular problem out.'* (CDS)

The conclusions from the above analysis indicate that:

- Awareness and feedback of pilot was poor.
- More cost effective use of operating theatres was demonstrated by improved planning.
- One meeting involving different staff groups, including Informatics, led to operating list scheduling and planning processes being changed.
- Pilot changed behaviour of the CDS in a pro-active way and provided an insight into theatre utilisation.

A summary according to trust of second phase findings, including the Urban Trust Theatre cross charging pilot, can be found in Appendix 10.

## **Quantitative Data- Second Phase**

### **Urban Trust**

A total of 197 elective operating lists were booked in the main operating theatres by six colorectal surgeons from 1st April 2012 to the 31st March 2013. 520 cases were completed and 36 (6.5%) cases were cancelled. Two lists (1%) were not utilised at all due to cancellations. Of the 195 lists that were used, 69 (35%) started 15 minutes or more later than planned (Late start). 67 (34%) finished 15 minutes or earlier than planned (Early finish) and 95 (49%) finished 15 minutes or more later than planned (Late finish), with the median gap time being 20 minutes per operating list. The overall mean theatre utilisation as defined by method 1 was 99.8% and by method 2 was 81.2% (Table 8b).

Quarter	No. of lists	No. Cases Completed	No. Cases Cancelled	Cancelled %	Late Start %	Early finish %	Late Finish %	Gap time minutes (IQR)	Utilisation Method 1 % (s.d.)	Utilisation Method 2 % (s.d.)
Quarter 1 10-11	53	161	16	9%	30.8%	19.2%	57.7%	19 (0-50)	104.9% (34.3)	79% (19.4)
Quarter 2 10-11	42	123	10	7.5%	35.7%	21.4%	71.4%	22 (6.3-45)	106.4% (26.5)	79.2% (20.6)
Quarter 3 10-11	67	222	22	9%	28.4%	25.4%	46.3%	22 (2-43)	99.6% (22.2)	82% (15.3)
Quarter 4 10-11	49	145	19	11.6%	25.5%	34%	48.9%	19 (3-49)	104.4% (25.6)	82.5% (14.8)
Quarter 1 11-12	43	135	9	6.3%	9.5%	31%	61.9%	25 (5.3-39)	104.1% (28.9)	80.5% (22.7)
Quarter 2 11-12	52	133	4	2.9%	25.5%	31.4%	47.1%	13 (0-35)	105.3% (28.2)	84.5% (13.8)
Quarter 3 11-12	64	174	10	5.4%	20.6%	34.9%	41.3%	13 (0-45)	101.3% (24.6)	85.2% (14)
Quarter 4 11-12	54	168	13	7.2%	20.8%	24.5%	43.4%	20 (3-39.5)	101% (23.2)	85.6% (14.8)
<b>Overall</b>	<b>424</b>	<b>1261</b>	<b>103</b>	<b>7.6%</b>	<b>24.7%</b>	<b>27.8%</b>	<b>51.1%</b>	<b>19 (0.5-43)</b>	<b>103.1% (26.6)</b>	<b>82.5% (16.9)</b>

Table 8a Urban Trust baseline quantitative data, including theatre utilisation figures according to method 2 (Numbers shown for Gap time are the median number of minutes with numbers in brackets being the inter quartile range (IQR). The figures shown for Theatre utilisation are the means according to method 1 and method 2 (see Table 2 for definitions) with the standard deviation (s.d.) being shown in brackets).

Quarter	No. of lists	No. Cases Completed	No. Cases Cancelled	Cancelled %	Late Start %	Early finish %	Late Finish %	Gap time minutes (IQR)	Utilisation Method 1 % (s.d.)	Utilisation Method 2 % (s.d.)
Quarter 1 12-13	51	147	4	2.7%	33.3%	29.4%	41.2%	28 (7-66)	99.8% (21.1)	82% (13.1)
Quarter 2 12-13	51	138	9	6.1%	27.5%	35.3%	52.9%	18 (0-50)	98.4% (23.8)	82% (17.5)
Quarter 3 12-13	53	139	16	10.3%	35.3%	35.3%	49%	20 (0-44)	103.3% (26.7)	81.6% (14.1)
Quarter 4 12-13	42	96	7	6.8%	47.6%	38.1%	52.4%	18 (0-34.3)	98.3% (34.8)	78.6% (20.1)
<b>Overall</b>	<b>197</b>	<b>520</b>	<b>36</b>	<b>6.5%</b>	<b>35.4%</b>	<b>34.4%</b>	<b>48.7%</b>	<b>20 (0-48)</b>	<b>99.8% (26.5)</b>	<b>81.2% (16.2)</b>

Table 8b Urban Trust second phase quantitative data (Numbers shown for Gap time are the median number of minutes with numbers in brackets being the inter quartile range (IQR). The figures shown for Theatre utilisation are the means according to method 1 and method 2 (see Table 2 for definitions) with the standard deviation (s.d.) being shown in brackets).

## University Trust

A total of 348 elective operating lists were booked in the main operating theatres by seven colorectal surgeons from 1st April 2012 to the 31st March 2013. 964 cases were completed and 146 cases (13.2%) were cancelled. One list was not utilised at all due to cancellations. Of the 347 lists that were used, 170 (49%) started 15 minutes or more later than planned (Late start). 125 (36%) finished 15 minutes or earlier than planned (Early finish) and 173 (49.9%) finished 15 minutes or more later than planned (Late finish). Overall theatre utilisation as defined by method 1 was 95.3% (s.d.=26.6) (Table 9b). Sixty-two of the 347 (17.8%) lists had a patient contact time that was greater than the number of utilised minutes and were excluded when gap time was calculated. The median gap time from the remaining 285 lists was 26 minutes.

Quarter	No. of lists	No. Cases Completed	No. Cases Cancelled	Cancelled %	Late Start %	Early finish %	Late Finish %	Gap time minutes (IQR)	Utilisation Method 1 % (s.d.)
Quarter 1 10-11	-	-	-	-	-	-	-	-	-
Quarter 2 10-11	-	-	-	-	-	-	-	-	-
Quarter 3 10-11	35	107	15	12.3%	65.7%	34.3%	54.3%	27(10.8-82.5)	95.6% (24.6)
Quarter 4 10-11	81	271	33	10.9%	44.4%	23.5%	63%	23 (12.5-45)	101.3% (20.8)
Quarter 1 11-12	74	229	19	7.7%	50%	27%	55.4%	24 (12-49.8)	103.2% (31.9)
Quarter 2 11-12	73	222	23	9.4%	57.5%	23.3%	65.8%	26(11.5-56.5)	102.9% (19)
Quarter 3 11-12	73	239	29	10.8%	56.2%	32.9%	50.7%	28 (12-48.8)	97.9% (19.8)
Quarter 4 11-12	79	210	24	10.3%	51.9%	31.2%	57.1%	21 (7.5-38)	100.7% (39.3)
<b>Overall</b>	<b>415</b>	<b>1278</b>	<b>143</b>	<b>10.1%</b>	<b>53%</b>	<b>28.1%</b>	<b>58.1%</b>	<b>24 (12-49.8)</b>	<b>100.7% (27.2)</b>

Table 9a University Trust baseline quantitative data. (Numbers shown for Gap time are the median number of minutes with numbers in brackets being the inter quartile range (IQR). The numbers shown for Theatre utilisation are the means according to method 1(see Table 2 for definition) with the standard deviation (s.d.) being shown in brackets)

Quarter	No. of lists	No. Cases Completed	No. Cases Cancelled	Cancelled %	Late Start %	Early finish %	Late Finish %	Gap time minutes (IQR)	Utilisation Method 1 % (s.d.)
Quarter 1 12-13	89	253	26	9.3%	47.2%	32.6%	52.8%	25(10.5-55.5)	96.6% (31)
Quarter 2 12-13	89	251	34	11.9%	50.6%	31.5%	49.4%	25 (3.5-52.5)	96.7% (25.9)
Quarter 3 12-13	93	261	39	13%	40.2%	40.2%	47.5%	30 (12-63.5)	95.5% (23.8)
Quarter 4 12-13	77	199	47	19.1%	59.7%	40.3%	51.9%	25 (8-60)	91.9% (25.2)
<b>Overall</b>	<b>348</b>	<b>964</b>	<b>146</b>	<b>13.2%</b>	<b>49%</b>	<b>36%</b>	<b>49.9%</b>	<b>26 (10-58.3)</b>	<b>95.3% (26.6)</b>

Table 9b University Trust second phase quantitative data. (Numbers shown for Gap time are the median number of minutes with numbers in brackets being the inter quartile range (IQR). The numbers shown for Theatre utilisation are the means according to method 1(see Table 2 for definition) with the standard deviation (s.d.) being shown in brackets)

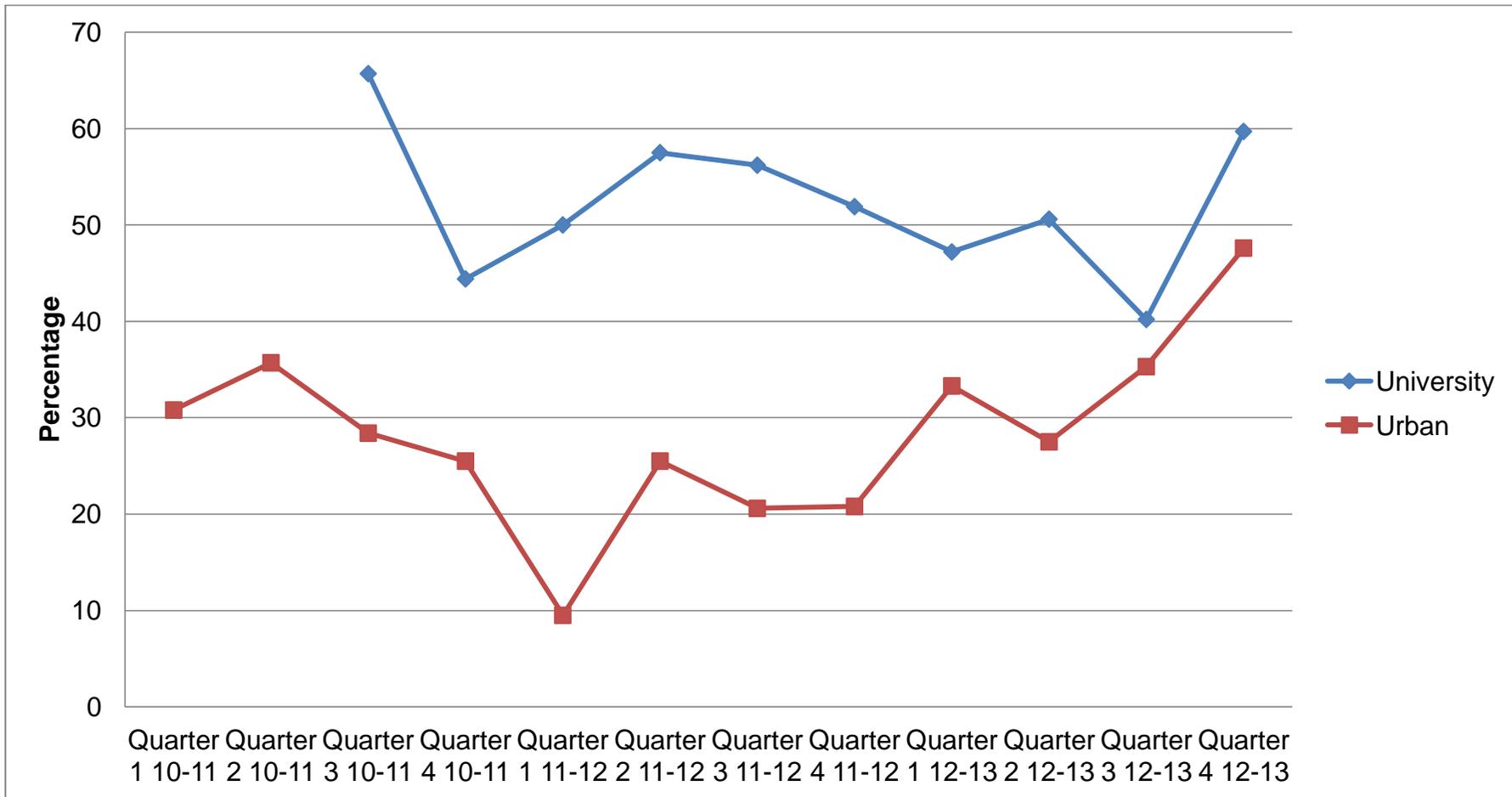


Figure 8 Line graph to show quarterly figures of the percentage of **Late starts** for Urban and University Trusts (April 2010-March 2013).

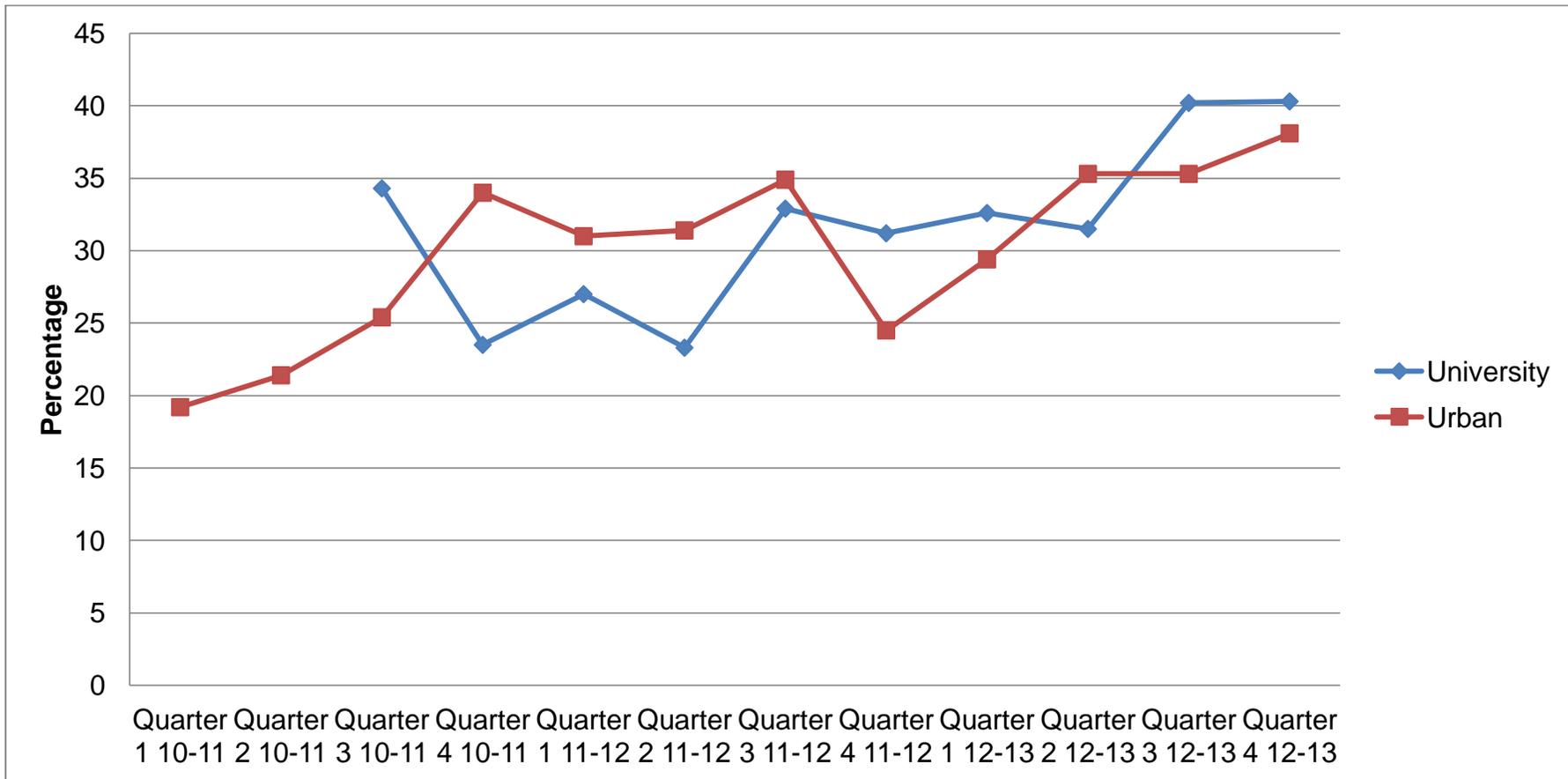


Figure 9 Line graph to show quarterly figures of the percentage of **Early finishes** for Urban and University Trusts (April 2010-March 2013).

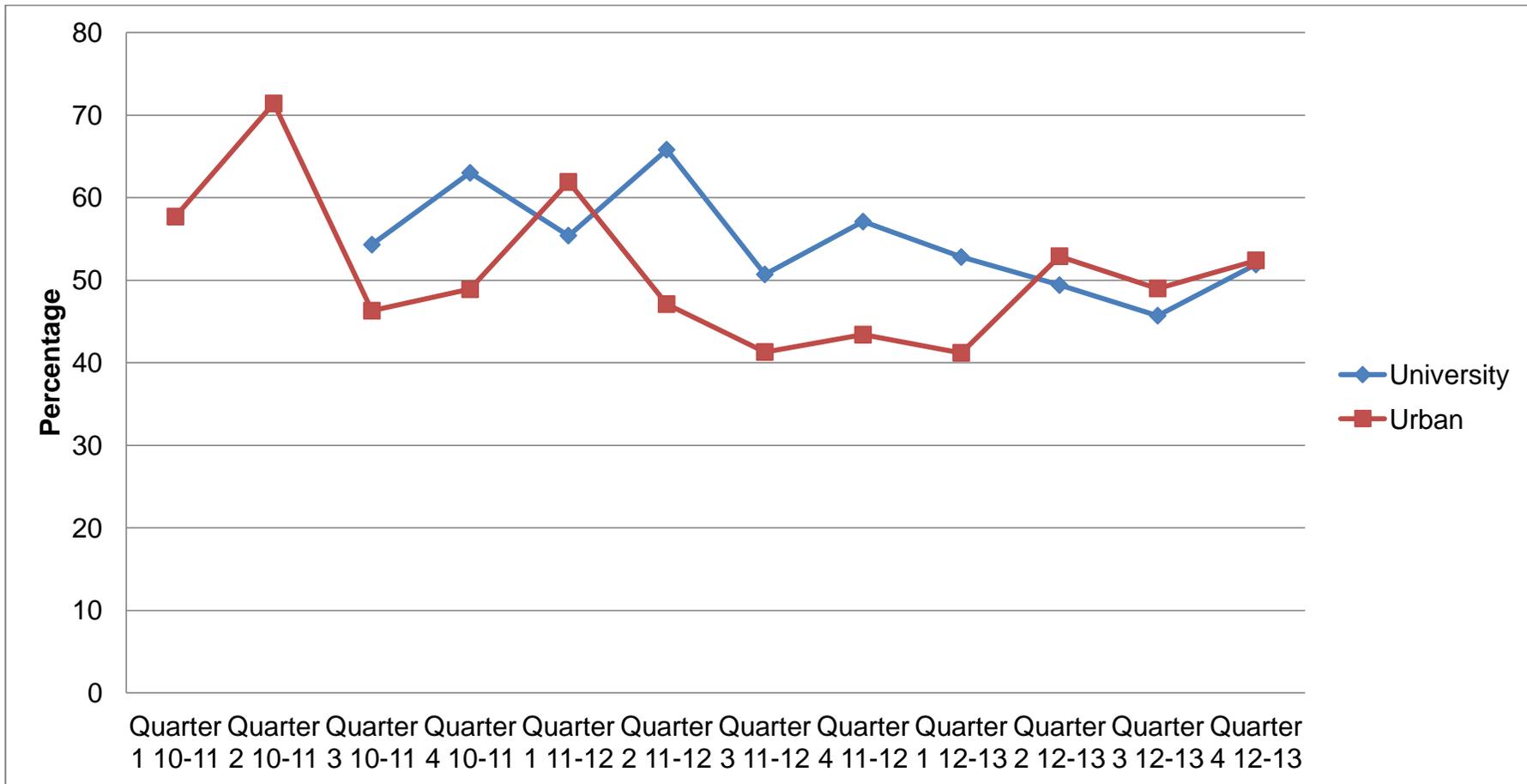


Figure 10 Line graph to show quarterly figures of the percentage of **Late finishes** for Urban and University Trusts (April 2010-March 2013).

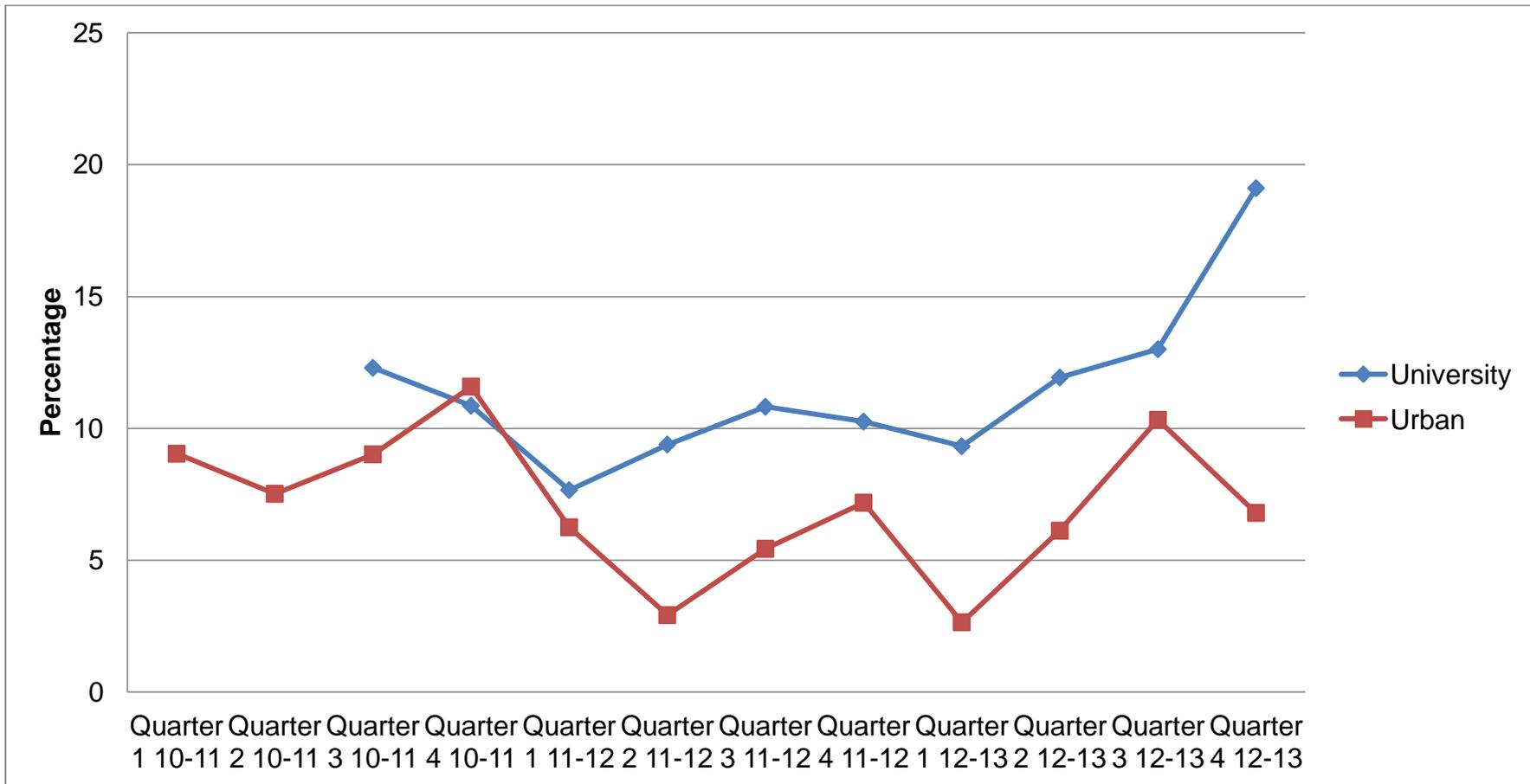


Figure 11 Line graph to show quarterly figures of the percentage of **Cancellations** for Urban and University Trusts (April 2010-March 2013).

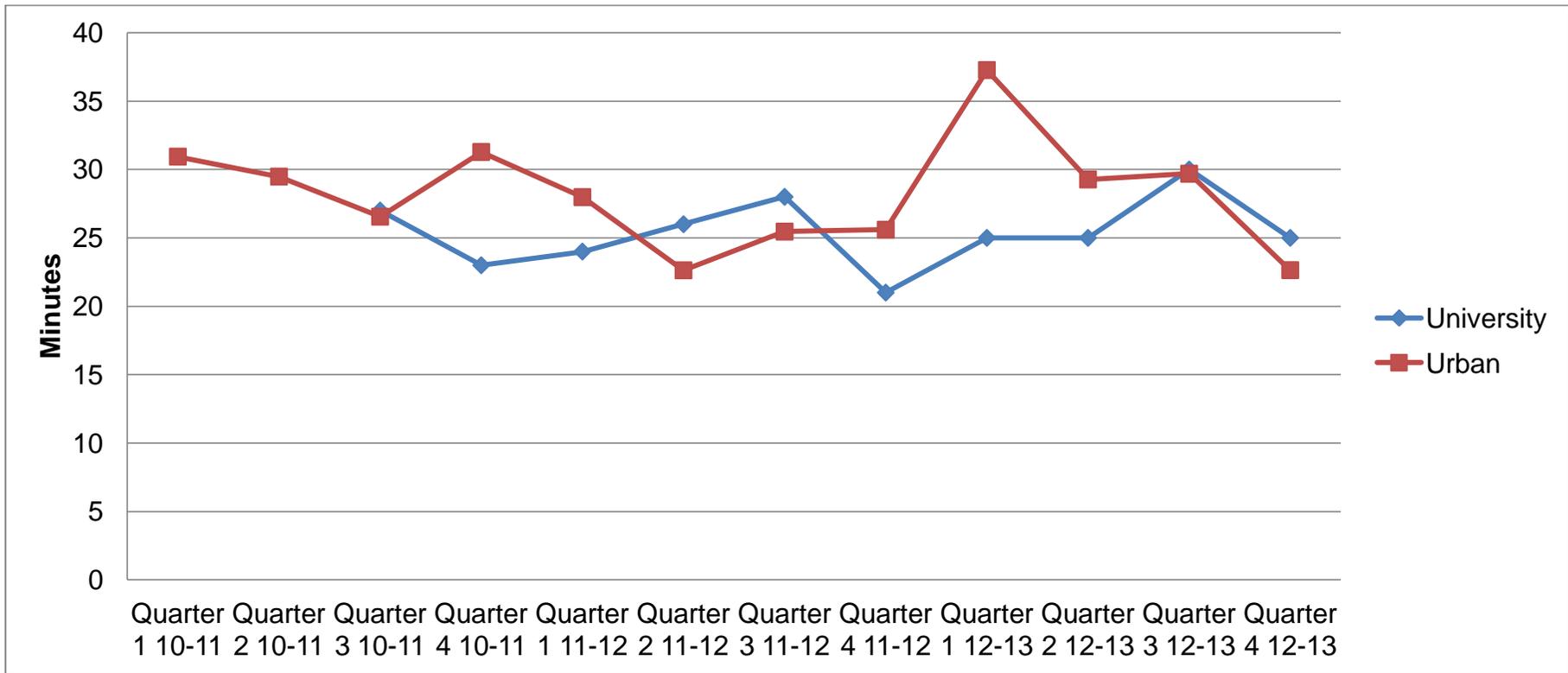


Figure 12 Line graph to show quarterly figures of the median **Gap time** for Urban and University Trusts (April 2010- March 2013).

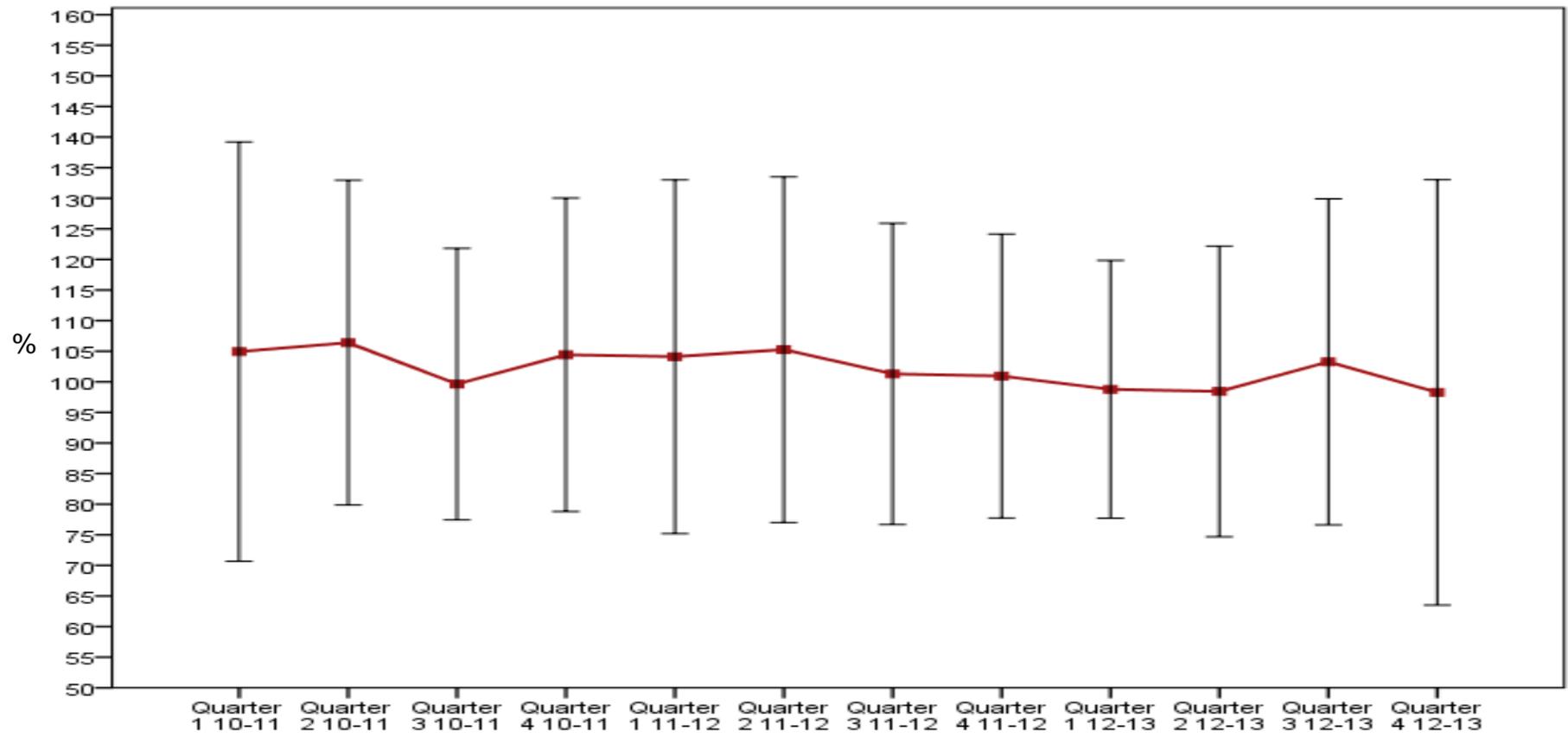


Figure 13 Line graph to show quarterly figures of the mean percentage **Theatre utilisation** for Urban Trust (April 2010- March 2013) with error bars of +/- 1 standard deviation.

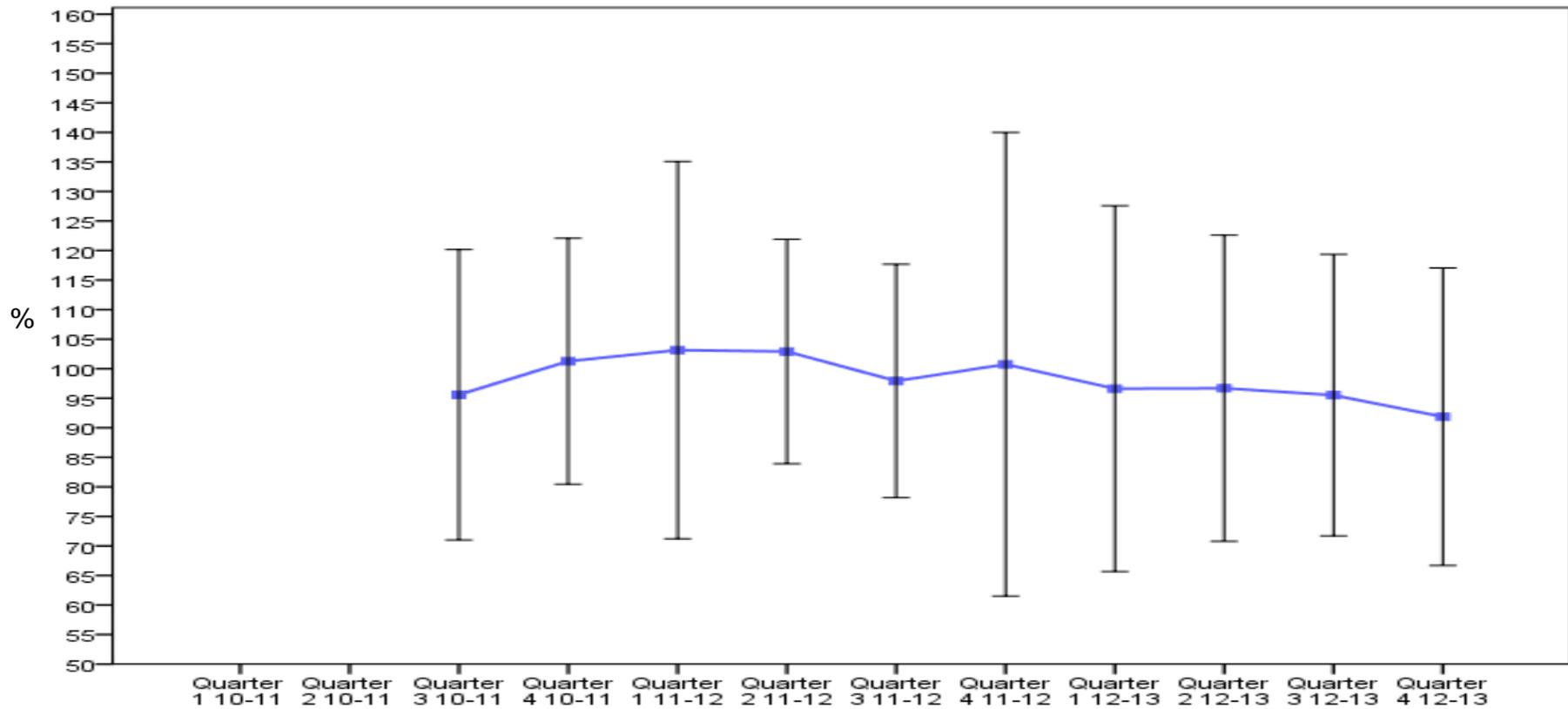


Figure 14 Line graph to show quarterly figures of the mean percentage **Theatre utilisation** for University Trust (April 2010-March 2013) with error bars of +/- 1 standard deviation.

	Urban trust (n=172)	University trust (n=389)
Early Finish	26.7%	31.4%
On-time	14.5%	12.9%
Late finish (overrun)	58.7%	55.8%

Table 10 Percentage of lists that finished early, on-time and late, if the operating list started late at Urban and University Trusts (April 2010-March 2013).

### **Summary of Results**

The findings presented and summarised in appendices 9 and 10, describe two trusts with similar issues regarding how operating theatres are used along with similar underlying problems in trying to implement change and SLM. This has meant that despite Urban Trust actively trying to implement SLM and University Trust continuing to develop a PLICS system, little evidence of either implementation or SLM affecting the use of operating theatres over time, has been shown. Despite both Urban (non-FT) and University Trusts (FT) having different status and functioning in different contexts, findings during baseline and second phase data collection were similar. Consequently, identified issues and underlying problems are likely to be relevant within the broader NHS and relevant to other NHS trusts wanting to improve the way operating theatres are utilised and implement SLM.

The key points identified and that are discussed further in the following discussion chapter are:

- The organisational structure of both trusts did not allow an effective service line team to affect how colorectal operating theatres were used (Structure).
- Data collected in both trusts was not used to effectively manage performance or affect the way operating theatres were used (Value of Data).
- Financial information was not being used by interviewees to improve the cost effectiveness or use of operating theatres (Cost and Finance).
- Engaged and pro-active leaders were individually able to affect parts of how operating theatres were used (Engagement and Leadership).

## **CHAPTER FIVE: DISCUSSION**

Operating theatres are an expensive but important resource needed as part of a comprehensive health care system. Consequently, in the current financial context of the QIPP challenge, the NHS must ensure this resource is used efficiently and cost effectively while safe, high quality care is maintained (Department of Health 2010b, Peltokorpi, 2011, Marjamaa and Kirvela, 2007, Agnoletti et al., 2013). The principles of Service Line Management (SLM) align with those of LEAN and effective change management, in aiming to create an environment in which front-line staff are empowered to affect and improve the cost effectiveness of resources such as operating theatres (Kotter J, 2002, Institute for Healthcare Improvement 2005, Monitor 2010c, Donahue and Mets, 2008, McGowan et al., 2007). Nevertheless, despite Urban Trust and University Trust intending to implement SLM, little evidence of its implementation and effect was found.

As a consequence of minimal SLM implementation, the main aim of this study and one of the study's three objectives has not been achieved:

- Aim: to evaluate whether implementing SLM affects the way operating theatres are utilised, and if so how and why?
- Objective: to compare and evaluate how the two differing approaches to SLM implementation affected the way operating theatres were utilised.

How and why SLM was not successfully implemented was established.

This mixed methods process evaluation was effective in obtaining opinions of key staff on theatre utilisation and in identifying the key factors affecting how operating theatres were utilised. This approach also established how and why these opinions and factors changed or did not change over the study period. As such two of the study's three objectives were achieved:

- To determine the opinions of key staff (surgeons, anaesthetists, theatre management and other theatre staff within both trusts) on how operating theatres were being utilised and to record, how and why these opinions changed over the study period, if at all.
- To identify key factors which affected how operating theatres were being utilised within both trusts and to record, how and why these changed over the study period, if at all.

In achieving or in attempting to achieve the study's aims and objectives, key issues and underlying problems relevant to SLM implementation and theatre utilisation were identified. These findings are summarised at the end of the results chapter (Summary of Results) and relate to the key elements of SLM described in the literature review (organisational structure, information, and performance management). These findings are used below to provide a structure for this chapter as they highlight the lessons learnt about implementing SLM and improving operating theatre utilisation.

## Organisational Structure

- The organisational structure of both trusts did not allow an effective service line team to affect how colorectal operating theatres were used.

The journey a patient takes when they require an elective operation is very complex and involves numerous hospital departments, numerous independently managed staff groups and numerous healthcare professionals (Al-Hakim and Gong, 2012, Pandit et al., 2012, Agnoletti et al., 2013). As this study demonstrates, this means there are both numerous steps and factors which can make the process inefficient. Nevertheless, little interaction between staff groups outside of an operating list was demonstrated, with no meaningful communication occurring to improve or change the inefficient process. This in part was due to the 'traditional' organisational structure of both trusts. Consequently, front line staff who influenced how operating theatres were used remained affiliated to separate divisions and/or directorates. These had their own separate budgets, made their own independent decisions and did not work together as a team, to improve how colorectal theatres were used.

The purpose of SLM is to structure services around patient pathways/services (Monitor 2009a). This may require the breakdown of traditional boundaries and means the more complex the patient pathway is, the more difficult organisational restructuring is likely to be (Greenberg et al., 2003). The difficulty is that without a clearly defined service line, leadership roles, decision rights, accountability and information support cannot be determined or developed (Lambert et al., 2006, Waring and Bishop, 2010). This makes defining an appropriate organisational structure, a key priority when implementing SLM (Monitor 2009b).

### ***Structural Options***

Successful SLM implementation generally occurs when specific service lines (e.g. cardiac services) are selected (Holth, 1994, Parker et al., 2001, Greenspan et al., 2003, Greenberg et al., 2003, Lambert et al., 2006). This could partly explain their success, as service lines may have been focussed around staff groups that are already dedicated to a disease or patient pathway and/or organised in parallel with traditional departmental structures. In contrast, this research identified that the patient journey through operating theatres clashes with traditional functional and managerial boundaries, and that staff are not always dedicated to a particular healthcare problem or pathway. This makes organisational restructuring more difficult.

Two possible service line structural options, that involve operating theatres, could be:

1. Specific operating theatres and all staff involved in the patient pathway are integrated into a surgical service line.
2. Operating theatres and anaesthetic time are considered resources that surgical services buy time from.

The entire patient journey involves numerous staff groups and consequently, the organisational structure influences how these staff groups communicate and collaborate (Greenspan et al., 2003, Greenberg et al., 2003, Kelly et al., 1997, Parker et al., 2001, Lambert et al., 2006, Turnipseed et al., 2007). At both Urban and University Trusts, the structure, in part, prevented staff believing they could significantly control how operating theatres were utilised. If the intention is to create a service line around this complex patient pathway (option one above), restructuring

would require all these separate/disconnected staff groups to be incorporated into a single service line team. In colorectal surgery, this would mean having dedicated colorectal anaesthetists, theatre and ward staff, and ultimately would require affiliations to divisions or directorates to be changed, budgets to be realigned and leadership roles to be redefined (Monitor 2009b). Although recommended by Monitor, adopting option one would require significant restructuring and would be time-consuming (Monitor 2009b). In contrast, the potential benefit of this approach, is that the service line team has greater control over the whole process and as such, is in a stronger position to affect it (Kelly et al., 1997, Holth, 1994, Lambert et al., 2006).

A potential difficulty with option one is that staff, especially portering, preassessment and anaesthetic staff, are all required to work as part of other service lines. Portering staff, for example, may be needed to transfer orthopaedic patients, and anaesthetists may be needed to work in intensive care or for other surgical specialties. Workload within a particular service line may dictate how viable option one is. For example, Foot et al reported interviewees describing service lines as 'mini Foundation Trusts', suggesting service lines were self-sufficient (Foot et al., 2012). This would only be possible if there is sufficient volume of work to justify staff, such as anaesthetists, being solely affiliated to a service line.

A further potential problem with option one is that the service line itself becomes a silo and, as a consequence, new conflict and new boundaries are created. An overview and appraisal of service line activity would be required to ensure changes implemented by a particular service line do not negatively impact on other services (Greenberg et al., 2003, Hibberd et al., 1992). One study describes a service line reporting directly to the Chief Operating Officer, which would seem appropriate, as an

individual would require the authority to control and monitor different service lines and ensure implementation was not detrimental to the wider organisation (Turnipseed et al., 2007).

Alternatively, a service line structure could be implemented one service line at a time incrementally (Hibberd et al., 1992). This approach would create different problems, as it would extend the time required for full implementation, could negatively impact on services not prioritised in terms of implementing SLM and would not align with Monitor's generic implementation programme (Monitor 2009a, Greenberg et al., 2003). As a consequence, time and active higher managerial coordination of implementation would be required for this approach to succeed (Holth, 1994, Hoff, 2004). In the context of time pressures created by the QUIPP challenge and the need for all NHS trusts to achieve Foundation Trust (FT) status, this approach would not be appropriate for non-FTs. Nevertheless, for trusts such as University Trust, who already has FT status and has less time pressure to implement SLM, using this approach could improve the chance of success as limited resources can be specifically allocated to purposefully selected service lines (Holth, 1994, Parker et al., 2001, Greenspan et al., 2003, Greenberg et al., 2003, Lambert et al., 2006).

Option two would require less organisational restructuring, meaning this approach would be less complicated, less time-consuming and thus cheaper to implement. Directorates and/or divisions could remain, with changing the way staff group interaction being the main focus of change (Parker et al., 2001). This approach, similar to payment by results (PbR), would use budgets as the incentive to encourage efficient working and improve the cost effectiveness of services (Dixon, 2004, Mannion et al., 2008). Surgeons, anaesthetists and theatre staff would remain

separate/disconnected, with financial incentives being the main drive for change (Dixon, 2004, Abbott et al., 2011, McGowan et al., 2007, Mannion et al., 2008).

The main difficulty with this option, is the need for a robust and reliable integrated data costing system, which is not always available in the NHS (Foot et al., 2012, Department of Health 2011b). This difficulty was apparent at Urban Trust, as the idea of a 'nectar point' system was felt to be unworkable due to inadequate data systems. At University trust, no evidence of interviewees even being aware of Patient Level Information and Costing System (PLICS) development was found, with the system only being used to benchmark against other NHS trusts. This does not preclude that this data system may eventually be used as part of SLM implementation to improve the cost effectiveness of operating theatres (Monitor 2009c), but as no evidence on the positive/negative impact of PLICS on operating theatres exists (Siegmüller and Herden-Kirchhoff, 2010), further evaluation of this intervention would be of interest. Despite this lack of evidence, Urban Trust clinical leaders believed PLICS was necessary whilst other NHS trusts are also trying to implement these financial systems (Department of Health 2011b). In the context of theatre utilisation, the lack of a costing system that follows the patient and which can accurately apportion charges to anaesthetic time, theatre time and surgical time, it is unlikely option 2 would work.

Option two, could also create conflict between specialties if delays resulted in operating lists overrunning. For example, surgeons could blame theatre staff for not being prepared and/or theatre staff could blame surgeons for not informing them if they required a piece of equipment. The outcome of such disputes would determine responsibility for expensive operating theatre time and consequently could create

further separation/disconnection between staff groups. Stakeholders would have to agree and clearly define accountability of cost for differing scenarios.

If financial data systems are available, option two may offer the quickest approach to implementing SLM. This approach would not devolve control or accountability of the whole pathway to clinical leaders and could be detrimental to staff group collaboration. In contrast, option one, could enable accountability and control to be devolved to clinical leaders, at the expense of time-consuming organisational restructuring.

It is concluded that non-FTs need an integrated data system and/ or to undergo restructuring if they are to improve theatre utilisation by implementing SLM (Monitor 2009b, Monitor 2009c). Without doing so, implementation to level 3 is unlikely to be achieved and it will be difficult to prove to Monitor financial viability and effective governance is in place (Monitor 2010c, Monitor 2008).

### ***Planning***

The planning or scheduling of operating lists, is a part of the process which staff can control and should be a focus to improve theatre utilisation (Alvarez et al., 2010, MacLellan et al., 2008, Pandit et al., 2007, Macario, 2006, McIntosh et al., 2006, Pandit and Carey, 2006, Rai and Pandit, 2003, Pandit et al., 2012, Hartmann and Sunjka, 2013). An example of this was identified in this study, when the CDS at Urban Trust minimised the number of unused theatre sessions during the Theatre Cross Charging pilot. That said, planning can be a complex process, as it should aim to make the whole patient journey efficient and ensure operating lists are used

appropriately (Hovlid et al., 2012, Wong et al., 2010, Sung et al., 2010, MacLellan et al., 2008, Sanjay et al., 2007). The planning process also requires coordination, communication and interaction between the different staff groups involved in the patient journey, meaning a mechanism or structure is also needed to facilitate this process (Hovlid et al., 2012, Wong et al., 2010, Sung et al., 2010, MacLellan et al., 2008, Sanjay et al., 2007). Although the newly introduced scheduling meetings at Urban Trust may address some of these issues, minimal evidence for effective team working was demonstrated in this study.

Despite the need for effective team working and broader engagement in planning of operating lists, this study found surgical ownership of list planning to act as an incentive to complete all cases and minimise cancellations and, similar to other studies, removal of control was found to potentially cause conflict and disengagement (Holth, 1994, Kelly et al., 1997, Jain et al., 2006, Hibberd et al., 1992). As completing all cases and minimising cancellations are appropriate targets, and because having appropriate incentives in place to encourage good practice is a desired outcome of SLM implementation, caution should be applied to ensure surgical ownership of operating lists is not fully removed (Monitor 2010c).

As individual's perception of success can vary, maintaining surgical control to incentivise case completion should not be to the detriment of effective team working (Parker et al., 2001). In this study, theatre staff did not consider finishing late in order to complete all cases a successful measure, with frequent overruns causing irritation and disillusionment. As a consequence surgeons and theatre staff were divided by this issue, with surgeons aiming to complete all cases, even if that meant finishing late, whilst theatre staff hoped to complete all cases within a defined time period.

Despite this contradiction, financial and time incentives, created by weekend waiting list initiatives at Urban Trust, were described to motivate all staff to work efficiently. Part of the incentive was an increase in weekend working hours flexibility, meaning staff were able to go home early upon list completion. This incentive did not exist during the weekdays, as inflexible shift patterns meant staff were unable to leave early, despite a list being completed. This infers fixed shift patterns can act as a disincentive, with alternate working patterns or incentives being needed to encourage efficient team working.

In the NHS, as part of SLM implementation, there is a need to develop a structure or mechanism that encourages effective team working (Monitor 2010c, Monitor 2009b). Initiating operating list scheduling and planning meetings could provide an effective approach to achieve this desired outcome (Greenberg et al., 2003, Lambert et al., 2006). Output of this study suggests that meeting attendees should include, pre-operative assessment staff, ward staff, surgeons, anaesthetists and theatre staff and as such, include all staff who can affect the process. As demonstrated in the Urban Trust theatre pilot study, clinical engagement and minimal disruption can create short-term financial gain. Consequently, as progress is made and the team cohesion develops, other controllable factors that affect the patient journey could be addressed (McGowan et al., 2007, Donahue and Mets, 2008, MacLellan et al., 2008). As such, scheduling and planning team meetings could create engagement and collaboration and form the basis of an effective service line team.

## Value of Data

- Data collected in both trusts was not used to effectively manage performance or affect the way operating theatres were used.

The use of data is integral to successful SLM implementation, as it is required for managing performance and for service line teams to make informed decisions (Monitor 2009b, Holth, 1994, Lambert et al., 2006, Turnipseed et al., 2007). At both Urban and University Trusts, no meaningful performance review meetings on colorectal operating theatre utilisation were taking place, with data mainly being fed back if a problem existed. Even if feedback was received, interviewees considered themselves unable to control the main factors responsible for late starts, overruns or patient cancellations and consequently no improvement in theatre utilisation was shown. This meant, although data was being collected on a daily basis at both trusts, it was not being used to affect anything that key staff did.

This raises the question of why it was collected at all? If accurate and used in the right way, interviewees felt data could be used to impact positively on theatre efficiency. Ensuring qualitative data is collected to determine how and why existing indicators change, for example on causes for late starts (Wong et al., 2010), will provide more useful information than quantitative figures alone (Sanjay et al., 2007, Hovlid et al., 2012, Al-Hakim and Gong, 2012, Agnoletti et al., 2013) and its collection was encouraged at Urban Trust. Porta et al also described the need to collect qualitative data so that the source of a delay could be identified and addressed (Porta et al., 2013). As a consequence, they developed a combined quantitative and qualitative data collection form to collect real-time information, from key staff, on

delays in and around operating theatres (Porta et al., 2013). This intervention was considered successful in reducing delays, due to active involvement, communication and collaboration between different staff groups; all desired outcomes of change management and SLM implementation (Porta et al., 2013, Monitor 2010c, Kotter J, 2002). This approach should be more widely adopted to strengthen the value of data collected and its potential impact on operating theatre efficiency.

### ***Accessibility***

Despite the value of data, how accessible it is and/or the way it is used will also determine its impact (Lambert et al., 2006, Turnipseed et al., 2007, Pandit and Carey, 2006, Sung et al., 2010, McGowan et al., 2007, Agnoletti et al., 2013).

Interviewees at University Trust were disconnected from the data they collected, had minimal access to it and as a consequence, it played no part in altering either staff behaviour or performance. Whilst at Urban Trust, data was accessible, in the form of operating theatre performance dashboards, they were not seen as relevant by interviewees, which meant that accessible data had no influence on staff performance. To provide benefit, data needs to be accessible and relevant to staff (Turnipseed et al., 2007, Lambert et al., 2006, Agnoletti et al., 2013). Front line staff interviewed for this study suggested that dashboards should incorporate Care Quality Commission indicators, outcome data of surgical procedures and timing indicators supported by qualitative information. Other studies have incorporated patient satisfaction surveys (Kelly et al., 1997, Turnipseed et al., 2007). Consequently, clinical and managerial staff need to collaborate to improve accessibility and value of

dashboards, so that data can be used to improve the outcome, experience and care patients receive.

### ***Performance***

If accessibility and quality of dashboards are improved, the complex nature of the patient journey and staff group interaction will determine the level of impact of data on efficiency and patient care (Turnipseed et al., 2007, Greenberg et al., 2003, Hovlid et al., 2012). This study identified staff group separation/disconnection at both trusts, with traditional boundaries and organisational structure hindering control and interaction. The actions of a proactive recovery nurse, at University Trust, exemplifies how interaction between the wards, recovery and operating theatres can improve patient flow/efficiency. These were achieved following formal discussions between these different staff groups. Similarly at Urban Trust, one meeting attended by the CDS, the CDAT, a theatre manager, administrative, informatics and finance staff, resulted in positive changes to the scheduling/planning process and even a financial benefit. If such staff group interaction took place more frequently improvement to performance indicators such as late starts or cancellations can be achieved (Sung et al., 2010, Hovlid et al., 2012, Wong et al., 2010, Overdyk et al., 1998). Consequently, as part of SLM implementation and in line with Monitor's desired outcomes, performance review meetings to improve theatre utilisation should be initiated early in the implementation process (Monitor 2010c, Monitor 2009b). These should include: ward staff; preassessment staff; surgeons; anaesthetists; theatre staff; theatre management; bed management and staff from informatics. Only collectively can they develop relevant performance indicators, determine the viability of data analysis,

develop dashboards, increase efficiency and improve patient care (Hovlid et al., 2012, McGowan et al., 2007, Donahue and Mets, 2008, MacLellan et al., 2008, Lambert et al., 2006, Turnipseed et al., 2007).

Late starts were found to be a particular issue in this study and should be a focus of review meetings, as this quantitative indicator is a measure that can be affected and partially controlled by improved planning processes, improved communication and/or the use of information technology (MacLellan et al., 2008, Donahue and Mets, 2008). Although starting late is considered to reduce efficiency (NHS Institute for Innovation and Improvement 2009, NHS Modernisation Agency 2002), it has also been shown to be a poor indicator of overall theatre efficiency, as it does not predict whether all cases will be completed before or after the planned finish time (Pandit et al., 2012). This study supports this finding (Table 10), with 26.7% and 31.4% of operating lists that started late, still finishing early at both Urban and University Trusts. How and why this is the case is not understood, although poor planning, patient cancellations and the unpredictability of procedure time are likely to be factors (Pandit et al., 2012, Hovlid et al., 2012, Sung et al., 2010, Sanjay et al., 2007, Hartmann and Sunjka, 2013). As such, starting late may not predict whether an operating list will finish on time, but it is an indicator that can be influenced by good planning/scheduling. For this reason, it seems an appropriate performance indicator (Sneyd, 2012); although it must be acknowledged that causes for late starts may not always be controllable.

The cause for late starts were frequently attributed to ward inefficiencies and a lack of ward capacity. This, in part, was caused by ward staff having other patients to care for, meaning their priorities conflicted with those of theatre staff and operating theatre efficiency. One possible solution, is to have an elective surgical admissions unit,

dedicated to preparing the first listed patient (Hovlid et al., 2012). As a prerequisite, prior to the day of surgery, list order would need to be finalised and subsequently communicated to the patient, to the admissions unit, to the main surgical ward and to all theatre staff (Sanjay et al., 2007, Hovlid et al., 2012, Al-Hakim and Gong, 2012, Sung et al., 2010, Donahue and Mets, 2008, McGowan et al., 2007). The unit should be well staffed/resourced, have plenty of capacity to cope with numerous patients and be close to operating theatres. To prevent disruption to patient flow, the main surgical ward, would need to allocate the first available bed to the first listed patient. To minimise delay and/or a patient cancellation, a lack of bed availability would need to be communicated to bed management and all theatre staff as early as possible (Hovlid et al., 2012, Al-Hakim and Gong, 2012, Donahue and Mets, 2008, McGowan et al., 2007). This would then allow time for alternative arrangements identified and/or the list order to be changed.

### ***Planning***

Data can be used to improve the planning/ scheduling of operating lists by calculation of average procedure times (Pandit and Tavare, 2011, Alvarez et al., 2010), with Pandit and Carey finding that data collected within hospital information systems, provides more reliable predictions than surgeons or other staff (Pandit and Carey, 2006). This suggests, that if data systems are reliable and are used appropriately, operating list planning/scheduling can be improved. Procedure times were not calculated or available at Urban Trust and were considered to be grossly inaccurate at University Trust, with similar issues having been found in other NHS hospitals (Foot et al., 2012, Pandit et al., 2012). Reliability, interpretation and the value of data

needs to be improved not only to manage performance, but to support planning processes too.

Even if information support is adequate, procedure time predictions will not be precise for individual cases, as predicted timings will be an average. Other uncontrollable factors (e.g. the patient arriving late) may also affect how efficient the operating list runs. Consequently, the planning/scheduling process may be improved by using predicted procedure times, but finish times will still remain unpredictable (Alvarez et al., 2010).

### ***Theatre Utilisation***

Unpredictability was demonstrated by the quantitative data collected for this study, as both Urban and University Trusts were more likely to overrun or finish early than they were to finish on time (Tables 8a, 8b, 9a and 9b). Despite this, planned operating times and theatre staff shift patterns were fixed in both trusts, with national standard performance indicators also being based on fixed times (Audit Commission 2003, NHS Institute for Innovation and Improvement 2009). As such, although a fixed start time makes sense (Sneyd, 2012), having a fixed finish time does not, as a finish time performance indicator is not a realistic target (Alvarez et al., 2010). Theatre utilisation is considered a poor performance indicator and is calculated by using the finish time (Pandit et al., 2007, Abbott et al., 2011, Faiz et al., 2008). This study confirmed theatre utilisation to be a poor indicator, as despite frequent early and late finishes in both trusts, an average theatre utilisation (method 1) of at least 90% and often above 100%, was found (Tables 8a, 8b, 9a, 9b and Figures 9,10,13 and 14).

Theatre utilisation was measured at both Urban and University Trusts by knowing the start time of the first case, the finish time of the last case and the amount of planned operating time. This definition does not take into account turnaround time or any patient cancellations. This means even if there is a large gap between cases and two cases are cancelled, that the utilisation figure can still be greater than 100% (Pandit et al., 2007). As such, this performance indicator could discourage efficient working, described to occur during waiting list initiatives in which operating lists may finish early. It also encourages large gaps between cases to ensure all the planned theatre time is used and rewards expensive overruns (McIntosh et al., 2006, Pandit et al., 2007).

Qualitative and quantitative data from University Trust highlighted further flaws with this performance indicator, with the average theatre utilisation figure having decreased after baseline data collection (Second phase=95.3% v Baseline=100.7%). These quantitative figures would suggest theatre utilisation had worsened and could prompt criticism/negative feedback towards theatre management, theatre staff, anaesthetists and/or surgeons. Yet, qualitative data and other quantitative indicators, explain the reason for this decrease to be an increase in patient cancellations caused by a lack of bed capacity. These cancellations led to an increase in early finishes and a decrease in the number of overruns, meaning theatre utilisation decreased (Table 9a and 9b). Consequently, without qualitative data and an understanding of how and why theatre utilisation figures have changed (Porta et al., 2013, Wong et al., 2010, Sanjay et al., 2007), criticising or performance managing theatre staff using this performance indicator alone, is totally unjustified and will not change or improve operating theatre usage or efficiency.

Urban Trust changed its definition of theatre utilisation (method 2) between baseline and second round interviews (Table 2). A similar measurement was also described by the Audit Commission (Audit Commission 2003), as the new definition only incorporated minutes in which an anaesthetist or surgeon are in contact with the patient, although Urban Trusts definition did not include time outside of planned session time. Consequently, when using this method to calculate theatre utilisation, patient contact after the planned finish time, and any turnaround time, is not included. This means, the maximum theatre utilisation figure is 100%, as compared to method 1 in which any percentage is possible. Despite this definition not rewarding overruns or large gap times, it still discourages efficient working that may lead to an early finish and does not take into account any patient cancellations (Pandit et al., 2009). As such, although this definition could be considered an improvement, similarly to method 1, without knowing how and why changes to the figure occur, this performance indicator is of little value.

As effective performance management is important for successful SLM implementation, a lack of good performance indicators highlights a problem if SLM is to impact on theatre utilisation (Monitor 2009b). If indicators are not valued and owned by front line staff, the willingness to change behaviour is reduced and undermines the entire implementation process (Hibberd et al., 1992, Waring and Bishop, 2010). To incentivise efficient cost effective working in operating theatres, alternative measures of performance, such as financial indicators need to be developed (Siegmueller and Herden-Kirchhoff, 2010), but should only be so by the different staff groups involved in the process .

## Cost and Finance

- Financial information was not being used by interviewees to improve the cost effectiveness or use of operating theatres.

The findings of the Theatre Cross Charging pilot, suggest proactive, positive behaviour can improve the scheduling and planning of operating lists and realise a financial benefit. Mannion et al described financial gain as a strong incentive and that the cost to perform an operation could be reduced by improved theatre scheduling (Mannion et al., 2008). As such, financial information should be incorporated into performance dashboards to demonstrate financial gains, although to maintain clinical engagement and incentivise positive behaviour, financial indicators should not be prioritised over quality of patient care (Hoff, 2004, Davies and Harrison, 2003, Winyard, 2003, Rodwin, 2004) .

A weakness of the Theatre Cross Charging pilot was that financial information obtained only approximately counted the cost of a theatre session. It did not include income generated from cases completed, or other costs possibly incurred from departments, such as radiology or intensive care. This was because a data system, similar to other NHS trusts, was not available to accurately determine expenditure and income for each patient (Foot et al., 2012, Department of Health 2011b). At University Trust the PLICS system may provide this level of accuracy in the future, and allow cost effectiveness of operations to be determined. Nevertheless, currently the cost effectiveness of an operation relies upon the cost of performing a procedure and the income generated from national tariffs (Dixon, 2004, Abbott et al., 2011, Mannion et al., 2008). Consequently, if the tariff is lower than it costs to perform an

operation the trust will lose money (Hearnden and Tennent, 2008, Abbott et al., 2011). This means that having data systems to determine income and expenditure for operations, could act as a disincentive to perform expensive procedures or encourage an increase in activity of procedures that generate income (financial gaming) (Dixon, 2004, Mannion et al., 2008). Nevertheless, unless this financial information is used appropriately by NHS trusts and is available to the Department of Health, the cost effectiveness of services will remain unknown and appropriate changes to national tariffs will not occur (Department of Health 2011b, Abbott et al., 2011). Having accurate financial information, should not only help clinical leaders to make services more cost-effective and, as a consequence, make required cost savings, but also help commissioners and the government to determine what funding is needed to sustain NHS healthcare services (Abbott et al., 2011, Hearnden and Tennent, 2008, Monitor 2009c, HM Treasury 2010, Department of Health 2010b, Ham, 2009).

Despite the development of the PLICS system at University Trust and the greater urgency and drive to implement SLM at Urban Trust, financial data was not available to interviewees to aid decision making or change processes within operating theatres at either trust. Until such data is available at a service line level, SLM cannot be regarded as having been implemented in this setting (Monitor 2009c, Monitor 2010c). As time is limited for non-FTs, such as Urban Trust, to gain FT status and uphold the Tripartite Formal Agreement, the consequence of failing to implement SLM and/or prove financial viability is yet unknown (Department of Health 2011a, House of Commons Committee of Public Accounts 2011). In contrast, having already gained FT status and having recently relocated to a brand new facility, University Trust is

unlikely to be under the same level of scrutiny from Monitor, especially as financial viability is supported by income from tertiary referrals and research activity (Monitor 2010d, Monitor 2010a). These differing contexts were reflected by interviewees, as a greater awareness of SLM and a greater urgency to change and improve the cost effectiveness of operating theatres was evident at Urban Trust.

Despite the urgency for Urban Trust to demonstrate financial viability (Monitor 2008, House of Commons Committee of Public Accounts 2011), the lack of an integrated data system hindered SLM implementation, with interviewees specifically commenting on the need for financial information at a patient level (PLICS) to improve the cost effectiveness of operating theatres. Although PLICS is considered the ultimate goal, having financial information to this level is not a necessity for implementation and is likely to take time to develop (Monitor 2010c, Foot et al., 2012). As described above for structural option two, comments made reflect the complexity of operating theatres and the degree of different staff group interaction, as without an integrated system that distinguishes between different elements of the patient journey, cost may be attributed to the wrong directorate or service line. Consequently, due to the level of patient journey complexity, to implement SLM in the context of operating theatres and encourage clinical engagement, costing data systems need to be accurate to a patient level. The approach taken by University Trust to develop PLICS, before actively involving interviewees, may ultimately prove more effective in improving the cost effectiveness of operating theatres.

The failure of the NHS information technology project highlights the difficulties in integrating data systems within the NHS (BBC Online 2013, Martin, 2011). This study, similar to Foot et al (Foot et al., 2012), further highlights these difficulties, not

only with integrated data system availability, but also, in how available data is used. Monitor consider information and performance management as two key elements of implementing SLM, meaning robust data systems are considered integral to successful implementation (Monitor 2009a, Monitor 2010c, Monitor 2009d). Despite a large amount of tax payers money being used to improve data systems nationally, success has not been achieved (Martin, 2011, BBC Online 2013, Foot et al., 2012). Until such systems are available it will be difficult for the NHS to realise cost savings from implementing SLM. The problem for NHS trusts, such as Urban Trust, which is trying to implement SLM and gain FT status, is that, in the context of the QUIPP challenge, the funds required to develop such systems are sparse and the time available short (Department of Health 2010b, HM Treasury 2010). It seems unlikely Urban Trust will achieve the desired outcomes of level 3 for two key elements of SLM implementation (information and performance management) and consequently, as suggested by a House of Commons report, be difficult for this non-FT to prove financial viability and obtain FT status by April 2014 (Monitor 2010c, House of Commons Committee of Public Accounts 2011).

### **Engagement and Leadership**

- Engaged and pro-active leaders were individually able to affect parts of how operating theatres were used.

Even if some form of structural change is decided, clinical engagement, effective leadership, the level of administrative support and the value/ usefulness of data available, will determine SLMs impact on theatre utilisation (Greenspan et al., 2003,

Hoff, 2004, Kelly et al., 1997, Turnipseed et al., 2007, Lambert et al., 2006, Waring and Bishop, 2010, Marjamaa and Kirvela, 2007, Kotter J, 2002, McGowan et al., 2007, Donahue and Mets, 2008). As neither Urban Trust nor University Trust changed the structure of colorectal surgery, this study was unable to establish whether this was the case.

At both trusts, despite minimal SLM implementation, proactive engaged leaders were able to impact on the way operating theatres were used. At Urban Trust the CDS was able to make a positive change in the number of operating lists utilised and to make a financial gain. The Transformation team, aimed to improve the planning process and affect the cost effectiveness of operating theatres, and had implemented scheduling meetings that involved different staff groups. At University Trust a proactive recovery nurse improved collaboration between recovery, operating theatres and the main colorectal wards and, as described by other studies, this change to communication was considered to have improved patient flow (McGowan et al., 2007, Donahue and Mets, 2008, Sung et al., 2010, Al-Hakim and Gong, 2012). Despite minimal SLM implementation, this study identified engaged leaders were able to implement change in areas which they could control.

The belief is that without a clinically led concerted effort to reform services and achieve the required cost efficiency savings, the quality of NHS healthcare will decrease (Ham, 2009, Ham, 2013, Darzi, 2008, Department of Health 2010b, HM Treasury 2010, Institute for Healthcare Improvement 2005, Hall, 2011). As such, how to improve clinical engagement and leadership has been a focus of published reports (NHS Institute for Innovation and Improvement and Academy of Medical Royal Colleges 2010, Ham, 2013, Hartley and Ham, 2013). Nevertheless, engaged clinical

leaders are only able to affect areas they control, meaning the organisational structure and the level of autonomy they are provided influences how effective they can be.

### **Strengths and Weaknesses**

The mixed methods multiphase design used, has enabled a baseline to be determined and minimal changes to be identified (Creswell and Plano Clark, 2011). Analysing quantitative data prior to qualitative data collection strengthened the baseline interview schedule, with confidential semi-structured interviews allowing different perspectives to be explored and rich information obtained (Harrell and Bradley, 2009). Observational work and attendance at relevant SLM meetings, enabled triangulation of findings and allowed the researcher to be informed of relevant developments (Hoff, 2004, Creswell and Tashakkori, 2007, Tashakkori and Creswell, 2007, O'Leary, 2010).

Although interviews took place, before and after the Theatre Cross Charging pilot at Urban Trust, the length of time between both phases of interviews could be considered too short. For example, second phase interviews at Urban Trust found that initiatives had just been introduced, and consequently minimal benefit had been realised. Although these initiatives do offer an opportunity for evaluation of approaches to improve the use of operating theatres, they were not considered to have arisen and as such, cannot be attributed, to SLM implementation. Nevertheless, scheduling meetings could be considered the first step in creating a service line

team, meaning in the long-term, evaluating their impact on theatre utilisation would have strengthened this study.

As the researcher had not conducted any formal semi-structured interviews prior to this study, an experienced member of the BBC-CLAHRC research team observed the first interview and provided feedback. The observer considered the researcher to have conducted the interview appropriately, as the interviewee was allowed ample time to speak freely and openly. Despite this, concern was expressed over whether all information required had been obtained. This feedback influenced subsequent interviews with more follow-up and probing questions being used to gain further information from interviewees on relevant specific topics. The interview schedule itself was not modified between interviews as following reflection and discussion the questions and prompts were still considered appropriate. All subsequent interviews, including second phase, were conducted by the researcher independently.

Following interviews audio recordings were played back and listened to by the researcher to improve interview technique. Nevertheless, the researcher's delivery of follow-up and probing questions was not as open or succinct as would have been the case with a more experienced researcher. An example is shown below:

*'Is there anything within that system that you see that, is the major factor or stumbling block or anything that you see that could quite clearly be changed that would improve things?'* (Researcher)

This could have been asked differently, for example:

*Within that system, what would you change?*

Also, numerous interviews were conducted during a single day (maximum 6) decreasing the amount of time available to reflect and learn from previous interviews. Throughout the process of conducting the baseline interviews, specific follow-up and probing questions were influenced by the information provided from previous interviewees. Interview style may also have been influenced by the researcher attending a week long qualitative research module during the time period that baseline interviews were being conducted. The module provided training in qualitative interview technique and is likely to have influenced how 7 of the 22 baseline interviews were conducted.

Although questions may have been better delivered by a more experienced researcher and technique was likely to have been influenced by the qualitative research module, all interviews were conducted by a single researcher using the same interview schedule.

### ***Interviewees***

A total of 35 interviews were conducted for this study. Interviewees were invited to participate purposively, enabling multiple healthcare staff integral to the colorectal patient journey, to contribute. Although the sample size/ number of interviewees required to justify conclusions, varies according to the research question and approach (Morse, 1994, Creswell and Plano Clark, 2011), the intention in qualitative research is to reach the theoretical level of data saturation (Morse, 1995, Sandelowski, 1995, Fossey et al., 2002). The literature does not always clearly define this term (Guest et al., 2006, Morse, 1995). Nevertheless for this type of

qualitative study, the majority of allocated data codes are created after analysis of 12 interviews, with analysis of six providing enough data to support overarching themes (Morse, 1994, Guest et al., 2006). The number of interviews conducted were 22 for the baseline phase (Urban trust- 12 and University trust 10, Table 5) and 13 for the second phase (Urban trust- 6 and University trust-7, Table 6), meaning an accepted level of data saturation was achieved.

No theatre manager or orderly (porter) at University trust agreed to participate in this study (Table 5&6). This has created an imbalance in qualitative data, as a broader perspective on patient transfers and managerial issues has been obtained from Urban Trust. Consequently elements of change may not have been identified.

Although informal discussions suggested this was not the case, not having a theatre managers or orderlies perspective from University trust is a limitation of this study.

Interviewees were consistent at both trusts in how ward issues affected processes, with no change in how colorectal wards were structured or managed being identified. Observational work also supported information provided by interviewees on ward issues. Nevertheless, interviewing a ward manager, a ward sister, a staff nurse and a ward clerk would have added different perspectives on the patient journey and could have provided further insight into theatre efficiency.

Although the focus of this study was on one specialty, interviewees worked for different departments and some for different hospitals. Perspectives and responses are likely to have been influenced by these experiences, meaning qualitative information presented, may not solely reflect colorectal surgery. That said, relative opinions and factors were consistent between interviewees and between trusts. This

suggests the main findings reflect issues relevant to other specialties and other NHS trusts, justifying the broader conclusions made, although this cannot be verified without interviewing staff from other specialties and in different trusts.

### ***Researcher***

The researcher, being an active surgeon, had worked in the NHS for 8 years prior to commencing this study. This background did provide easier access to interviewees and quantitative data, as well as a broader understanding of interviewee responses. Nevertheless, prompts during interviews and interpretation of findings may have been influenced by past experiences/ preconceived opinions. To minimise bias and to add rigour, interview schedules were discussed with supervisors, a BBC-CLAHRC associate supervised the researcher during an interview, two independent BBC-CLAHRC associates coded transcripts during both baseline and second phase data collection, and findings/ themes were discussed with supervisors throughout the study. Despite this, a researcher with no previous contact with interviewees or operating theatres would have further minimised bias.

As the researcher worked and was known by some interviewees at Urban Trust and was also known to an interviewee at University Trust, responses during semi-structured interviews may have been affected. Although it is difficult to quantify how and to what extent this occurred, qualitative data overall was consistent amongst interviewees from both trusts and was supported by observational findings, suggesting the key issues described are representative of reality.

### ***Quantitative Data***

Analysis of quantitative data was expected to be more complex when commencing this study, with financial information expected to be more prominent. The lack of change found during second phase interviews, and the lack of value given by interviewees to performance indicators, meant quantitative data was only integrated descriptively to explain or explore qualitative findings, as more detailed analysis of the data available would not have added greater depth to conclusions made.

The accuracy of quantitative data was questioned by interviewees in both trusts, which cast doubt on data reliability. This doubt was substantiated at University Trust, where patient contact time was found to be greater than utilised minutes in 13% of operating lists. Although quantitative data appeared consistent, debatable accuracy has limited the value and interpretation of this data. This has meant integration between quantitative and qualitative findings has been less than expected and a stronger emphasis on this study's qualitative findings made.

### **Further Work**

The impact of implementing SLM on the utilisation of resources remains unknown, according to Monitor's SLM framework. The multiphase, mixed methods process evaluation approach used for this study, was appropriate to determine the impact of SLM on operating theatres (Medical Research Council 2008, Tashakkori and Creswell, 2007, Hoff, 2004, Parker et al., 2001, Creswell and Plano Clark, 2011). This methodology should be considered when looking to evaluate if, how and why

this complex intervention affects resource utilisation, although the period of time required to fully evaluate the process, is likely to be difficult to predict.

At University Trust the PLICS system was continuing to be developed and may in the future impact on how operating theatres are used. The expectation of this evaluation was that the system would be introduced at a faster rate than occurred. This means an evaluation of its potential impact on operating theatres was not established and again offers an opportunity for further work with other NHS trusts trying to implement similar data systems (Department of Health 2011b).

Scheduling meetings which involved different staff groups, had also been introduced by the Transformation team at Urban Trust. By improving collaboration, these meetings may improve the planning process and affect how cost-effective operating theatres are (Hovlid et al., 2012, Al-Hakim and Gong, 2012, Sung et al., 2010, MacLellan et al., 2008). Further evaluation of this intervention would be of value, especially as the 12 week Urban Trust pilot study showed that improved planning saved the trust over £20,000 (Table 7).

At the time of second phase interviews, performance boards were being trialled within Orthopaedic surgery at Urban Trust. A process evaluation of this approach, could provide useful information to determine if, how and why such an intervention is successful. These were being used to record any problems or concerns theatre teams had and to record causes for delay. If obtained information is used constructively, this real-time approach could improve efficiency with other studies having found real-time approaches to minimise delays (Porta et al., 2013, Overdyk et al., 1998).

## **Conclusion**

This mixed methods process evaluation, has enabled two key objectives of this study to be addressed because opinions of key staff and the key factors affecting how operating theatre utilisation were determined. As minimal SLM implementation was found in both trusts, the impact of SLM on theatre utilisation could not be established. How and why this was the case has been determined.

Baseline interviews found interviewees to work within an organisational structure that was not based around the use of colorectal operating theatres. This meant communication between interviewees was poor, that they felt separated and disconnected from each other and, as a consequence, were unable to control or affect elements of the complex patient journey. The organisational structure did not promote collaboration between staff groups, did not provide clinical leaders with adequate autonomy/control and consequently, did not create an environment in which change initiatives, such as SLM, are likely to succeed.

A lack of information and performance management, due to a lack of reliable, accurate and valued data, including financial data, has also hindered processes to improve the cost effectiveness and utilisation of colorectal operating theatres. The need for PLICS is integral when aiming to save money and implementing SLM within operating theatres, not only to provide incentives, aid planning and performance management, but also to support local and national commissioners to financially plan surgical healthcare services (Department of Health 2011b, Monitor 2009b, Monitor 2009e). Without successful investment in data systems and in data processing, it is

unlikely clinical leaders will be able to radically reform services, maintain standards of healthcare and make the required cost savings, as valued performance indicators and financial implications of change will remain unknown.

In conclusion, evidence demonstrating the benefits of SLM implementation in the NHS is minimal, and that which does exist is of poor quality. This situation is unlikely to change unless multiphase, long-term, mixed method evaluations of implementation are performed (Medical Research Council 2008, Creswell and Plano Clark, 2011, Tashakkori and Creswell, 2007, Hoff, 2004, Parker et al., 2001). Nevertheless, Monitor's SLM framework does encourage appropriate changes, supported by the literature, to improve the efficiency and cost effectiveness of resources, such as operating theatres (Monitor 2009a, Hovlid et al., 2012, Lambert et al., 2006, McGowan et al., 2007, Holth, 1994, Parker et al., 2001, Turnipseed et al., 2007, Greenberg et al., 2003, Marjamaa and Kirvela, 2007, Kotter J, 2002, Donahue and Mets, 2008, MacLellan et al., 2008, Hall, 2011). Consequently, trusts intending to implement SLM and improve the cost effectiveness of operating theatres, need to develop organisational structures that promote collaboration across traditional staff boundaries and devolve control of the complex patient journey to engaged clinical leaders. Investment in integrated data systems, including financial, is required as without information that is valued and useful, clinical leaders will not be able to make healthcare services more cost-effective and sustainable . Without these fundamental elements of SLM being properly implemented, the true impact of this promising complex intervention, on how operating theatres are used will not be established.

## **APPENDIX 1- Literature Searches**

### **Search terms used:**

Service line management / Product line management (MeSH term)

Healthcare (MeSH term)

Implementation

Theatre utilisation/ utilization

Operating rooms (MeSH term)

Efficiency (MeSH term)

Utilization (MeSH term)

The final literature search was performed on the 21st October 2013 using Endnote Reference manager (X4, Thompson Reuters).

### **Service Line Management and Theatre Utilisation**

#### **MEDLINE and Web of Science**

1.

Title/ Keywords/ Abstract

Service line management/ Product line  
management

Title/ Keywords/ Abstract                      Utilisation/ utilization

Title/ Keywords/ Abstract                      Operating rooms

### **PubMed**

1.

All fields    Service line management/ Product line  
management

All fields    Utilisation/utilization

All fields    Operating rooms

### **5 references identified**

All were articles from American journals, four were not research studies but commentaries or programmes on approaches to improving operating room performance and the remainder was a cost-benefit analysis of adding an emergency general surgical service to a trauma/critical care service.

## **Service Line Management Implementation**

### **MEDLINE and Web of Science**

1.

Title/ Keywords/ Abstract-                      Service line management/ Product line  
management

Title/ Keywords/ Abstract      Healthcare

Title/ Keywords/ Abstract      Implementation

**PubMed**

1.

Title      Service line management/ Product line  
management

All fields      Healthcare

All fields      Implementation

2.

Abstract      Service line management/ Product line  
management

All fields      Healthcare

All fields      Implementation

3.

MeSH term      Product line management

All fields      Healthcare

All fields      Implementation

After duplicates were removed, 96 references remained. Following review of titles and abstracts 24 of these 96 references were selected for full review and 72 excluded.

Articles were excluded if they were :

- Not related to Service Line Management implementation
- None English
- Community based
- Business or marketing orientated
- Focussed on Mental Health services
- Focussed on information technology implementation
- No abstract available

One further reference, not found by the searches above, was obtained from the King's Fund website ([www.kingsfund.org.uk](http://www.kingsfund.org.uk)).

## **Theatre Utilisation Search**

### **MEDLINE and Web of Science**

1.

Title/ Keywords/ Abstract      Operating rooms

Title/ Keywords/ Abstract      Utilisation/utilization

Title/ Keywords/ Abstract      Efficiency

### **PubMed**

1.

All fields      Operating rooms

All fields      Utilisation/utilization

Allfields      Efficiency

After duplicates were removed, 221 references remained. Following review of titles and abstracts 24 of these 221 references were selected for full review and 197 excluded.

Articles were excluded if they were:      None English

Published prior to 2007

Focussed on day case or emergency  
theatres

Focussed on building construction

Focussed on Anaesthetics or Orthopaedics

Mathematical modelling

No abstract available

Following full review of the selected 24 articles 29 cited references were obtained and reviewed. These 29 references were mainly published prior to 2007, meaning this approach identified the most relevant articles for this study.

### **Websites Accessed**

Monitor- [www.monitor-nhsft.gov.uk](http://www.monitor-nhsft.gov.uk)

Department of Health- [www.dh.gov.uk](http://www.dh.gov.uk)

NHS Institute for innovation and improvement - [www.institute.nhs.uk](http://www.institute.nhs.uk) (from 1st April 2013 became NHS Improving Quality (see below))

NHS Improving Quality- [www.england.nhs.uk/ourwork/qual-clin-lead/nhsiq/](http://www.england.nhs.uk/ourwork/qual-clin-lead/nhsiq/)

The organisation for economic cooperation and development (OECD)-  
[www.oecd.org](http://www.oecd.org)

The Audit commission- [www.audit-commission.gov.uk](http://www.audit-commission.gov.uk)

The King's Fund- [www.kingsfund.org.uk](http://www.kingsfund.org.uk)

NHS National Institute for Health and clinical excellence- [www.nice.org.uk](http://www.nice.org.uk)

Care Quality Commission -[www.cqc.org.uk](http://www.cqc.org.uk)

NHS Connecting for health- [www.connectingforhealth.nhs.uk](http://www.connectingforhealth.nhs.uk)

NHS Right Care- [www.rightcare.nhs.uk](http://www.rightcare.nhs.uk)

National Audit Office- [www.nao.org.uk](http://www.nao.org.uk)

Legislation.gov.uk- [www.legislation.gov.uk](http://www.legislation.gov.uk)

British Society of Gastroenterology- [www.bsg.org.uk](http://www.bsg.org.uk)

Royal College of General practitioners - [www.rcgp.org.uk](http://www.rcgp.org.uk)

Royal College of Physicians- [www.rcplondon.ac.uk](http://www.rcplondon.ac.uk)

Royal College of Surgeons of England- [www.rcseng.ac.uk](http://www.rcseng.ac.uk)

Community interventions for Health- [www.oxha.org](http://www.oxha.org)

**Google search terms:**

Theatre Utilisation NHS

Service Line Management

PLICS

QUIPP

Systematic reviews of qualitative research

Meta-synthesis

Lean

Mixed methods research

Justification of mixed methods research

MRC framework

Journal of mixed methods research-most cited articles.

Process evaluation

Medical Leadership

NHS IT project

Data saturation in qualitative research

## **APPENDIX 2- Baseline Interview Schedule**

### **1. Tell me about your current position and how long you have worked in**

#### **Trust ect?**

Job title and brief description

Length of time in current role

### **2. How do you see your role in how theatres run?**

Relevance to patient pathway

### **3. What are your thoughts on the way operating theatres are used?**

Efficiency-late starts, late finishes

Cancellations

Turnaround

Define

### **4. What factors affect how operating theatres are used?**

Patient Pathway/Within operating theatres

Pre op

Planning

Staffing

Equipment

Cost

**5. Are you aware of any national or Trust programmes that relate to theatre usage?**

TPOT

SLM

**6. Are you aware of any or do you have any aims regarding the way theatres are used?**

**7. What do you consider quality to be, in terms of theatre usage?**

Patient

Cost effective

Efficient

Measures

**8. Are you aware of any data that is collected relevant to theatre usage and how is it used?**

Ormis

Galaxy

Barcodes

Reference times

By whom

Drive change?

Reliable

Interpreted by the right people?

**9. What additional information or data would or does help to affect how theatres are utilised?**

**10. Post interview: Three emerging messages and any comments on process**

## **APPENDIX 3.1- Baseline Participant Information Sheet**

### **Baseline Study**

#### **From structure to function; health service redesign- Theatre utilisation.**

You are being invited to take part in a research study. This Information Sheet is provided to explain why the research is being done and what it will involve to help you decide if you would like to participate. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information and please take time to decide whether or not you wish to participate.

Thank you for reading this.

#### **What is the purpose of the study?**

Nearly seven million hospital operations are performed each year in England and Wales with operating theatres requiring an annual budget of > £ 1 billion. Improving the productivity and efficiency of this costly resource is seen as an important part in maintaining NHS budgets in the current economic climate.

The overall aim of this study is to evaluate how two trusts with differing strategies, priorities and status utilise operating theatres and ensure they are cost effective. Evaluating these differences and determining elements of the approach that work well or that are less successful will not just be of interest to the trusts evaluated but to NHS trusts nationally.

This study is part of the Birmingham 'Collaborations for Leadership in Applied Health Research and Care' (CLARHC) programme commissioned by the NHS National Institute for Health Research (NIHR). We are already in the process of evaluating services within the Trust, with this study contributing to theme 1 of the project: From structure to function; health service redesign.

The specific objectives of the study include:

- to compare how theatres are utilised across the Trusts in order to identify the most effective and efficient ways of utilising theatres;
- to identify the extent to which stated objectives are achieved and if cost affects how theatres are utilised;
- to contribute to the development of services by including a strong formative component;

- to incorporate multiple dimensions of change (including clinical, economic, organisational, management and cultural factors) in our analyses to appropriately reflect the complexities of the various elements.

### **Why have I been chosen?**

We have asked potentially key participants to recommend people who could make an interesting and insightful contribution to the study based on their experience and perspective. You were identified as one of these people.

### **Do I have to take part?**

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign two consent forms (one for yourself and one for the researcher). If you decide to take part you are still free to withdraw at any time and without giving a reason.

### **What will happen to me if I take part?**

We wish to interview you about your experience and perspective on how theatres are utilised. The study will undertake face-to-face or telephone interviews, and with your permission, we may ask for one or more follow up interviews. Each interview will last around 30-45 minutes and you will be asked to consent to the interview being recorded. The recording will be transcribed and the interview stored electronically on

access only secure computers. The transcribed interview will be given a unique identifier to ensure anonymity.

The interviews will be conducted by a member of the research team with appropriate training and qualifications. The interviews will normally take place at your workplace on dates and at times agreed with you in advance.

### **Will my participation in this study be kept confidential?**

The interview data will be kept confidential and no participants will be named in the outputs of the research. We will not disclose lists of participants or discuss who has agreed to take part. Any direct quotation will be attributed to general job title only (e.g. "Clinician A"), however, it may not be possible to totally anonymise quotations as we cannot categorically rule out that readers of the report will be able to attribute quotations to the person(s) involved.

The interviews will be recorded, transcribed and given a unique identifier. Analysis will be performed using the unique identifier with no transcript identifying interviewees by name. The digital recordings will be securely stored until the end of the study, when they will be deleted, with only the research team having access to these records. In line with the University of Birmingham's code of conduct for research, the interview transcripts will be destroyed five years after publication of the study's findings.

### **What will happen to the results of the research study?**

One of the research objectives is to provide key staff with timely, formative feedback in order to strengthen the way in which theatres are utilised. A report will be disseminated to participants at the end of the study period (1 year approx) with discussions and presentations being part of dissemination .

### **Who is organising and funding the research?**

The research is being organised and sponsored by the University of Birmingham in collaboration with the participating Trusts. It is part of a postgraduate research project.

### **What indemnity arrangements are in place?**

This study is covered by the University of Birmingham's insurance policy for negligent harm. The study is not covered for non-negligent harm, as this is not included in the University of Birmingham's standard insurance policy.

### **Who has reviewed the study?**

This study has been reviewed by the Trusts R&D department and The University of Birmingham Ethics committee (please refer to the University's ethical review process for further information: <http://www.rcs.bham.ac.uk/ethics/review/index.shtml>).

**What if there is a problem?**

In the event of a complaint relating to the research, you are requested to inform [name of researcher] who will try to resolve the matter (see contact details below).

**How can I get further information?**

Please ask [name of researcher] (email and mobile number of researcher) if you have any questions or would like more information about this invitation or contact [name of theatre manager and contact details].

**Thank you for your help.**



## **APPENDIX 3.2- Baseline Cover Letter**

Dear .....

**Re: How effectively are operating theatres being used?**

**CLARHC Theme 1 project: From structure to function- service redesign**

I am contacting you as part of the Birmingham 'Collaborations for Leadership in Applied Health Research and Care' (CLARHC) programme; a collaborative research project taking place between the University of Birmingham and the NHS. The aim is to help improve the effectiveness and efficiency of patient services and, as you may be aware, we are already in the process of evaluating some services within your Trust.

### **What is the purpose of this study?**

This study aims to evaluate how two separate NHS Trusts use their operating theatres for maximum effectiveness and efficiency, within their budgets. Determining

what works well and what is less successful, will be of interest to your department and Trust but will also help to inform NHS development nationally.

The specific objectives of this study include:

- comparing theatre usage in each Trust to review effectiveness and efficiency
- identifying the extent to which stated objectives are achieved and how costs affect the ways in which theatres are used
- contributing to theatre development with strong ('real time') formative elements

### **Why are you being invited to participate?**

Your role means that you will have views and insights into theatre usage that will improve the quality of this study. This, in turn, will improve the value of any findings, which may alter the way operating theatres run.

### **Time commitment**

We appreciate the many demands on your time so we are asking for no more than 30-45 minutes for a confidential (and hopefully interesting) interview with a member of the study team.

## **What happens next?**

We hope that you will agree to meet with us; over the next week or so, you will be contacted by a member of the research team in order to arrange a mutually convenient time and place for us to carry out the proposed interview.

In the meantime, do feel free to contact us if you would like to discuss any aspect of the project; I am the main researcher for this work [ researcher contact details] which will form part of my postgraduate study. I am more than happy to deal with any queries you may have. [Theatre manager name and contact details] is supporting the project and may also be able to help with any issues you may have.

I look forward to your involvement in this exciting project, which has the potential to change the way in which operating theatres provide quality care in the future.

Yours faithfully

**Researcher name**

**MD Student**

**CLAHRC theme 1**

## **APPENDIX 4- Second Phase Interview Schedule**

### **1. Since the last interview how has your current position/ job role altered?**

New job title and brief description

Length of time in current role

### **2. What are your thoughts on the way operating theatres are used?**

i. Efficiency-late starts, late finishes

ii. Cancellations

iii. Turnaround

iv. Define

### **3. Have there been any changes in the way that theatres are used?**

i. Patient Pathway/Within operating theatres

ii. Pre op

iii. Planning

iv. Staffing

v. Equipment

vi. Cost

vii. How has change been implemented?

**4. Has there been or are there any programmes being implemented that have or may affect theatre usage?**

i. TPOT

ii. SLM- pilot/ Theatre scheduling

iii. Transformation plan

iv. Targets

v. Aims achieved? Changed anything.

**5. What changes have there been to the structure of the trust or department that has affected theatre usage?**

How and why have they affected theatre usage?

**6. What changes have been made to the way performance is managed or measured around theatre usage?**

Quality measures

KPI's

Cost effectiveness

**7. What changes have been made in the way data on Galaxy/ Barcoding or ORMIS is collected, used or fed back?**

Patient location

List planning- overrun emails & predicted timings

**8. Please describe how the trust views/ defines theatre usage?**

Definition

Changed?

Views on relevance

**9. Post interview: Three emerging messages and any comments on process**

**APPENDIX 5.1- Second Phase Participant Information**  
**Sheet**

**End of study period interview**

**From structure to function; health service redesign- Theatre utilisation.**

You are being re-invited to take part in a research study. This Information Sheet is provided to remind you why the research is being done and what it will involve to help you decide whether you would like to participate further. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information and please take time to decide whether or not you will continue to participate.

Thank you for reading this.

## **What is the purpose of the study?**

Nearly seven million hospital operations are performed each year in England and Wales with operating theatres requiring an annual budget of > £ 1 billion. Improving the productivity and efficiency of this costly resource is seen as an important part in maintaining NHS budgets in the current economic climate.

The overall aim of this study is to evaluate how two trusts with differing strategies, priorities and status utilise operating theatres and ensure they are cost effective. Evaluating these differences and determining elements of the approach that work well or that are less successful will not just be of interest to the trusts evaluated but to NHS trusts nationally.

This study is part of the Birmingham 'Collaborations for Leadership in Applied Health Research and Care' (CLARHC) programme commissioned by the NHS National Institute for Health Research (NIHR). We are already in the process of evaluating services within the Trust, with this study contributing to theme 1 of the project: From structure to function; health service redesign.

The specific objectives of the study include:

- to compare how theatres are utilised across the Trusts in order to identify the most effective and efficient ways of utilising theatres;

- to identify the extent to which stated objectives are achieved and if cost affects how theatres are utilised;
- to contribute to the development of services by including a strong formative component;
- to incorporate multiple dimensions of change (including clinical, economic, organisational, management and cultural factors) in our analyses to appropriately reflect the complexities of the various elements.

### **Why have I been chosen?**

You were kind enough to participate previously, and provided an interesting and insightful contribution to the baseline study. We are now interested to hear about your current perspective and recent experiences as compared to the time of these baseline interviews.

### **Do I have to take part?**

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign two consent forms (one for yourself and one for the researcher). If you decide to take part you are still free to withdraw at any time and without giving a reason.

### **What will happen to me if I take part?**

We wish to interview you about your experience and perspective on how theatres are utilised. The study will undertake a face-to-face interview, with each interview lasting around 30 minutes. You will be asked to consent to the interview being recorded. The recording will be transcribed and the interview stored electronically on access only secure computers. The transcribed interview will be given a unique identifier to ensure anonymity.

The interviews will be conducted by a member of the research team with appropriate training and qualifications. The interview will normally take place at your workplace on dates and at times agreed with you in advance.

### **Will my participation in this study be kept confidential?**

The interview data will be kept confidential and no participants will be named in the outputs of the research. We will not disclose lists of participants or discuss who has agreed to take part. Any direct quotation will be attributed to general job title only (e.g. "Clinician A"), however, it may not be possible to totally anonymise quotations as we cannot categorically rule out that readers of the report will be able to attribute quotations to the person(s) involved.

The interview will be recorded, transcribed and given a unique identifier. Analysis will be performed using the unique identifier with no transcript identifying interviewees by name. The digital recordings will be securely stored until the end of the study, when they will be deleted, with only the research team having access to these records. In line with the University of Birmingham's code of conduct for research, the interview transcripts will be destroyed five years after publication of the study's findings.

### **What will happen to the results of the research study?**

One of the research objectives is to provide key staff with timely, formative feedback in order to strengthen the way in which theatres are utilised. A report at the end of the study will be disseminated to participants as soon as possible with discussions and presentations being part of dissemination .

### **Who is organising and funding the research?**

The research is being organised and sponsored by the University of Birmingham in collaboration with the participating Trusts. It is part of a postgraduate research project.

### **What indemnity arrangements are in place?**

This study is covered by the University of Birmingham's insurance policy for negligent harm. The study is not covered for non-negligent harm, as this is not included in the University of Birmingham's standard insurance policy.

**Who has reviewed the study?**

This study has been reviewed by the Trusts R&D department and The University of Birmingham Ethics committee (please refer to the University's ethical review process for further information: <http://www.rcs.bham.ac.uk/ethics/review/index.shtml>).

**What if there is a problem?**

In the event of a complaint relating to the research, you are requested to inform the researcher who will try to resolve the matter (see contact details below).

**How can I get further information?**

Please ask [name and contact details of researcher ] if you have any questions or would like more information about this invitation or contact Theatre manager.

**Thank you for your help.**



## **APPENDIX 5.2- Second Phase Cover Letter**

Dear .....

**Re: How effectively are operating theatres being used?**

**CLARHC Theme 1 project: From structure to function- service redesign**

I am contacting you again as part of the Birmingham 'Collaborations for Leadership in Applied Health Research and Care' (CLARHC) programme; a collaborative research project taking place between the University of Birmingham and the NHS. The aim is to help improve the effectiveness and efficiency of patient services and you may recall you were kind enough to participate in the baseline interviews for the above study. We are now looking to re-interview staff to determine your current perspective and recent experiences as compared to the time of these baseline interviews. We hope you wish to participate further.

## **What is the purpose of this study?**

This study aims to evaluate how two separate NHS Trusts use their operating theatres for maximum effectiveness and efficiency, within their budgets. Determining what works well and what is less successful, will be of interest to your department and Trust but will also help to inform NHS development nationally.

The specific objectives of this study include:

- comparing theatre usage in each Trust to review effectiveness and efficiency
- identifying the extent to which stated objectives are achieved and how costs affect the ways in which theatres are used
- contributing to theatre development with strong ('real time') formative elements

## **Why are you being invited to participate?**

Your role means that you have views and insights into theatre usage and have witnessed any changes that may have occurred since the baseline interviews. The information you provide will help determine whether stated objectives have been achieved and if so how and why.

**Time commitment**

We appreciate the many demands on your time so we are asking for no more than 30 minutes for a confidential (and hopefully interesting) interview with a member of the study team.

**What happens next?**

We hope that you will again agree to meet with us; over the next week or so, you will be contacted by a member of the research team in order to arrange a mutually convenient time and place for us to carry out the proposed interview.

In the meantime, do feel free to contact us if you would like to discuss any aspect of the project; I am the main researcher for this work [researcher contact details] which will form part of my postgraduate study. I am more than happy to deal with any queries you may have.

I look forward to your continued involvement in this exciting project, which has the potential to change the way in which operating theatres provide quality care in the future.

Yours faithfully

**Researchers name****MD Student****CLAHRC theme 1**

## **APPENDIX 6- Elements of Patient Journey**

### **Analysis of Factors Affecting the Patient Journey**

The factors described by interviewees to affect how operating theatres were utilised related to four different elements of the patient journey. These four separate journey elements were:

1. Ready for Theatre- the patient arriving at hospital to the point in which they were ready for theatre.
2. Ready to be Anaesthetised- the patient being 'Ready for Theatre' to the point in which they were in the operating or anaesthetic room ready to be anaesthetised.
3. Undergoing procedure- The patient being 'Ready to be anaesthetised' to the point in which they arrive in recovery.
4. Recovery- the patient being in recovery to the point in which they return to the ward.

To determine what factors affected how colorectal operating theatres were being utilised and to determine possible causes for baseline quantitative findings, all relevant coded extracts, mainly from factor sub-codes, were collated according to these four patient journey elements. The codes or sub-codes that had been allocated to extracts relevant to these four patient journey elements were:

### ***Ready for theatre***

- Factors
  - Patient pathway- ready for theatre
  - Patient preoperative assessment
  - Bed issues
- Ward factors

### ***Ready to be anaesthetised***

- Factors
  - Patient pathway- after the operation completion
  - Physical hospital layout
  - Bed issues
  - Colorectal specific factors
- Opinions
  - Starting
  - Turnaround and transfer

### ***Undergoing procedure***

- Factors
  - Theatre staff factors including Communication
  - Planning lists
  - Equipment
  - Specific case issues
  - Colorectal specific factors

- Cost

## ***Recovery***

- Factors
  - Patient pathway- after the operation completion
  - Bed issues
  - Theatre staff factors -including communication
  - Physical layout
  - Resource availability (NOT beds)
  - Specific case issues
  - Colorectal specific factors
- Opinions
  - Turnaround and transfer
- Ward factors

Following collation of all extracts relevant to each patient journey element, qualitative data was interpreted, summarised and used to produce initial baseline reports. These reports were then used to develop baseline themes (see Methods Chapter: Initial Reports- Baseline and Methods Chapter: Baseline Theme Development).

**APPENDIX 7- Meeting Observation Pro forma**

**CLAHRC Theme 1: Service Redesign**

**Meeting Observation Pro forma**

Event Title \_\_\_\_\_

Venue \_\_\_\_\_

Date \_\_\_\_\_

Time and Duration \_\_\_\_\_

Name of Observer \_\_\_\_\_

Who facilitated the meeting? \_\_\_\_\_

<u>Issue</u>	<u>Questions</u>	<u>Observation</u>	<u>Further Questions/ Areas to investigate</u>
<p><b>Who attends?</b></p>	<p>What staff groups were represented?</p>	<p>How many attendees? _____</p> <p>Demographics:</p> <p>Male _____ Female _____</p> <p>White _____ Black: _____ South Asian _____</p> <p>Other _____</p> <p>Job:</p> <p>Clinical _____ Managerial _____</p> <p>Administrative _____</p> <p>Other (specify) _____</p>	

<u>Issue</u>	<u>Questions</u>	<u>Time</u>	<u>Observation (and verbatim quotes)</u>	<u>Further Questions/ Areas to investigation/ Analytical notes</u>
<b>Main topics covered</b>	<p>Structure of the event (presentations, discussions, facilitated debate)</p> <p>What activities took place?</p>			

<u>Issue</u>	<u>Questions</u>	<u>Time</u>	<u>Observation (and verbatim quotes)</u>	<u>Further Questions/ Areas to investigation/ Analytical notes</u>
<b>Group and Power Dynamics</b>	<p>Who does the talking?</p> <p>Any factions? Peer identification?</p> <p>Was anyone silent or uncommunicative? (Why?)</p> <p>Were any topics conspicuously absent from discussion?</p>			

<u>Issue</u>	<u>Questions</u>	<u>Time</u>	<u>Observation (and verbatim quotes)</u>	<u>Further Questions/ Areas to investigation/ Analytical notes</u>
<p><b>Service Redesign Methods</b></p>	<p>Are the participants explicitly or implicitly drawing on any particular service redesign methodology?</p> <p>Are patients and the public involved in the redesign in a <i>meaningful</i> way?</p> <p>To what extent are patients invoked in the discussion? (as whole people with experiences or as objects in the system?)</p>			

<u>Issue</u>	<u>Questions</u>	<u>Time</u>	<u>Observation (and verbatim quotes)</u>	<u>Further Questions/ Areas to investigation/ Analytical notes</u>
<b>Staff Response</b>	<p>Is there clear identification of goals, confidence of staff to make suggestions?</p> <p>Action points?</p> <p>Formal and informal comments about the experience of attending the event</p>			

<p><b>Post-observation reflections</b></p>	<p>How would you characterize the cultural norms in the organisations and whether they were challenged in the session? (e.g. was there any change in attitude throughout the session, explicit reflections by participants on professional or organisational culture)</p>	
	<p>Overall sense of the 'success' of the meeting?</p> <p>What 'benefits' were there for the organisation?</p>	

## APPENDIX 8- Factor sub-codes

Details and examples of extracts allocated Factor sub-codes are shown in the table below.

Title	Incorporated extracts were:	Example extract
Bed issues	Factors related to bed issues and to bed management.	<i>'There is a scarcity of beds and that often causes quite a lot of delay within the operating schedule'</i> (Consultant anaesthetist A University Trust)
Equipment issues	Factors related specifically to equipment that affected case flow(not cost).	<i>'We haven't had equipment problems particularly, so that's not been an issue'</i> (Consultant surgeon A Urban Trust)
Patient pathway (ready for theatre)	Factors that affected patients being ready or prepared on the morning of surgery for theatre, including relevant to the route of admission. However this sub-node did not include any pre-operative issues related to a prior separate attendance or the transferring of patients from the ward to the theatre suite.	<i>'... always some patient hasn't, still sat in a chair, not been changed into a gown and hasn't had ECGs done, all sorts of things, not been consented, all sorts of things that just hinder you'</i> (HCA University Trust)
Patient pathway (after operation had been completed)	Factors which affected processes within the recovery area, the process of transferring patients out of the recovery area, discharges and bed blockages.	<i>'... we realise now that the ward staff expect us to not only fetch the patient in the morning but take all the patients back to the ward once they are recovered'</i> (Theatre sister Urban Trust)

Title	Incorporated extracts were:	Example extract
The planning of operating lists	Factors relevant to operating list order, content and list scheduling, which affected how operating theatres were being utilised.	<i>'I think sometimes a surgeon should be possibly a little bit more realistic with what they are putting on their lists'</i> (ODP Urban Trust)
Theatre staff factors (including surgeons and anaesthetists)	Factors relevant to staff availability, training, behaviour, team working as well as status.	<i>'I am given a team to work with, but at the moment some of my staff they work elsewhere so there is no consistency with that team'</i> (Theatre sister Urban Trust)
Communication-Theatre staff	Issues raised on communication between different staff/ colorectal theatre team members.	<i>'... are times when we switch the order of the list and the Ward has not, the ward isn't advised, so there are expecting patient X to be called and then we send for patient Y, so it throws them off'</i> (Scrub nurse University Trust)
Clinical care factors	Factors such as complications/ difficulties which affected clinical management and delayed patient flow.	<i>'... you're having to manage the bed side of things rather than actually providing the actual care'</i> (Recovery nurse University Trust)
Colorectal specific factors	Factors that affect theatre usage specific to colorectal surgery.	<i>'The difficulty with general surgery and colorectal surgery is that as you know it is not always that predictable'</i> (Clinical director University Trust)

Title	Incorporated extracts were:	Example extract
Cost	Factors related to cost which affected theatre usage. This included references to consumable/ equipment cost.	<i>'... we do have situations where we get into really expensive staffing of evenings and overruns'</i> (CDAT Urban Trust)
Patient preoperative assessment	Factors that affected patients preparation for surgery- e.g. completion of paperwork and investigations.	<i>'There are pre-assessment clinics that are, trying to make sure people don't come on the day of surgery and discover something that you should not discover at that point'</i> (Consultant anaesthetist A Urban Trust)
Physical hospital layout	Factors related to hospital layout that affected how theatres were used.	<i>'... because it's such a big hospital as well, it's just a mission trying to get, I mean it takes an hour to get a patient to theatre'</i> (HCA University Trust).
Resource availability (not beds)	Factors related to list availability, capacity & service provision.	<i>'... it's fairly clear to the hospital at the moment that because the work in the trust in general is expanding there isn't enough theatre capacity to cope with the increasing amount of work'</i> (Clinical director University Trust)
Specific case issues (during surgery)	Factors related to specific case issues which affected how operating theatres were used.	<i>'... late finishes is usually due to unexpected or unforeseen pathology'</i> (Consultant surgeon B Urban Trust)

## **APPENDIX 9- Summary of Baseline Findings**

Summary points of all baseline findings according to themes and trust are shown in the table below.

<b>Theme</b>	<b>Urban trust</b>	<b>University trust</b>
Value of Data	<ul style="list-style-type: none"> <li>• Colorectal operating theatres were considered inefficient</li> <li>• Theatre timing performance indicators were of limited value to interviewees</li> <li>• Data was accessible</li> <li>• Data was not being used effectively to change interviewee behaviour or performance</li> </ul>	<ul style="list-style-type: none"> <li>• Colorectal operating theatres were considered inefficient</li> <li>• Data collected was not accessible or reliable</li> <li>• Data was not being used effectively to change interviewee behaviour or performance</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Poor communication between staff groups could cause delay throughout the patient journey</li> <li>• Staff groups involved in the patient journey were disconnected and not always working as an effective team</li> </ul>	<ul style="list-style-type: none"> <li>• Information communicated via published operating lists was unreliable</li> <li>• Lack of communication affected patient flow</li> <li>• Managers, theatre staff and recovery staff were disconnected and not always working as an effective team</li> </ul>
Planning	<ul style="list-style-type: none"> <li>• Unpredictability of procedure times made planning of operating lists difficult</li> <li>• Lack of planning could cause delay throughout the patient journey</li> </ul>	NA

Theme	Urban trust	University trust
Control	<ul style="list-style-type: none"> <li>• Planning processes did not involve all staff groups who managed colorectal surgical patients</li> <li>• Conflict in staff shift patterns could impact on how operating theatres were used</li> <li>• Interviewees did not feel they had control over processes that affected how colorectal operating theatres were used</li> </ul>	<ul style="list-style-type: none"> <li>• Theatre utilisation was very complex</li> <li>• Theatre staff felt disconnected and powerless</li>   <li>• Interviewees did not feel they had control over processes that affected how colorectal operating theatres were used</li> </ul>
Capacity and Resources	<ul style="list-style-type: none"> <li>• Bed capacity could affect operating list start times</li> <li>• Staffing capacity on the wards was affecting start times and patient transfers</li> <li>• Staffing levels in theatre could affect how well operating theatres were used</li> <li>• Interviewees could not affect the capacity issues that affected how operating theatres were used</li> </ul>	<ul style="list-style-type: none"> <li>• Bed capacity was a major problem that affected start times and patient flow throughout the day</li> <li>• Staffing capacity on the wards was affecting start times and the transferring of patients out of recovery</li>   <li>• Interviewees could not affect the capacity issues that affected how operating theatres were used</li> </ul>

Theme	Urban trust	University trust
Separation/ Disconnection	<ul style="list-style-type: none"> <li>• The organisational structure did not facilitate the utilisation of colorectal operating theatres</li> <li>• Traditional boundaries affected staff group collaboration</li> <li>• Interviewees were not empowered</li> <li>• Decision rights were not devolved to interviewees</li> </ul>	<ul style="list-style-type: none"> <li>• The organisational structure did not facilitate the utilisation of colorectal operating theatres</li> <li>• Organisational structure hindered how operating theatres were managed</li> <li>• Traditional boundaries affected staff group collaboration</li> <li>• Interviewees were not empowered</li> <li>• Decision rights were not devolved to interviewees</li> </ul>
Cost and Finance	<ul style="list-style-type: none"> <li>• Incentives affected theatre efficiency</li> <li>• Financial information was not available to affect the cost effectiveness or use of operating theatres</li> </ul>	<ul style="list-style-type: none"> <li>• Financial information was not being used to improve the cost effectiveness or use of operating theatres</li> </ul>
Theatre Cross charging pilot	<ul style="list-style-type: none"> <li>• The Theatre cross charging pilot was not important to interviewees.</li> </ul>	NA

## APPENDIX10- Summary of Second Phase Findings

Summary points of second phase findings according to the four elements of Service Line Management, observed meetings, Theatre Cross charging Pilot and to trust are shown in the table below.

<b>Area of SLM</b>	<b>Urban trust</b>	<b>University trust</b>
Organisational Structure	<ul style="list-style-type: none"> <li>• Some devolving of decision rights to a manager had occurred, but this was not attributed to SLM and was not considered the case by a clinical leader.</li> <li>• Support and resources to implement change was lacking.</li> <li>• Organisational structure had not changed to affect the utilisation of colorectal operating theatres.</li> </ul>	<ul style="list-style-type: none"> <li>• Decision rights had not been devolved to interviewees.</li> <li>• Communication across traditional staff boundaries had been improved by a pro-active leader.</li> <li>• Organisational structure still hindered how colorectal operating theatres were managed.</li> </ul>
Performance Management	<ul style="list-style-type: none"> <li>• Intended implementation of SLM had made minimal impact on theatre utilisation.</li> <li>• Issues affecting how colorectal operating theatres were used remained outside of interviewees control, with no incentives or accountability for performance being found.</li> <li>• Data collected was still not being used in a meaningful way to manage performance or affect the way colorectal operating theatres were used.</li> </ul>	<ul style="list-style-type: none"> <li>• Despite the intention to improve theatre efficiency, the utilisation of colorectal operating theatres had worsened; mainly because of bed capacity issues.</li> <li>• Issues affecting how colorectal operating theatres were used remained outside of interviewees control, with some incentive but no accountability for performance being found.</li> <li>• Data collected was still not being used in a meaningful way to manage performance or affect the way colorectal operating theatres were used.</li> </ul>

<b>Area of SLM</b>	<b>Urban trust</b>	<b>University trust</b>
Information Management	<ul style="list-style-type: none"> <li>Financial information was not available and therefore was not being used by interviewees to improve the cost effectiveness or utilisation of colorectal operating theatres.</li> </ul>	<ul style="list-style-type: none"> <li>Despite the PLICS system continuing to be developed no financial information was being used by interviewees to improve the cost effectiveness or use of colorectal operating theatres.</li> </ul>
Strategy and Planning	<ul style="list-style-type: none"> <li>Interviewees were not working within an effective service line team to affect how operating theatres were used.</li> </ul>	<ul style="list-style-type: none"> <li>Interviewees were not empowered.</li> <li>Interviewees were not working within an effective service line team to affect how operating theatres were used.</li> </ul>
	<b>Urban trust</b>	<b>University trust</b>
Summary of Meetings	<ul style="list-style-type: none"> <li>No structural change that integrated colorectal surgery, theatres and anaesthetics was made.</li> <li>A lack of progress in implementing SLM was found</li> </ul>	<ul style="list-style-type: none"> <li>Progress had been made in the development of the PLICS system</li> <li>PLICS not available to front line clinical staff</li> <li>PLICS was not being used to aid decision making or implement change.</li> </ul>

	<b>Urban trust</b>	<b>University trust</b>
Theatre Cross charging Pilot	<ul style="list-style-type: none"> <li>• Awareness and feedback of pilot was poor.</li> <li>• More cost effective use of operating theatres was demonstrated by improved planning.</li> <li>• One meeting involving different staff groups, including Informatics, led to operating list scheduling and planning processes being changed.</li> <li>• Pilot changed behaviour of the CDS in a proactive way and provided an insight into theatre utilisation.</li> </ul>	NA

## **LIST OF REFERENCES**

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