An investigation into the nature of individual and organisational capability and their linkage: how the competence of an NHS hospital is enacted through patient-care related actions and use of organisational artefacts by its doctors.

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Abstract

An investigation into individual and organisational capability and their linkage: how the competence of an NHS hospital is enacted through the patient-care related actions and use of organisational artefacts by its doctors.

The words 'competence' and 'capability' are used independently by the human resource management and the strategy communities who relate the terms to people and organisations respectively. However, the linkage between the individual and organisational level is not well documented. A better understanding of this link is important in being able to understand how organisational and individual performance may be improved but also why things sometimes go wrong.

This research based case study is to identify the linkage between individual and organisation capability through an examination of patient care provided by doctors in St George's Hospital, Tooting, London using the perspective of the resource based view of the firm.

The research showed that patient care is achieved through the emergent skilful exploitation by doctors of their own capabilities, interaction with others, and their use of artefacts representing technical systems, processes, and structural influences within which the doctor operates. The role of artefacts is particularly important because continuity of patient care is dependent on information provided via artefacts rather than doctors' individual knowledge of particular patients. Doctors need not only medical knowledge but also an understanding of 'how to work the organisation', that is how to get the organisation to do what the doctor needs for the patient. Competent action of the hospital is dependent on a series of inter-relating and inter-locking activity systems, from the doctor carrying out direct actions for a patient through the operation of departmental support systems to the overall hospital level patient care systems. Contradictions or non-competence occurred when there was breakdown within or between the systems.

A conceptual model and diagnostic is developed that will be of use in analysing these dimensions of organisational capability.

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Glossary

Activity theory an analytical framework developed out of German and Russian psychology, used for the study of human activity. Also known as Cultural Historical Activity Theory

Artefact a physical thing made or cognitive thing conceived by humans

A&E Accident and Emergency department of a hospital that makes an initial assessment of patients presenting at the hospital with a health problem

Bleep a telephonic device carried by doctors that receives simple text based messages, used for requesting doctors to call particular phone numbers or emergencies

Capability a quality or power of action that may be deployed

CHAT cultural historical activity theory – see activity theory

Competence being able to complete a required task to the level required

Consultant most senior level of hospital doctor grades

DILO Day in the life of – a diary of events – in this thesis of events occurring in St George's MAU

HAN Hospital at Night study – overnight study of doctor activity

HIT The St George's team responsible for resolving patients' social issues in relation to their health care

MAU Medical Assessment Unit – the department of UK NHS hospitals that assesses whether patients presenting to A&E with suspected medical problems should be admitted or discharged

MRI magnetic resonance imaging

Nature a thing's essential qualities, kind, sort, class

NHS the United Kingdom National Health Service – a service free at point of delivery

PACS A computer based system for communication of x-ray images

PRHO Pre Registration House Officer – lowest grade of practicing doctor

Queuing theory A theory relating to the operation of queue systems

Resource Based View (RBV) A school of thought based around the concept of organisational capability being based upon the deployment of its resources

Resources those things available to an organisation

SHO Senior House Officer – middle grade of practicing doctor

SpR Special Registrar – senior level of practicing doctor under Consultant level

Ultrasound a method of imaging based upon sound

Chapter 1 Introduction to the thesis

'Productivity is not determined solely by how hard and how well people work. The technical factors play a role, sometimes an overwhelmingly important one, sometimes a minor one.' Robert Sutermeister (1976)

1.1 Research rationale and aims

This enquiry starts from the use of the words 'competence' and 'capability', by the strategy community in relation to the qualities of an organisation that can bring it competitive advantage or enable it to provide required services to its customers but separately by the Human Resources Management community in relation to the qualities of people that enable them to achieve. (Prahaled and Hamel, 1990; Woodall and Winstanley, 1996). However the relationship between capable individual action and the competent operation of the organisation has not been well defined. There is a need to better understand this relationship.

The literature review identifies that there has been continuing enquiry into the factors that make one organisation more effective than another with seemingly similar attributes (Drejer, 2000). There have been a number of explanations and explanatory models built to describe the contributors to organisational effectiveness (Prahaled and Hamel, 1990; Campbell and Goold, 1997; Corbridge and Pilbeam, 1998; Dosi, Nelson and Winter, 2000; Drejer, 2000). Research at the individual level has often ignored the strategic situation in which actions take place and research at the organisational level has often ignored the role of the individual in organisational success.

Much of the existing writing around competence has been based on large American based multi-national manufacturing companies (Coriat, 2000), therefore, has not covered work activity in the public sector and services oriented organisations. There is a gap in understanding how the models originating in the search for competitive advantage in the commercial or profit sector fit in the public service sector. Much writing on competence was in the early 1990s e.g. (Prahaled and Hamel, 1990) but a review of literature shows that research is still being carried out (Drejer, 2000; Dosi, Nelson and Winter, 2000; Oddoye, 2006) and that there is still much to do to understand what makes organisations effective (Dosi, Nelson and Winter, 2000). Ways of opening up the 'black box', operationalising, and empirically researching the operation of organisations are said to be needed in order to measure and understand organisational capability better (Heene and Sanchez, 1997; Teece, Pisano and Shuen, 2000; Dosi, Nelson and Winter, 2000).

The work environment is said to have an impact on productivity but there is a need to better understand its effects (Clements-Croome, 2006a). Many tools are designed for use by people in organisations but without due consideration for the actual situation in which they will be used (Woods, 1998). A relevant example is the UK NHS junior doctor job allocation systems that did not meet the needs of its users (Daily Telegraph, 2007).

Organisations are encouraged to improve their performance through improved competence and building new capabilities (Johnson and Scholes, 1989; Great Britain. Healthcare Commission, 2006b) but sometimes exhibit incompetence such as 'failing hospitals' (Great Britain. Healthcare Commission, 2006a; Great Britain Healthcare Commission, 2009) or the Northern Rock funding crisis (BBC, 2007). Understanding the way in which the people interact with organisational resources in the context of the organisational objectives is important in understanding how an organisation performs competently and thus may aid the development of organisational capability. It will also assist in explaining the relevant factors when things go wrong (Alberti, 2009). It is assumed by this thesis that any enterprise whether private or public is in a competitive environment either competing against direct competitors or in providing services against constrained budgets. Knowing how to competently apply skills is at the heart of any successful activity and particularly important to competitive and demanding environments (Campbell and Summers-Luchs, 1997).

In response to these needs, the focus of this research project is to investigate the nature of the linking factors between the actions of an individual in relation to the achievement of organisational objectives. The contribution of these linking factors have been described as the technical factors (Sutermeister, 1976) or 'structural characteristics' of organisational competence (Drejer, 2000, p 306). They are the organisational factors that complement the abilities of the people and enable the organisation to achieve what it sets out to achieve. Therefore this research sets out to achieve a better understanding of the nature of these organisational factors and how they provide a link between the individual and organisational capability. This is by examining individual action, the organisational context in which the individual action takes place and the role of the organisational element that link between them.

1.2 The investigation into individual and organisational competence and capability

Competence is being able to complete a task to the level required and a capability is a quality or power of action that may be deployed (Fowler and Fowler, 1966). Looking at how these terms have been used in practice, the human resources management community relate them to use of skills, knowledge and behaviours of the individual (Boyatzis, 1982; Woodall and Winstanley, 1996; Fletcher, 1997). The strategy community in applying the terms to organisations have said they relate to the people and other resources or organisational factors such as the technical environment, managerial structures, systems, culture, processes and routines (Penrose, 1959; Nelson and Winter, 1982; Rumelt, 1984; Wernerfelt, 1984; Barney, 1991; Dosi, Nelson and Winter, 2000; Drejer, 2000; Clements-Croome, 2006a). This raises the question about how the human and other elements in an organisation combine in pursuit of the organisational objective, thus bridging the gap between individual and organisation. This question lays at the heart of this research project.

In response to this question, this research study investigates the nature of individual and organisational capability and competence in the literature, in secondary sources and empirically in the practical situation of doctors carrying out patient care. Whilst individual actions can be observed and recorded, in order to understand the meaning of the actions taken, it is also necessary to understand the situation in which the individual activity is taking place (Cassirer, 1953; Leontiev, 1981; Suchman, 1987). This is particularly important in looking at the activity of individuals within an organisational setting. Therefore the empirical research examines the activities of individuals in their natural work setting and relates their actions and use of organisational artefacts to the organisational context of which they are a part.

1.3 The research setting of St George's Healthcare NHS Trust

Whilst the concepts of competence and capability apply to all kinds of organisation, the setting of the case study research described in this thesis is the patient care activity of doctors at St George's Hospital, part of St George's Healthcare NHS Trust. The approach taken has been to examine the patient care activities of doctors whilst also relating their actions to the setting and context in which they were working. St George's is a teaching hospital based in Tooting, south London having the objectives of providing, within realistic financial plans, excellent health care to the local population and to patients with particular problems from a wider area plus teaching and research (St George's Healthcare NHS Trust, 2005b; St George's Healthcare NHS Trust, no date). St George's is not seen in any way to be a special case and no comparison is sought between St George's and other hospitals.

The particular focus of the study is the way in which the hospital doctors use their own capabilities and the influence of artefacts representing other organisational mechanisms in the important task of patient care and how the doctor activity relates to the hospital's patient care system.

The empirical research to gather data to address the research aim was at two levels. Firstly a snapshot was taken of the patient care activities of doctors, between the hours of 9pm and 8am across the main departments of the whole hospital that provided a view of doctor activity and the other resources they used (the HAN study) then in order to gain more detail, the activities were observed of doctors carrying out diagnosis and treatment decision making in the hospital's Medical Assessment Unit (MAU study).

These two studies provided appropriate situations for studying the purposeful activity of individuals in an organisational setting. They enable conclusions to be drawn about the role of individual capability and interaction with artefacts representing other organisational resources have influenced the enactment of organisational competence. Whilst these conclusions are specific to the research setting, it is proposed that the structure identified is potentially applicable to other organisations and settings.

1.4 Roadmap of the thesis

The remaining part of this thesis has the following structure. In Chapter 2, the research and literature on individual and organisational competence and capability are examined. This is firstly to draw conclusions on the use of language and identify the underlying concepts, then the extent of existing knowledge and research is reviewed. This is based around the concepts of the productive power of enterprises, individual and coordinated labour power, the production of use value or services and the use of machines, influenced by organisational processes and structures.

This review of existing knowledge enables the grounding of a series of research questions that address the investigation into the linking between individual and organisational capability and point towards appropriate research methods. These relate to individual action, the organisational context in which the actions take place and the influence of artefacts use that bridge between individual and organisational levels. Chapter 3 describes and justifies the research methodology and how the empirical research was carried out. The chapter also discusses the ethical issues raised by the study.

The next parts of the thesis describe and discuss the findings of the research. In view of the nature of the research, as a case study, an approach combining findings and analysis was deemed more appropriate than the separation of findings and analysis often undertaken (Saunders, Lewis and Thornhill, 2003). The findings and analysis comprises three main chapters; Chapter 4 describes the health based situation in which the research study was set and is based mainly on secondary sources. It identifies the nature of capability and competence relating to the individual doctor and the organisation in the public health sector. This is in order to operationalise the concepts of capability and competence in the doctor and hospital situation. Chapters 5 and 6 describe and analyse respectively the findings from the HAN study of patient related overnight doctor activity across the hospital and the more detailed Medical Assessment Unit (MAU) observational study.

Chapter 7 pulls together the conclusions from the research and reflects on the meaning of the findings. Chapter 8 then explains the implications of and contribution to both theory and professional practice. An analytical framework for investigating organisational capability is suggested along with a worked example of its use. The chapter also reflects on the strengths and limitations of each element of the thesis and makes recommendations for further research.

Chapter 2 Literature Review – Competence and Capability

Introduction

In order to investigate the linking between the individual and their organisation capability, the nature of the qualities or powers of action at individual and organisational levels need definition and exploration. It is necessary to understand the underlying concepts and how they have been used and researched. In the following sections, the understanding of both human individual and organisational capability and how they relate will be explored, first theoretically then through description of and discussion about three research projects exploring this subject. At the heart of this enquiry are the questions: how is an organisation able to do what it does and how are the actions of individuals within it mediated in relation to the pursuit of the aims of the organisation.

Competence and capability

This research project has resulted from the researcher's observation that in the literature, the terms competence and capability have been applied to both individuals and organisations but how the individual and organisational levels relate has not been made clear. The terms competence and capability have been used by the human resource management community in relation to individuals and separately by the strategy and organisation science community in relation to organisational enterprises (Prahaled and Hamel, 1990; Woodall and Winstanley, 1996). Thus the theoretical discussions are found in these two separate bodies of literature. Moreover, the terms have been used with a variety of meanings (Dosi, Nelson and Winter, 2000). The term competence is defined in the Oxford English Dictionary as being able to complete a task to the level required (Fowler and Fowler, 1966) and is thus a value judgement on whether achieved. Capability is defined as a quality or power of action that may be deployed (Fowler and Fowler, 1966) thus relates to the means by which an outcome may be achieved. However, in the literature, the terms: competence, competency, competences, competencies, competenc(i)es, performance, productivity, resources, skills, ability, capability and capabilities are used by different authors with the same word having different meanings and different words having the same or similar meaning. Dosi and his colleagues state that the word capabilities 'floats in the literature like an iceberg in a foggy sea – one iceberg amongst many' (Dosi, Nelson and Winter, 2000, p 2).

2.1 The concept of labour power

At doctoral level, to research the questions posed, a strong theoretical foundation is needed (Robson, 2002). It is proposed that a theoretical foundation to the concepts of individual and organisational capability will be achieved through reference to the concepts of use-value, productive power, individual labour power and collective labour power discussed by the economists, Adam Smith, David Ricardo and Karl Marx. This will be followed by a discussion of the way the concepts have been developed later by Edith Penrose. Although much of the writings of these authors is about the relationship between capital, value, wages and profit, they identified the key conceptual elements relating to the subject of this study.

Foundations to Smiths (1776) theorising about wealth creation was the concept of the productive power of labour and the systematic way in which work was divided between individuals in pursuit of the enterprise objective. In considering the ways that different kinds of work were divided, he viewed the process at two different levels – relating both to the individual and the organisation. This differentiation is in line with the emphasis in this thesis.

At the individual level, work was divided which resulted in the individuals becoming more talented in their 'skills, dexterity and judgement' (Smith, 1776, p 109) in relation to the task in hand and becoming 'educated' and better 'acquainted' (Smith, 1776, p 109) with the machinery used on the task. At the organisational level, he also saw specialisation, for example, differentiation between pin making and the design of machines for pin making (Smith, 1776, p 109).

He asserted that the enterprises each followed a 'peculiar trade' (Smith, 1776, p 115) having productive power based upon the combination of the productive power of labour by individuals and coordinated collectives of individuals in a common endeavour. Machines also represented part of the productive power and were used to 'facilitate and abridge labour, and enable one man to do the work of many' (Smith, 1776, p 112). Thus Smith identified that it was not only the individuals in an enterprise that led to its specific capability but also the skilled use of machines (Smith, 1776). This is echoed later by Ricardo (1911) who identified that the productive power of labour in combination with use of machines may be deployed in different ways, which would have a variable impact on organisational outcome. He recognised that supplementing human labour power with machine power could reduce the costs of manufactured items thus representing larger profits – a measure of organisational competence. This suggests that the way in which humans and machines combine in productive power is a variable factor in organisational capability.

Smith (1776) and Ricardo (Ricardo, 1911) do not go further in discussing these individual and organisational capability related areas. However they have identified that an enterprise may become competent in a particular trade. This is mediated through coordination of the productive power of its labour, both individuals with their skills, dexterity and judgement and coordinated collectives of individuals, in conjunction with the variable use of machines.

Marx used the concepts of both Smith and Ricardo and in addition to writing from a materialist perspective about the relevant social and historical aspects of capitalism identified further the concepts of individual and collective labour-power and the other components that enable organisations to do what they do (Marx, 1930). The foundation to Marx's theories was his conceptualisation of the processes by which use-value was produced by (capitalist) enterprises. By use-value, he was referring to products, described as 'materially supplied by nature and adapted to human wants by a change in form' (Marx, 1930, p 173), thus identifying the outcome of enterprise as products meeting human needs in some way. Marx described that use-value is the outcome of the application of productive power, derived from a combination of labour power and material means of production but dependent upon labour processes and organisational structures. Thus Marx introduces the specific concepts of process and structure as the influences on productivity.

Marx identified labour power as being the application of a person's ability to work or impact on nature or "the aggregate of those mental and physical capabilities existing in a human being, which he exercises whenever he produces a use-value of any kind" (Marx, 1930, p 154). In this interaction with nature, labour power uses muscle power, dexterity, brain power and instruments in purposive activity related to the 'subject matter of labour' (Marx, 1930, p 173), if having the attitudes, motivation and self presentation to do so. Thus labour power is applied to some subject matter and is a potential until the individual has the appropriate opportunity and motivation to carry out actual labour and represents the potential of human capability. Underpinning the use of labour power is the need for division of labour but also its coordination. Marx describes the workforce as 'cooperating as members of a working organism' (Marx, 1930, p 173). Thus Marx describes that organisational capability comprises the results of the coordination of individual capabilities echoing Smith's (1776) assertions on this point.

The material means of production include what Marx described as instruments or tools (Marx, 1930, p 358). The instrument of labour is the thing or complex of things that the worker interposes between them self and the subject matter of the work. It is seen as the conductor of activity between worker and subject matter. The productivity of the worker is based not only on the skills of the worker but also on the appropriateness of the tools. There are specific tools for specific purposes for example Marx asserts that at the time of his writing, there were 500 particular types of hammer manufactured in Birmingham (Marx, 1930, p 359). Thus Marx describes the concept of the interaction of the individual with tools. He describes the use by humans of tools and machines as an integral part of the productive process and that the nature of the tool is important to its contribution to productive power. Thus organisational capability includes the interaction between individual capability and tools.

Purposive processes represent the way in which the combination of labour power and tools are deployed as the productive power of the enterprise. Work 'shall be done in a proper way' (Marx, 1930, p 178). The productive activity of the collective workforce is a purposive set of detail operations carried out jointly by the workers. Thus Marx identifies that the organisation of the work and the way in which the separate elements of work is carried out by a collective workforce influences the outcome and thus represents an element of the capability of the enterprise.

Marx goes on to identify that organisational structures also influence outcome. The spacial concentration of the means of production and the configuration of work and workers influences productivity. The way in which the work is best structured is dependent on the nature of the work being carried out – the 'work pattern' (Marx, 1930, p 364). Marx also describes social structure. Not only is there division of labour across different skills but also hierarchically. Marx asserts that the collective workforce needed to work to 'command' (Marx, 1930, p 346) and describes a managerial class nominated to carry out this command function. Thus Marx identifies organisational structure both as a way that work is set out spatially and as the social structure in which the people are inter-related.

Summary and conclusions

Thus whilst being very focussed on the financial and power relationship between the capitalist and worker, Marx has defined further the key elements of the enablers of organisational achievement. He has built on the foundations described by Smith (1776) and Ricardo (1911) who identified an enterprise may become competent in a particular trade, mediated through coordination of the productive power of its labour, in conjunction with the variable use of machines. Marx has identified that the productive power of the enterprise in production of use-value is based upon the way that labour power is employed and use specific instruments or tools though purposive productive processes and influenced by organisational structures related to the way work is set out and people interrelate. He has described that the role of the tool is to act as a mediator between the individual and the subject matter of work. However the specific way in which these components combine in pursuit of the objectives of the enterprise is not described by Marx, other than his assertion that workers follow command by a managerial class. This leaves the question, in the context of this thesis how the combination of labour power, collective labour power and instruments or tools are deployed through processes and structures as the productive power of the enterprise.

2.2 Penrose's theories on the contribution of productive resources to organisational achievement

The ideas discussed above were picked up later by Edith Penrose (Penrose, 1959) whilst theorising from an economic viewpoint on the influences on enterprise size and in particular what enabled them to grow. Penrose (1959) enables the understanding to a further extent of the way in which the components of productive power combine in production of use-value. In this section Penrose's (1959) concept of the productive resources of organisations will be discussed in relation to their contribution to understanding how the components of productive power combine in production of use-value and thus the links between the individual and organisational capability. The relevance of Penrose's conceptualisation will be described and justified in the context of this research project. It will be argued that elements of Penrose's theories can apply potentially to organisations other than those specifically considered by Penrose and that her theories and others developed in relation to them have explanatory power of interest to this thesis. Penrose (1959) takes the concepts developed by Smith, Ricardo and Marx a step further in relation to the enquiry of this thesis.

Looking at organisational processes, not just size

Penrose's breakthrough in thinking was by moving away from the then-current economic theories of the firm that focussed on markets and their associated resource allocation and relative pricing to examining the internal components of the organisation echoing the earlier thinking of Smith, Ricardo and Marx (Penrose, 1959). Penrose was examining the conditions within firms that could lead to growth. To do this, she examined how productive power could be explained, which is of interest to this thesis.

Justification of theories to research context

Although Penrose based her thinking on the industrial firm, she allowed that her theories may be applicable to other kinds of firm (Penrose, 1959, p xi) and that the concept of the firm is not an 'unambiguous clear-cut entity' (Penrose, 1959, p 10). She describes the firm as an economic entity that has the function of 'acquiring and organizing human and other resources in order profitably to supply goods and services to the market' (Penrose, 1959, p 10). The setting of this research project is a hospital and not an industrial firm. however the question may be raised in what way Penrose's theories may apply. This thesis argues that a UK hospital as part of the NHS also has the function of acquiring and organising human and other resources in order to supply goods and services to its market – the general public as defined for the hospital. Whilst not seeking profit per se, a hospital is expected to operate within its budget. Additionally, the resource based view has been used already in the context of hospitals (Lai et al. 2007; Su, Lai and Huang, 2009) so have been demonstrated to be applicable.

Penrose also describes the firm as a 'collection of resources bound together in an administrative framework, the boundaries of which are determined by the 'area of administrative coordination' and 'authorative communication' (Penrose, 1959, p xi) Barney (1991) describes this as organisational capital that includes the organisation's formal reporting structure, its formal and informal planning, controlling and coordinating systems. It is argued that a hospital may also be seen as a collection of resources bound together by an administrative framework in the ways described – that of the hospital facilities, organisation and managerial structure which also acts in administrative coordination and provides authorative communication. Therefore Penrose's description of the firm as the subject of her theories appears to apply to a hospital in the context of this study, however it will be important to identify if such an assumption has limitations in consideration of her other theories (Bryman and Bell, 2003).

Productive resources

The heart of theory as it relates to this research project is the conceptualisation of an organisation as a collection of productive resources that are deployed in pursuit of the organisation's plans and strategies (Penrose, 1959). These productive resources comprise both the organisation's human resources and what are described as physical resources thus echoing the conceptualisation of Smith, Ricardo and Marx who had used the terms labour or workers and machines, tools and instruments. The physical resources are described as what may be used for the firm's operations and comprise plant, equipment, land and natural resources, raw materials, semi-finished goods, waste products, by-products and stocks of finished goods (Penrose, 1959, p 24). They are the things the organisation buys, leases or produces. For the purposes of this thesis, these non-human resources will be described as 'other organisational resources' or 'other resources' as appropriate to the context. Thus Penrose has defined the nature of the non-human elements of production further to the earlier descriptions of machines, instruments and tools (Smith, 1776; Ricardo, 1911; Marx, 1930).

The human resources comprise the available personnel – labour, clerical, administrative, financial, legal, technical and managerial staff (Penrose, 1959, p 24). The human resource is described by Wernerfelt (1984) as the employed, skilled personnel (Wernerfelt, 1984) and by Barney (1991) as the characteristics of the workers and managers through training and experience, including their judgement, intelligence, relationships and insight (Barney, 1991). Thus the human resource may be described as the people and their capabilities building on the definitions used previously by Marx in the context of labour power (Marx, 1930).

Services provided by resources

It is not the human and other resources themselves that represent the production power but the services that the resources can render (Penrose, 1959, p 25). Thus there is a separation of the resource and how it influences the achievement of the firm. Any particular resource may be used in a number of different ways in achievement of the strategy and each resource may provide levels of service different to other resources of the same kind (Penrose, 1959, p 67). Penrose (1959) avoids the term 'factor of production' specifically because it makes no distinction between the resource and the service it provides. The services provided by the resources, their production of use-value contribute to what the organisation can do – its production of use-value. Thus organisational capability as a service is dependent on the capabilities of the people and their use of other resources providing subsidiary services. Logically, these services or production of use-value may result in services or physical products being provided to customers.

Interaction between humans and other resources

The next question relates to how the human and other resources may interact in pursuit of the organisational achievement and is where Penrose takes her thinking on from the earlier economists described previously. The way in which the resources are deployed is according to 'administrative decision' by the personnel (Penrose, 1959, p 24). The purpose of the human designed organisation is to arrange for the deployment of the organisation's resources 'in order to yield services essential for the execution of the plans of its personnel' (Penrose, 1959, p 31). Therefore the execution of plans or provision of goods and services or 'productive operations' (Penrose, 1959, p 67) is achieved though the services provided by the resources of the organisation and the way this is done is through the conscious deployment of the resources by the personnel within a designed structure. Thus the organisational structure and its management and operational processes represents the way in which the organisation sets out to arrange deployment of the resources and thus produce use-value.

Capacity and knowledge of personnel

Penrose (1959) described that the organisation comprises an administrative structure made up of the organisation's personnel. The interaction between human and other resources is mediated by the knowledge held by the individuals within this administrative structure. Because different resources can provide different levels or kinds of alternative services, it is important that knowledge is held of the way in which the resources may be deployed (Penrose, 1959, p 73). This relates both to individual resources and combinations of resources (Penrose, 1959, p 77). This has to be in response to the demands of the external environment such as consumer attitude and available technology (Penrose, 1959, p 79). Thus knowledge is held and decisions taken about how resources should be deployed in pursuit of organisational achievement in the context of understanding the market desire for particular use-value.

The way in which resources are deployed to provide services depends on the 'capacities' of the personnel (Penrose, 1959, p 78) but this capacity is itself shaped by the interaction between personnel and the other resources. Thus the interaction of personnel and resources is heterogeneous and emergent (Penrose, 1959, p 78).

Summary and conclusions

The contribution of Penrose was to define further the nature and contributory elements of productive power and creation of use-value. She identified that the organisation may be viewed from two perspectives, as an administrative structure and as a bundle of productive resources. The function of the administrative structure is to deploy the productive resources in order to achieve services in pursuit of organisational achievement. The productive resources comprise both people in a range of roles and other resource elements including plant, land, equipment, raw materials and product elements. The nature of the deployment of resources is dependent upon the knowledge mediated interaction between the people and other resources and the services or desired use-value that the interaction can provide. The administrative framework is based upon planning, coordination and communication.

In the context of this research project, the relationship between individual and organisational capability is through the mediation of individual action by the knowledgeable application of the administrative framework and particular use of other resources. However Penrose's description of the way in which the administrative framework operates to deploy the human and other resources is limited. In particular, although interaction between human and other resources has been identified as contributing to the achievement of the organisational plans and strategies, the way in which the interaction operates and the way in which knowledge is used has not been identified. Picking up on the insights provided by Marx (Marx, 1930), the administrative framework may be concluded to include the way in which work is carried out – the organisational processes and the influential structures, physical such as the layout of the workplace and the social organisation.

In the following section, the human element of productive power will be examined further, then three research projects that illustrate the interaction between labour and other organisational resources will be discussed and conclusions drawn how they clarify the interaction of individuals and other resources. Conclusions will then be drawn about how the relationship between the individual and organisational capability may be conceptualised and appropriate research questions identified.

2.3 Labour power as individual capability

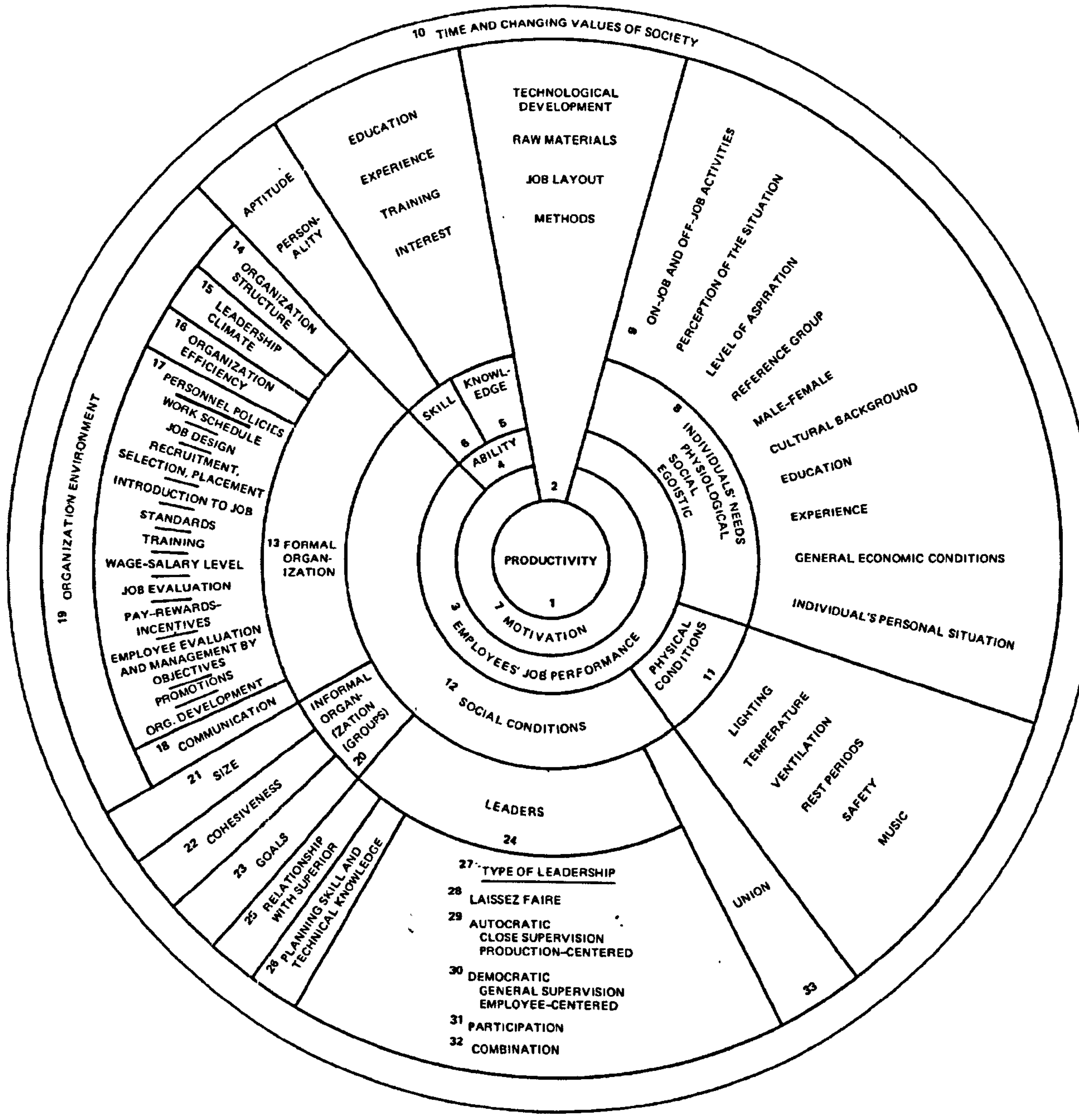
In this section the concept of labour power or human capability will be further investigated in order to build a richer picture of its qualities as a foundation to relating the role of the individual to the organisational setting.

An early documented study of the application of individual capability is the story of Frederick Taylor, Schmidt and pig-iron handling (Taylor, 1911). The research was the identification by Taylor of the ways in which Schmidt could be made more effective in pig-iron handling through combining Schmidt's particular characteristics such as strength and desire for money with use of specific tools and following processes designed by Taylor. Later, research was carried out at Hawthorne Electric Plant with significant results for our understanding of motivation. It was concluded that the way people were treated and their emotional involvement in the activity had an influence on their performance (Mayo, 1939). This finding spawned much research and theorising around the area of motivation and it was found that motivation was dependent on both aspects of the individual and the situation in which the individual was being required to take action (Maslow, 1943; Herzberg, Mausner and Snyderman, 1959; Vroom, 1964; Locke, 1975; McClelland, 1988). Research in the late 1940s concerned the way in which problems in the Harwood Manufacturing Corporation in Marion, Virginia could be resolved. During the research, specific characteristics of the workforce were identified that were at a higher level than simple skills: 'ingenious and inventive, capable of seeing short cuts and aware of their own and their fellow workers' capabilities' (Marrow, Bowers and Seashore, 1967) cited in (Hall, 1980, p 26). This description identifies abilities in innovative thinking, problem solving and the applied use of knowledge, thus relating to cognitive skills, knowledge and behaviours. Also, like Hawthorne, the emotional involvement of the workforce, in their decision making about production, was found to be important in achieving motivation and thus effectiveness.

There have been a number of studies focused on managerial skills that have helped the understanding of individual capability. Woodall and Winstanley (1996, p 75) identify a range of characteristics which may contribute to effective managerial performance in a given situation or role as 'skills, knowledge and understanding, qualities and attributes, sets of values, beliefs and attitudes'. Whilst the dimensions relate specifically to management competence, they would seem to apply more widely. In the early 1970s research was sponsored by the American Management Association who wanted to identify the characteristics common to effective managers. Richard Boyatzis surveyed over two thousand managers in forty one different management jobs in twelve organisations (Boyatzis, 1992). The research study identified eighteen specific characteristics that correlated with high performance as a manager, classified as one or more of a motive, trait, skill, aspect of self image or social role, or body of knowledge (Boyatzis, 1992). In this analysis, Boyatzis included a number of different dimensions thus illustrating the complexity of the factors supporting capability – some associated with the inherent qualities of the individual such as skill and knowledge and others related to behaviours such as acting with self confidence. The characteristics were each described as a job competency that 'result in effective or superior performance' (Boyatzis, 1982, p 21). A criticism of the Boyatzis analysis is that it ignores other situational influences such as organisation and environment on performance, a criticism recognised by Boyatzis who limited the generalisability of his model (Boyatzis, 1992). However Boyatzis' approach relating high performance with the characteristics of the individual or inputs has gained wide acceptance (Woodall and Winstanley, 1996). In the UK, research based reports into the quality of management (Handy, 1987; Constable and McCormick, 1988) prompted action through the Management Charter Initiative (MCI) to improve management capability by use of a framework based upon situation and outcomes. Units of required competence reflecting particular management responsibilities were identified such as being able to 'manage activities to meet customer requirements' and being able to 'agree customer requirements' (Woodall and Winstanley, 1996, p 78). This approach identified important management tasks that managers should be able to do thus taking an outcome perspective. However, the MCI approach is silent on the individual characteristics needed to achieve the required outcomes. A research study that combined the input, output and situational elements was followed by Stuart and Lindsay (1997) who researched the areas of ability required of managers in small/medium enterprises in Northern Ireland. In this research the situational and outcome areas were examined by identifying important domains of activity such as cash control, sales and supplier relationships, specific activities such as leading people and creating business opportunities and characteristics such as communication skill and initiative. This framework combined the benefits of the Boyatzis based competence and behavioural approach with the UK MCI outcome approach. It was recognised in this research that the qualities required of managers were often particular to the specific situation, thus contrasting with the Boyatzis approach that sought to identify common managerial qualities. Therefore individual capabilities are based upon inherent personal characteristics and behaviours exhibited in relation to the particular context in which they are applied.

A detailed model, based on his research in production companies, was developed by Robert Sutermeister and describes the many factors that affect employees' job performance and productivity (Sutermeister, 1976). Productivity is described by Sutermeister as output of products with appropriate quality per employee hour and reflecting Marx's (1930) definition of productivity as relating production of use-value to the amount of labour employed. Productivity thus relates to organisational effectiveness and therefore to the aims of this research project. The model is reproduced below. (Note however that the relationships between job performance and motivation and productivity described textually by Sutermeister do not align with the core of the diagram.)

MAJOR FACTORS AFFECTING EMPLOYEES' JOB PERFORMANCE AND PRODUCTIVITY



1. The size of each segment has no relationship to its relative importance, which would vary with different organizations, different departments, and even different individuals with their own distinct needs.
2. The factors in each segment affect factors in the corresponding segment of the next smaller circle; they may also affect and be affected by other segments in the same circle or other circles.
3. The numbers in the various sections of the diagram correspond to figures in parentheses throughout Chapters 1 to 18.

Figure 1 Influences on productivity from Sutermeister (1976)

The key elements impacting on productivity are the human and the nature of the job. The nature of the job is based upon the technological development, raw materials, job layout and methods. Job performance of the employee is dependent on their ability and motivation. The three core elements of ability, motivation and job, match those identified by Marx (1930) and the elements incorporated later in the Ability/Motivation/Opportunity or Bath model (Hutchinson and Purcell, 2003), based upon their research in twelve UK organisations into the influences on productivity.

The relative importance of the job and person are dependent on the nature of the setting. A factory production line is where the job elements will be more important and a department store is where the human factors will be more important (Sutermeister, 1976). Ability is based upon the employee's skills and knowledge which are influenced by the employee's aptitude, personality, education, experience, training and interest. This is a somewhat simpler list than the list of competencies identified for effective managers by Boyatzis (1992) which suggests that Sutermeister is basing his model on a research setting where the higher level characteristics identified by Boyatzis such as self confidence or pro-activity are not required. The employee's motivation is influenced by their physiological, social and egoistic needs. Social conditions are influenced by the formal and informal organisation structure, leadership and any union membership.

Whilst much of what Sutermeister describes is in the setting of (American) manufacturing companies, he suggests that the relationships apply also to service organisations in private and public sectors. In his description of technology's contributions to productivity, Sutermeister states (1976, p 7) 'Productivity is not determined solely by how hard and how well people work. The technical factors play a role, sometimes an overwhelmingly important one, sometimes a minor one.' This statement reflects the focus of this research project that the organisation sets out an environment that affects how individuals can contribute and again reflects Marx's (1930) observations on the human and instrument/tool influences on productivity and Penrose's observations on the importance to productive services of the interaction between people and other resources. Sutermeister's detailed model identifies further the nature of the instruments, processes and structures mentioned by Marx (1930)

Although Sutermeister's model suggests a very direct relationship between the factors identified, he explains that the lines between the factors are not distinct and that there are other inter-relationships that are not shown. In the model the main focus is on the factors relating to the productivity of an individual, however this view misses some important elements. These include the relationship between the productivity of the individual and the organisational aims and the customer and takes for granted that productivity is the one and only goal (a point acknowledged by Sutermeister). Also the focus of the model on the individual fails to address a sense of collaborative working. Therefore in assessing the model regarding the individual to organisational linking, the relationship is not clear between the productivity of the individual, co-workers and the organisational aims and intended capability and how these may change over time. Whilst the model itself is comprehensive, the context of the model is simplistic, is a snap-shot and much oriented towards production line environments and does not explain how the different elements are combined in achieving the organisational objective.

A simpler model of the influences of individual characteristics on competent performance but widened to include achievement was developed in the context of Royal Navy leaders by Young and Dulewicz (Young and Dulewicz, 2005).

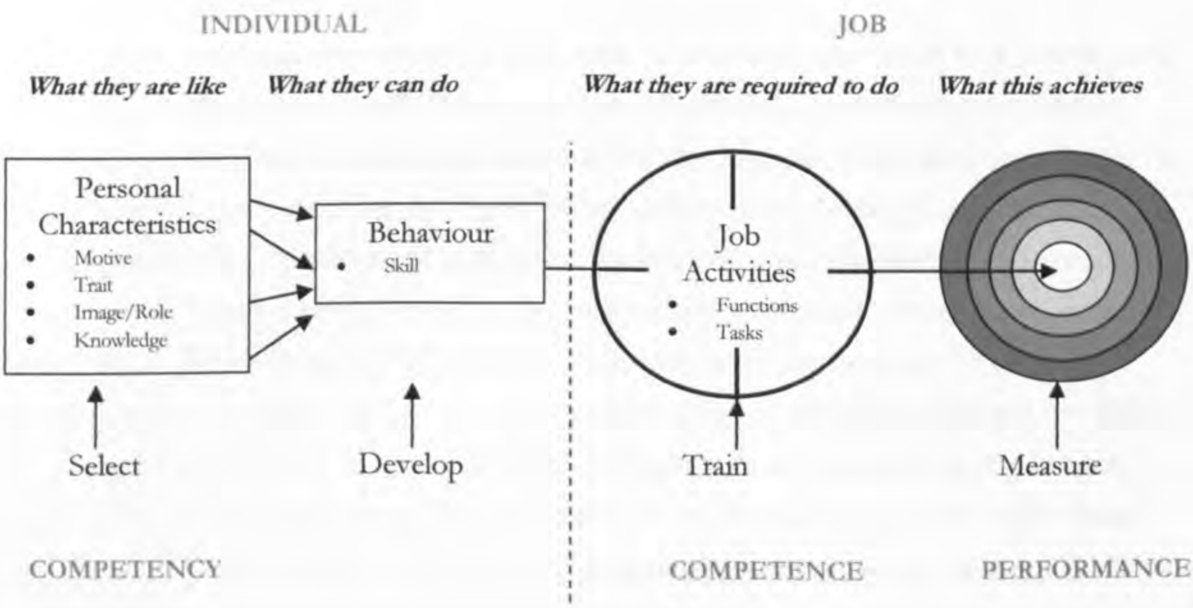


Figure 2 A model of command, leadership and management competency in the British Royal Navy based on Young and Dulewicz (2005)

This model splits the chain of how individual characteristics are enacted in performing a particular job. It identifies the dimensions of personal characteristics, the inputs to capability, how these are translated into behaviours and outcome, relating this to the context of what the individual is expected to do in a job. Thus the model includes both input and behavioural factors with the context and outcome identified in the previous discussion so in spite of being related only to Naval Officers appears to be more generally applicable. However, the model ignores influences external to the individual such as teamwork and the broader organisational and situational influences and use of instruments and tools or technologies equivalent to those identified by Sutermeister (1976).

In reviewing these approaches, they have identified the elements of how labour power is applied in producing use-value (Marx, 1930). These are the characteristics of the individual, the purposeful act or application of labour power, how the individual uses instruments, tools or other technology as part of the act, the context within which the individual acts and the desired outcome of the act. They have also identified behaviour as the mediator between the labour power and production of use-value.

In the following section, the separate characteristics contributing to labour power or capability will be discussed further as a foundation to enabling the understanding of individual capability in the research context.

2.4 Discussion on the characteristics of labour power

Manual and cognitive ability - skill

One of the individual characteristics used freely in the literature is 'skill'. Skill is defined as 'expertness, practiced ability, facility in doing something, dexterity, tact' (Fowler and Fowler, 1966). The term skill has been applied to both manual and cognitive ability and is qualitative for example people may be described as 'highly skilled' or 'low skilled'. Attewell examined skill from four perspectives – positivist, ethnomethodological, Weberian and Marxist and concluded that the meaning of skill is socially constructed, has multiple dimensions, and the perception of skill depends on the viewpoint and the factors or situation taken into account. Therefore it is impossible to build an objective and non-judgmental definition of skill. Manual skill is the ability to carry out some physical action such as riding a bicycle or cutting straight a piece of wood (Polanyi, 1969). Manual dexterity and skill is linked to an individual's physical characteristics which together influence whether and how an individual may carry out an action e.g. Schmidt's physical strength and his ability to lift pig-iron (Taylor, 1911). Cognitive skill is being able to carry out some cognitive task such as numeric calculations or problem solving (Meyer, 1968; Polanyi, 1969). Cognitive capacities are described by Gibb as the 'forms and aspects of intelligence which comprise the possession and processing of information in the brain and higher level neurological abilities' (Gibb, 2008, p 29) thus are multi-dimensional and deal with the way a person's world is represented.

In considering skill further, people may be observed to have particular skills but can learn new skills, such as learning to ride a bicycle (Polanyi, 1969). Manual ability may be inherent, learnt or developed through practice and experience (Gibb, 2008) and cognitive capacities may be developed by studying and from experience (Wood, 1999; Gibb, 2008). Ethnomethodology would see cognitive capacity as something developed from birth over a life-time with the particular requirements of specific roles only a surface layer (Coulon, 1995). Thus individuals have capabilities that are based upon the bodily and mental configuration they were born with or have learnt or developed since birth.

The nature of knowledge and knowing

A factor that connects manual and cognitive abilities is having stored experience to draw on – or knowledge, to enable the individual to work out how to do a task (Polanyi, 1966; Polanyi, 1969). This relates to, for example, Teece and Pisano's and Von Krogh and Roos' emphasis on learning by doing (Teece and Pisano, 1994; Von Krogh and Roos, 1995b) and White's (1959) description of people being able to profit from the past and use their experience to initiate new and possibly more complex experiences (White, 1959).

In the literature, there is much discussion about the nature of knowledge, both in general and as it applies to human capability. Personal knowing is based upon electro-chemical connections in the brain and learning is a re-configuration of such connections (Ryle, 1949; Wood, 1999). However our understanding is that these connections are not simply a 'data-base' of facts but comprise higher order connections, interpreted as knowledge or wisdom. The separation of the specialties concerning the operation of the brain into neurology and cognitive science recognises these two conceptual levels. The higher order connections have been categorised in a number of different ways, such as Johnson Laird's (1983) concept of mental models – that humans hold cognitive models of the real world and that any new experience is judged against the existing models. Another categorisation, much discussed, is the split between tacit and explicit knowledge (Polanyi, 1969; Nonaka and Takeuchi, 1995; Von Krogh and Roos, 1995a; Henderson and Cockburn, 2000; Argote and Darr, 2000; Nurse, 2001; Gourlay and Nurse, 2005). Polanyi describes all personal knowing to be tacit, and decribes the nature of tacit knowing in the famous phrase 'we know more than we can tell' (Polanyi, 1969, p 4), that we do not know what we know until we use it. Nonaka (1994) describes tacit technical knowledge as the 'concrete know-how, crafts and skills that apply to specific situations' and thus includes physical craft ability as part of his view of knowledge (Nonaka, 1994, p16). This identifies that skill and knowledge are not separate entities but closely connected through the brain, nervous and muscular systems. For example, Teece describes knowledge as residing in patterns of activity and routines. (Teece, Pisano and Shuen, 2000). Thus manual dexterity can be seen as knowledge embodied within the muscular and nervous systems and not necessarily dependent upon conscious thought – the muscles and nervous system know how to balance the bicycle or hold the saw (Polanyi, 1966). This correlates with Blackler's (1995) concept of personal knowledge as being embrained and embodied.

Knowledge has also been categorised in a number of other ways, for example Anderson's ACT model based on declarative and procedural knowledge, Ryle's classifications - knowledge of and knowledge how, Winter's concepts of transferable and non-transferable knowledge and Von Krogh and Roos' semantic and episodic knowledge. (Anderson, 1983)

(Ryle, 1949; Winter, 1987; Von Krogh and Roos, 1995b). Thus individual knowledge may be seen as multidimensional.

Given that personal knowledge comprises patterns of connections in the brain, how the individual 'brings forth' knowledge in some situation may be interpreted in many different ways as exemplified by the categories above and reflecting the higher level neurological abilities (Gibb, 2008). This knowledge may be seen as a social construction with its meaning dependent on the individual and their culture, values and power relationships, thus linking between the individual and the environment in which they sit (Von Krogh and Roos, 1995b; Stacey, 2001). The implications for research is that knowledge may not be seen as a discrete body of facts that can be interrogated through question and answer but as related to the process of doing in a particular situation.

Motivation and behaviour

People do not necessarily take action in a particular situation – to be able to do a particular thing is not to say that the thing is actually done. The influence that governs taking action is described as motivation. Since the research carried out at the Hawthorne Electric Plant (Mayo, 1939) it has been recognised that motivation to act is invisible, complex, related to both the individual and the situation and has been subject to much study and dispute. Governing inherent or learned factors are said to include motives, attitudes, values, emotional intelligence and possibly job satisfaction (Maslow, 1943; Herzberg, Mausner and Snyderman, 1959; Alderfer and Smith, 1982; Shipley and Kiely, 1988; McClelland, 1988; Gibb, 2008). The external or extrinsic factors related to the situation said to influence motivation include the organisational culture, work, structures and incentives (Roethlisberger and Dickson, 1939; Thompson, 1961; Blau and Scott, 1962; Vroom, 1964; Miller, 1967; Kohn, 1971; Aronowitz, 1973; Rosow, 1974; Terkel, 1974; Locke, 1975; Sutermeister, 1976; Hage, 1980; Hochschild, 1983; Withey and Cooper, 1989; Hall, 1994).

An individual when carrying out a task and thus motivated to enact their abilities do this through some behavioural action – cognitive or physical. Particular situations or desired outcomes require particular kinds of behaviour and these depend on a match between the situation and the attitudes and values of the individual (Weightman, 1994; Gibb, 2008).

Because motivational forces are complex and invisible characteristics of the individual and thus difficult to identify, behaviours are more often used as a unit of analysis in studying the individual in an organisational setting, a conclusion relevant to this research project (Hall, 1980; Orr, 1990; Narduzzo, Rocco and Warglein, 2000; Argote and Darr, 2000; Young and Dulewicz, 2005).

Conclusions about the concept and application of individual capability

Labour power or capability to do something is based upon an individual's embodied qualities such as manual dexterity, cognitive ability, memory or knowledge, in physical characteristics such as height, strength, agility and balance e.g. (Marx, 1930; Gibb, 2008). Capability is such that an individual can do the task and motivation is the driver that means she or he will do the task (Purcell, 2004).

The complexity of the combination of human characteristics, the situation and the influence of motivation means that research has only gone so far in explaining individual performance and that more can be done to develop understanding of the enactment of capability in particular situations such as within an organisational setting. Therefore in the research setting, it is important to define an approach that is open and does not seek to simply place observations onto the ready made 'coat-hangars' of existing perspective bound theories (Hall, 1980). What the literature has identified is the nature of the contributors to capability and their influence in particular circumstances, such as skill and dexterity (Marx, 1930), strength and willingness to follow orders in the case of Schmidt (Taylor, 1911) and ability to build customer relations in the case of the Stuart and Lindsay (1997) research. In each case, the definition of contributors to capability has been in the context of some desirable outcome – production of use-value. Capabilities, inherent or based upon experience may have been demonstrated in the past and may be applied to new situations. It may be concluded that every characteristic and previous experience of an individual may impact positively or otherwise on how she or he approaches and carries out a task in a particular situation. Regarding the judgment of competence, it may be concluded that a definition or measurement of competence will be dependent on the situation and viewpoint of the observer – competence is a social construction.

In the literature, it has been accepted that the nature of a task and more broadly a job is seen to be part of the context influencing outcome e.g. (Sutermeister, 1976; Purcell, 2004; Young and Dulewicz, 2005). Competent performance is dependent on the match between the abilities of the individual and the demands of the task at hand (Von Krogh and Roos, 1995b). The nature of job characteristics may be very wide as illustrated in the model developed by Sutermeister (figure 1). Thus the situation as represented by the complex range of job characteristics mediate between the abilities of the individual and their competent performance of particular tasks or activities.

Thus, in the context of this thesis and its research objectives, it is important to have a view of the labour power reflecting the bodily and cognitive capacities of the individuals being studied. It is also important to understand the context in which labour power is being applied. The context includes not only the expected outcome in terms of expected use-value, but also the nature of the work and the processes followed, the way in which instruments and tools or other technologies are used by the subjects and the nature of interaction and structuring between individuals representing coordinated labour powers.

2.5 How organisational resources are deployed in pursuit of organisational aims

In the previous sections, the concept of the productive power of an enterprise was discussed in consideration of the concept of labour power or individual capability. In this section, the linking of individual and organisation will be investigated further through a general introduction then review of three research projects that shed light on this linking.

The way in which organisational resources are combined in achieving organisational aims is 'complex and opaque' (Campbell and Summers-Luchs, 1997, p 9). The combination and interaction of resources and how they are used has dynamic, systemic, systematic, cognitive and holistic aspects and is based on human cognition, skills and knowledge (Heene and Sanchez, 1997), thus is multiple dimensional. Verdin and Williamson (1994) describe twenty-nine separate components of organisational resources and services. These are described as 'asset stock' such as R&D capability and technological know-how that may be combined in particular situations (Verdin and Williamson, 1994, p 81) and their list may be viewed as a simplification – for example 'knowledgeable employees/managers' is only one of the assets identified and a typical organisation will have employees with many different areas of knowledge. Argote and Darr (2000) whilst looking at literature on how learning is embedded in organisations listed contributors to organisational capability including: task routines, methods of production control, equipment design, routing and material handling, methods, equipment and technology, specialisation of labour, incentives, leadership, tooling, layout, structures, routines, methods of coordination and an understanding of who in the organisation is good at what. In this list, it may be concluded they include a wide range of both human and physical resources and routines, methods, incentives and designs through which the resources are deployed.

Thus there are multiple perspectives on the resources and how they contribute to organisational achievement. The following research projects provide a view of how organisational resources are deployed in the particular context of the research setting.

2.6 Three research projects relating to individual and organisational capability

The following research projects, identified in the literature, shed light on how human and other resource components of productive power have been deployed in pursuit of use-value and thus inform this thesis.

Orr's study of Xerox technicians

Orr studied the activities of Xerox photocopier technicians and how they performed diagnosis of copier machine faults taking an ethnographic approach (Orr, 1990). He observed technicians at work, spent time with them and recorded their informal conversations and noted the manuals and materials they used. He even went as far as taking the copier machine maintenance course so that he could understand the context of the work being carried out. Through this study, Orr built a deep understanding of not only what the technicians did in their work and the way that they shared knowledge and solved problems but also the social and identity structures within the technician community.

Orr provides a view of the linking of the individual activities of the technicians to the objectives of the organisation, through the relationship between the success of the technicians in their diagnosis activities and customer satisfaction and the possibility of lost contracts. An important element of this was that whilst in theory, the technician's role was purely fixing machine faults, in practice they had the responsibility of maintaining the customer relationship. For example, machine fault diagnosis is described by Orr (1990, p 170) 'Diagnosis may be technically problematic in that the state of the machine itself is often unclear. In all of these cases, definition of the problem, or the state of the machine, is accomplished through social interaction between technician, customer and machine' (though a social relationship with a machine may be an argued concept (Law, 2003)).

Key elements of Orr's findings are the role of interaction and story telling between the technicians and the relationship between practice of the technicians and the documentation provided to them. Orr found that the documentation that was supposed to provide guidance in fault finding provided only superficial guidance because of its lack of contextual grounding. Documentation produced by the machine designer was out of step with a technician fixing an actual machine fault for an actual customer. Thus the experience of the technicians and their knowledge sharing in a community of practice (Wenger, 1998) provided the bridge between theory and the actual fixing of machine faults which themselves were representative of potential customer relationship problems. A further insight comes from the identification in the study that the copier machine held different places in the world view of customer and technician. For the customer, the copier represented part of their activities and was placed within their world. The technician represented an invited expert upon whom trust was placed to address the machine fault problems. For the technician, the machine seemed to represent a system that was both 'perverse and fascinating', a worthy opponent and partner (Orr, 1990, p 186) and a mechanism by which the technician constructed their own self in terms of their expertise in fixing faults. Thus the context of the study was complex including both technical and social elements and shows the complex relationship between the engineer and what Marx (1930) described as the subject matter of work .

Conclusions from the study relevant to this research project are that the technical knowledge of engineers was combined with procedural information contained in repair manuals but was supported by knowledge sharing within the community of engineers. In carrying out repairs, the engineers were cognisant of the role they were playing in organisational achievement through the relationship they held with the customer. Individual engineers interacted heterogeneously with physical resources, other company individuals and also with the customer in production of the repair service in the way Penrose (1959) described and in pursuit of the company objectives of maintaining the customer relationship. Thus the research project demonstrates ways in which individuals interact with each other and other resources in pursuit of organisational achievement in the particular research context.

Narduzzo, Rocco and Warglein's study of Italian communications technicians

This study aimed to identify the emergence of organisational capabilities by studying a group of technicians during the installation and fault fixing of mobile telephone transmission stations (Narduzzo, Rocco and Warglein, 2000). The relevance of the study is that whilst examining individual and organisational activity, it is also possible to view these activities within the context of the company aims and identify the linking between individual and organisational capability. Narduzzo and his colleagues used the techniques of interview, examination of documentation and observation through spending time in the field with engineers. Thus the examination was from the human perspective but with the 'routine' as the unit of analysis. The routine was described as the processes used by engineers in their various tasks and comprised a combination of documented procedures and human practice.

The company objective was that over one thousand transmission stations were to be installed in the short period of a year. The urgency was because the Italian national regulatory framework required a threshold number of operational stations by a particular date. Network coverage was also a key parameter of service quality to customers which emphasises the importance of successful installation and speedy repair of problem sites. Customer satisfaction through service reliability and regularity was seen by the company to provide competitive advantage. The installation and fault fixing tasks were novel as the company had not carried out a similar project previously. In a few months over 100 technicians were recruited from companies using similar but not the same technologies. The technicians brought with them not only technical skills but also ways of working associated with the previous company and industry. For example, technicians previously from the radio communications industry used maps but technicians from other industries used textual information.

At the start of the installation project, the technicians were able to work in pairs and meet at the head office, but as the number and dispersal of stations increased, the technicians worked more on their own with much less frequent face to face contact and used their mobile telephones for communications with each other. During this phase, it was observed that operational practices grew and diverged from area to area, depending on the company/industry habitual routines carried by specific technicians. The study observed the growth of capabilities in installation and fixing faults arising in the technology as both an organisational and individual technical capability. The capabilities were observed to derive from two separate sources. The company had a number of very specific procedures for both installation of stations and fault repair. These procedures were supplemented and 'systematically violated' (Orr, 1990, p 41) by the technicians in the development of individual and shared working practices. This was either because H.Q. procedures did not cover a particular area of activity or because of time pressures where use of the standard procedure would be too slow. Thus viewing the written procedures as a physical resource, installation may be seen as an emergent interaction between the technician and the procedure.

Areas of expertise were likened to a heterogeneous patchwork and each area had a network of interlocking routines. It was observed that the different areas became locked in their particular ways of working – 'organisational imprinting' (Orr, 1990, p 33) coordination activities became formalised and embedded – described as 'crawling institutionalisation' (Orr, 1990, p 45). This shows how organisational processes or routines are developed.

The company had a number of very specific and detailed procedures laid down and as experience built, these were observed to be used by the technicians in combination with their own expertise as building blocks of practice rather than as definitive ways of acting. Part of the reason for this was that some procedures were found through collective diagnostic experience to be non-effective, thus the situation was more complex than the designers of the procedures had documented. In the situation of 'over-sizing' of operational stations where additional facilities were added to those existing, elements of the original installation procedures were used as operational building blocks to counter the uncertainty of outcome involved in the process.

Observations of fault fixing is of interest as it relates to diagnosis of problems and solution – relevant to the situation of this research project. Diagnosis was said to occur through use of company procedures coupled with reflection and diagnostic reasoning using information shared between technicians. This sharing was sometimes directed and sometimes ad-hoc or through the telling of war-stories (Orr, 1990). It was observed that the technicians built individual logical representations of both the technology at fault and the diagnosis process. The technicians while fault fixing were dealing concurrently with the technology, the fault condition, what to do to identify the cause of the fault and how to repair it. More experienced technicians were found to use a greater range of possible causes and higher complexity of model. Hypotheses of fault cause and possible actions were tested against previous experience of the individual and other technicians, so an important element of a technician's knowledge was who else they knew to call for advice. Diagnosis routines were also re-played from previous experience and the researchers noted that in these re-plays, inconclusive tests that had already been completed were repeated because they were part of the historically established routine, thus emphasising the adherence to and thus the strength of the routine as an influence on individual action.

It was observed during fault fixing that the working method of the technicians was around the diagnostic process rather than the detailed operation of the technology. An example from a telephone conversation between technicians was 'what do I do then' – knowledge 'how' rather than knowledge 'of' (Ryle, 1949). Because of the complexity of faults, it was observed that the habitual routines developed were not of test procedures but at the higher cognitive level (Gibb, 2008) of how test procedures were built, using representations of the task. These representations were reduced scale models of the external reality and available actions, stored in a combination of the minds of the technicians and in physical resources such as procedures, software or physical features of the environment. This was described as 'Automatic and tacit behaviours were observed to be embedded in more complex patterns of action in which interpretation, reasoning, more or less explicit manipulation of mental representations, deliberations and design take a relevant part' (Orr, 1990, p 47). This reflects the multi-dimensional nature of the fault diagnosis task.

It was concluded by the researchers that the individual abilities of the technicians could be regarded as organisational phenomena since they had developed collectively and made use of shared language. That is, there were company specific ways of working and in use of language. Other elements of the organisational resources were the hardware and software used for diagnosis and coordination processes and job descriptions. These were observed to provide a common representation of tasks and suggested sequence of actions, described as structuring resources (Suchman, 1987) and was a way in which emerging roles were formalised and made irreversible.

Examining the research, it identifies that again like the Orr study (Orr, 1990) engineers built practice through an emergent interaction (Penrose, 1959) between their own knowledge and the written procedures in the context of the particular situation that held at that time. The resources of organisational procedures were pulled apart by the technicians and reconstructed in the light of particular events and the immediate and overall desired outcomes. Thus the engineers were re-constructing the organisational resources as well as directly interacting with them. The knowledge that technicians dealt with concurrently included model representations of the system and procedure as well as identification of expertise, thus illustrating the multi dimensional nature of the knowledge that mediated between individuals and resources. The study illustrates the development of processes as part of Penrose's (1959) administrative organisation. However these were not in this case a centrally created artefact but grew organically and varied from location to location because of local influences. Physical organisational resources such as computer systems, job descriptions and procedures played roles of both forming a shared representation and embedding processes and organisation.

Thus the linking between individual and organisation was through the purposeful merging of individual and collective knowledge and capability with organisational processes and other resources. This was in light of the need for speedy installation and repair of the transmission stations in order to meet statutory and customer service requirements. Thus the study sheds further light on the nature and development of organisational processes or how work is organised (Marx, 1930).

Argote and Darr's study of pizza franchise outlets

This study followed on from Argote and her colleagues' previous studies of organisational learning curves e.g. (Argote and Epple, 1990; Argote et al. 1995) and was looking at how learning became embedded in the organisation. Whilst describing the study as referring to knowledge, the findings of the study actually relate to use of knowledge, skills and physical resources. The study is of relevance to this thesis as again it throws light on how the activities of individuals are linked to physical resources and the organisational achievement.

The study was of thirty six pizza outlets owned by ten franchisees and examined how knowledge was stored in their operations, in particular in technology, routines (described as structures) and individuals. The organisational objectives that set the context of the operations were profitability, delivery speed, service performance measured by late pizza delivery, product quality based upon ten (unspecified) quality points, paperwork completion and management turnover. Another important element of the context of the study was that the turnover of people in the outlets averaged 300% per annum thus bringing into focus the separation of knowledge held by people and the other resources.

The research identified an example of knowledge held in technology, a cheese spreader developed by a multi outlet franchisee. This spreader was developed to enable the right amount of cheese to be spread evenly across the pizza thus enabling satisfaction of the customer (not too much nor too little cheese) but also ensuring optimum profitability in that too much cheese would not be used. Use of the cheese spreader was repeated across each of the outlets of the franchisee. Thus the individual ability of the pizza maker was augmented by the tool that assisted them to put on the right amount of cheese.

Knowledge was found to be held in a procedure for testing dough quality. The dough was made by the franchiser and distributed to each outlet where it could be stored for up to three days. However it was possible that the dough would degrade before this time so a way of checking the quality of the dough was developed. This involved pinching the dough to check if it sprang back, if not then the dough had degraded. This procedure was then transferred between outlets as a common process. Thus the abilities of the individual was augmented by the common procedure of quality checking. Darr, Argote and Epple (1995) also describe a similar procedure from the same study for a standard distribution of pepperoni in spokes to ensure proper distribution across the pizza once the underlying cheese had melted in the oven (Darr, Argote and Epple, 1995).

Knowledge held by people was identified in the way in which the dough ball would be hand spun to form the pizza base. This was seen to be a highly skilled activity and was learnt through observation and practise. In this case, the knowledge may be seen as a combination of manual dexterity or skill and knowledge of the pizza spinning routine and the expected outcome, but would also be based upon the dough ball being of the right size and quality – an organisational derived element or resource (Penrose, 1959).

This study of pizza outlets illustrates how the organisational aims of pizza quality and profitability was supported through the knowledge and skills held by individuals and the organisational resources of standard tools and routines. However, the researchers were particularly examining knowledge held by the people, organisational processes or routines and technology so potentially leave other important elements uncovered. For example, there is no discussion of teamwork or other cultural factors and how these influenced the effectiveness of the franchises.

Conclusions from the research into organisational capability

The findings from the quoted research projects add further clarification in a number of areas. Each study has been based upon a specific and particular context with individuals playing particular roles within the organisation. The context in which people have been employed in relation to the organisational aim is important in identifying the contribution of tools and other resources. In each case, the individuals constructed the interaction between themselves and the other resources contingent on the specifics of the situation – what the individual was seeking to achieve and the broader organisational aims. This interaction was purposeful and emergent. The organisational structure within which individuals operated influenced the way in which they worked, for example in the differing processes adopted by the different geographic groups of Italian communications engineers (Narduzzo, Rocco and Warglein, 2000).

In addition, the nature of the interaction between individuals and other organisational resources was influenced by the histories, experience and knowledge of the individuals. The studies shed further light on the nature of the knowledge used to mediate between individuals and other organisational resources (Penrose, 1959). This knowledge could be shared between individuals in the organisation, was structured and multi-dimensional, including factual and procedural dimensions (Ryle, 1949).

The studies identified different kinds of purposeful tools or technical systems, designed to take a particular role in the interaction with individuals in pursuit of the organisational objective. The tool is a way of embedding organisational knowledge (Blackler, 1995) thus extending Marx's (1930) concept of instrument and Penrose's (1959) concept of knowledge as a human characteristic.

Routines or processes were identified as the way in which interaction between combinations of human and other resources occurred. The routines or processes may have been written or unwritten (Nelson and Winter, 1982). Routines and processes developed and were re-created through the interaction of individuals and other resources in the light of specific situations. Routines and processes were another way in which knowledge was represented in the organisation (Nelson and Winter, 1982; Blackler, 1995).

Dialogue between individuals through discussion and war-story telling was identified as an important form of social interaction that influenced the achievement of the organisational objective.

In conclusion, firstly, the research projects emphasise the importance of understanding the context within which the acts of individuals are being carried out. The context relates to the aims or objectives of both individual and organisation.

The complexity of the interaction between individuals and other organisational resources suggests that in the research context it is necessary to understand the detail of the interactions between individuals and physical resources. This needs to be informed by an understanding of the context and organisational objectives in order to understand the linking between the individual and organisational capability.

The research described also suggests the nature of the theoretical underpinning of the researchers to the observations. It may be concluded that the research projects were studying real objects and actions and thus represent a realist perspective. Therefore the methodology of these research projects informs a possible approach to this research study.

Having discussed the three research projects examining the deployment of individual capability within an organisational setting, the overall conclusions drawn from the literature will be discussed.

2.7 Conclusions on organisational capability from the literature.

At the heart of this enquiry are the questions: how is an organisation able to do what it does and how are the actions of individuals within it mediated in relation to the pursuit of the aims of the organisation.

A discrete number of components have been identified in the literature review which are important to organisational achievement in particular situations.

From the earlier writers Smith (1776) and Ricardo (1911), the ability of an enterprise to achieve was through a productive capacity, based upon coordinated division of labour and use of machines. Marx (1930) provided a firmer foundation by identifying the concepts of the productive power of an enterprise to produce use-value. This was based upon individual labour power using instruments or tools, coordinated with others, following work processes and arranged within organisational structures. People have mental and physical abilities that represent labour power which could be applied to change nature and produce use-value. Penrose (1959) and the other resource based view writers provided further insight by identifying organisational achievement to be based upon the deployment of a range of human roles and different kinds of other resource to provide services through an administrative framework. The interaction between individual and other resources in production of services is mediated by emergent knowledge relating to the individuals, the resources and the context.

The research projects discussed identified further the characteristics of Marx's labour power and Penrose's 'human resources' - skills, knowledge based upon experience, values, personality, attitudes and the ability to work collaboratively with others. Other resources or instruments have been identified including technical systems and tools available to the organisation. The way in which the administrative organisation has been represented, through organisational processes and structures, through which the people, and other resources were deployed was identified. The knowledge influencing the deployment of resources in pursuit of organisational aims has been seen as embedded not only in the people but also in organisational processes and routines and the structures of the organisation, but that the processes, routines and structures were re-created dynamically according to the context.

Thus it may be concluded from the literature that the capability of the organisation to achieve may be viewed as a combination of the individual capabilities and interactions of the people combined with other resources such as tools and machines and applied through an administrative organisation. The administrative organisation comprises a knowledge mediated combination of organisational processes and structures. However the way in which these are combined is emergent, contingent on the individuals and resources concerned and the specific organisational task being pursued and its context.

Therefore in order to study the linking between the individual and the organisational capability, there are three questions to be answered, as follows. The objective of each question is also show (Saunders, Lewis and Thornhill, 2003).

1. What is the organisation seeking to achieve in relation to the individual activity and how is it set up to do so?

Objective: It is necessary to understand the organisational context in which the individual is operating in order to understand the link between individual action and the desired achievement of the organisation relating to that action.

2. What is the individual activity being studied. What are the important characteristics of the individual and what are the key elements of their capability important to achievement of the desired outcome?

Objective: It is necessary to identify the specific activity of individuals in a particular setting against the background of the archetypal characteristics of the individuals.

3. In the research context, how do individuals interact with instruments and tools and with each other. What structures and organisational processes exist that influence the individual achievement.

Objective: If organisational capability is based upon the use of organisational resources by individuals, then it is necessary to understand how the individuals are influenced or make use of the other resources in pursuit of the organisational objective. This is in order to understand the way in which the capabilities of the individual are linked to the organisational capability.

Chapter 3 Methodology

3.1 Research aims

In the literature review, the productive capacity or capability of an enterprise to achieve was identified as being based upon deployment of people and other resources by an administrative organisation. These were represented by the people and their social interaction and the use of instruments and tools through organisational processes and influenced by organisational structures. The aim of the empirical research project is to test this theory by studying in a particular whether and if so, how these organisational elements play a role in the enactment by the individual of organisational capability. Thus, the study is to examine that which mediates the actions of individuals in relation to the pursuit of the desired outcomes of the organisation in which they work. Contingency theory (Woodward, 1980; Bryman and Bell, 2003) and the analysis of the research projects in section 2.6 suggest that the ways the resources are combined will be contingent on the particular circumstances applying at the time. Therefore in order to understand the linking between individual and organisation, it is necessary to study empirically, the specific activities of individuals and their use of other organisational resources whilst setting the activity against a background of the context of what the organisation is seeking to achieve. In the previous chapter, three research questions were posed that addressed the individual and organisational context and the mechanisms that linked them. The way these questions have been answered will be set out in the following sections which will discuss and justify the underpinning philosophy, rationale and the method of research carried out.

Philosophical perspective

With any research, the approach of the study is influenced by the nature of that being researched and the philosophical position of the researcher (Robson, 2002). A view of the epistemological positions from which research phenomena may be studied are positivism, interpretivism and realism (Robson, 2002; Bryman and Bell, 2003). This research project has been carried out from a realist perspective. The theoretical position taken by the researcher is that in the real world, life in and the capability of organisations is based upon real phenomena such as people skills, buildings, furnishings, technical systems and written procedures but combined with human interpretation and construction. Realism assumes there is a reality in the form of social forces and objects, processes and phenomena that affect people and the way they perceive their world and that this reality is independent of human thoughts and beliefs. (Giddens, 1984; Bryman and Bell, 2003). Robson (2002) describes the process simply as within some context action is taken with an outcome, where the outcome is influenced by a mechanism. The mechanism is the sum of the social forces, objects, processes and phenomena and other influences that mediate between action and outcome (Robson, 2002).

Interpretism deals with phenomena purely as a social construction thus takes the perspective of the actors involved (Bryman and Bell, 2003) which does not fit with the aims o the research. In contrast, positivism would seek an essential formula free of human interpretation that would define the relationship between individual and organisational capability (Bryman and Bell, 2003). However, the nature of human and organisational capability described in the literature review suggest that the linkages between individuals and the capability of their organisation could not be so defined.

The study is a combination of the descriptive, exploratory and explanatory (Saunders, Lewis and Thornhill, 2003). As the objects of study are the real actions carried out by people, these need to be described, the way in which they use organisational resources must be explored and how such use relates to the desired aims and context of the organisation be explained. The approach of connecting the individual and organisational perspectives is informed by Cassirer's (1953) assertion that the universal can be perceived only in the particular, while the particular can be thought of only in reference to the universal.

3.2 Case Study Research Strategy

A recurrent theme in research literature is that the strategies adopted for research should match the research aims (Robson, 2002). It was considered by the researcher that an empirical examination of real life activity of individuals in their normal work setting was needed in order to achieve the aims of the study (Baszanger and Dodier, 2004). It is necessary to build a case study of the day to day actions of individuals, identify that which influences what they do and achieve but relate this individual unit of analysis to the organisational objective. A case study is said to enable the explanation of the causal links in real life interventions that are too complex for survey or experimental strategies (Yin, 2009). Case studies are applicable when 'how' or 'why' questions are being posed, when the investigator has little influence over events and when the focus is on a contemporary phenomenon within some real life situation(Yin, 2009). They relate to situations where interventions being studied may have no single clear outcome and the boundaries between the research phenomenon and its context may be in-distinct. (Yin, 2009). It is proposed by the researcher that the study of the work related actions of individuals and their use of resources within their normal organisational setting and seeking to relate these observations to the objectives of the organisation correlate with these features of the case study strategy. The emphasis on context in case study research (Yin, 2009) strongly aligns with the importance of understanding the organisational context in making sense of individual action related to the organisational setting. Therefore a case study strategy using elements of mixed mode research (Yin, 2009) was deemed the most appropriate method to meet the research aim.

This case study approach to research into individual actions within a particular setting reflects the previous research described in the literature review of the research carried out by Orr into the activities of photocopier engineers, Narduzzo and colleagues into the activities of communications engineers and Argote and Darr who studied activities in franchised pizza enterprises (Orr, 1990; Argote and Darr, 2000; Narduzzo, Rocco and Warglein, 2000). Thus the case study strategy adopted is informed by the approaches used in previous research.

Ethnography was rejected as it is said to be a study in depth of the life events of particular people, their feelings and motivations (Bryman and Bell, 2003) which was not considered appropriate for this research study as the subject is what people do rather than feelings. Survey as the principal research strategy was rejected as it would not provide the rich picture needed to relate action to context and handle the variables of individual and organisational capability adequately (Robson, 2002). An experimental strategy was also deemed inappropriate to achieving the aims of the research as it is necessary to base the study on real life events to achieve validity.

Operationalising the case study approach

In carrying out case study research, there are a number of design options (Yin, 2009). A case study may be of a single case (holistic) relating to a particular context, or of multiple cases relating to different contexts. Within the case there may be a single or multiple units of analysis (UOA) (Yin, 2009, p 46).

An appropriate organisational situation was sought for the research and St George's Hospital was identified as an appropriate setting and patient care by doctors an appropriate subject of study providing a definable individual and organisational context. During the research process it was identified that two complementary studies were needed in order to provide an appropriate understanding of how doctors use organisational resources in carrying out patient care and the context in which they operated. Using more than one case provides more 'compelling' evidence' (Yin, 2009, p 53) and in this research provided two separate but complementary views of the activity of doctors and their use of hospital resources. This fits with the description of flexible research described by Robson (Robson, 2002). Therefore, in Yin's terms (Yin, 2009), this research is multiple case comprising two separate studies with their own separate functional contexts (HAN and MAU studies) but sharing the common context of being within St George's Hospital and relating to a common unit of analysis of a doctor doing actions in care of an individual patient. Yin (2009) describes that multiple cases may be chosen in order to replicate a study or to provide a basis of comparison, the latter being the reason for this study. The cases are illustrated in the diagram below with reference to Yin's case study structure categorisation (Yin, 2009, p 46).

St George's Hospital (+ its context)

HAN observational study
UOA – patient care event by doctor
in context of hospital at night

MAU observational study
UOA – patient care event by doctor
in context of medical assessment

Figure 3 Structure of the Case study in St Georges with reference to Yin (2009)

The context of St George's Hospital is as a South London based provider of health services to the general population within the UK National Health Service. The HAN study was of doctors on duty in main wards overnight with the unit of analysis of the doctors taking action to resolve patient problems that had arisen at that time. The researcher's initial analysis of the data collected then informed the identification of the form of a further more detailed study. This was in the Medical Assessment Unit with the unit of analysis of the doctors' actions in deciding whether patients presenting should be admitted to the hospital or discharged. This study provided more contextual detail complementing that from the HAN study. The findings of these two studies were then analysed and synthesised to provide triangulated and complementary illustrations of the activities of the doctors and the other resources they used in patient care (Yin, 2009) in relation to the desired outcomes of the organisation in which the activity was carried out.

The HAN and MAU studies each illustrated multiple events of doctors taking patient care action and using organisational resources. Each event studied comprised the particular and short term actions of doctors taken with respect to particular patients. In choosing the unit of analysis, it had to be wide enough to provide an appropriate situation for analysis whilst small enough to provide a basis for measurement (Yin, 2009). Thus an individual patient care action (e.g. taking a temperature) would be too small as it would be too limited in its motive to provide the appropriate level of understanding whilst the whole patient treatment process would be too wide as it would involve too many elements over too long a period of time to practically record considering the research resource available. The unit of analysis was bounded at the start by the call or event by which a doctor commenced to pay attention to a patient. It was bounded at the end by the doctor turning their attention to some other activity unrelated to this patient.

As is appropriate for case studies (Yin, 2009), the choice of hospital and cases were not randomised, since quantification and statistical generalisation are not part of the research aim. St George's Hospital was identified as the study setting through existing relationships with Kingston University and the occurrence of a data collection project instigated by the hospital that provided people to collect doctor activity and resource use data required for this study. St George's is a large teaching hospital that may be described as typical of its kind so is not considered to be special in any way.

3.3 The theoretical base for the research

"theory is a way of binding together a multitude of facts so that one may comprehend them at once" George Kelly as quoted in Hall (1980; p vii)

The question 'what kind of theory' is posed by Bryman and Bell (2007) when considering the kinds of theory useful to research. As well as theories being an explanation of some observed phenomenon, Bryman and Bell (2007) also describe theories that operate at a more abstract level that provide a more general framework to the researcher. As described in the literature review, the explanatory theory that underpins this study is the resource based view, which describes that the capability of an organisation to carry out effective action is based upon the deployment of the resources it has available through an administrative organisation (Penrose, 1959), based upon the foundations of labour power contribution to the productive capacity of enterprises (Smith, 1776; Ricardo, 1911; Marx, 1930; Wernerfelt, 1984; Barney, 1991). Thus the resources comprise individuals, collectives of individuals and their use of instruments, tools and machines and the administrative organisation comprise organisational processes and the influence of organisational structures (Smith, 1776; Ricardo, 1911; Marx, 1930). Kelly's 'multitude of facts' that represent theory (Hall, 1980) in the context of this research project concerns the nature of the labour power and how labour uses the other organisational resources, follow organisational processes, are influenced by organisational structures and how they in combination provide the services that contribute to an organisation's capability.

There are four broader theoretical frameworks that have been used in organisational research and are said to bridge the gap between reality and construction and that within the overall case study framework have explanatory power in relation to this study. In this section, these four frameworks, actor – network theory, structuration theory, activity theory and queuing theory will be discussed and their contribution to the study described.

Actor-Network Theory

Actor - network theory was developed to provide a theoretical framework for helping explain interdependent social phenomena and practices, based upon original work carried out by Callon and Latour in the Ecole des Mines, Paris with further development by Law at Lancaster University (Miettinen, 1999; Law, 2003). Its original focus was on the intersection of science and society or the sociology of science (Law, 2003). In looking at the interaction between actors, the principles of the theory are that semiotically, both human and non-human actors are equal. Thus holding a gun changes the role of the individual whilst being held by someone changes the role of the gun (Fleischmann, 2007). Actors are defined not by some abstract quantitative or qualitative measure but by their interaction or relationship with other actors in the network (Lemke, no date). Different kinds of actor in a network may include humans, social groups, artefacts, devices and entities (Keele, no date), texts and graphical representations (Sarker, Sarker and Sidorova, 2006). The actors negotiate a progressive constitution or emergence of the network through taking on identities according to prevailing strategies of interaction (Bardini, 1997). Thus the network is defined by the relationships and interactions of the actors associated with it.

The main focus of Actor-network theory as suggested by the name and the applications to which it has been put is investigating the relationship between actors, in particular between humans, groups of humans and technologies in a social world – the mechanics of power and organisation (Law, 2003). Whilst being used in this way pragmatically, the nature of the theory is contested, even down to a critique of the nature of the concepts of actor, network, theory and the connecting hyphen between actor and network (Latour, 1999). In consideration of the application of actor-network theory to this research project, it offers a perspective for examining the interaction and roles of individuals and the organisational resources they interact with whilst pursuing organisational and individual objectives. However, the social focusing in on relationships and roles does not meet the need for connecting the application of individual's capabilities to the competent operation of the organisation in the way required to meet the aims of the research project.

Structuration Theory

Structuration theory has been developed since the late 1970s from original thinking by Anthony Giddens who was concerned about explaining the relationship between individuals and society (Giddens, 1984). The theory is based around the way that social structures influence agency and thus the behaviour of individuals – social structure being a combination of rules and resources (Jones, 2008). These structures are continuously produced and reproduced through the situated practice of individuals, however, in concrete terms, the structures have no existence as agents independent of the knowledge that individuals have about what they do in their day to day activity (Giddens, 1984). In this, the individual is assumed by Giddens to be a reflexive actor with a practical conciousness of the options open to them and a knowledge of how to go about things in the social setting. The structural rules are those that are applied by the individual in reacting to the social environment and influence the individual's behaviour (Giddens, 1984). Structures are seen by Giddens to influence the individual through signification (meaning), domination (application of power) and legitimation (approval). Jones and Karsten (2008) give the examples of work-dress to illustrate these three concepts – that an individual's work- dress is taken to signify things about them, for example the role of the doctor in a white coat, that wearing the certain kinds of work-dress such as a police uniform provides power and that wearing the wrong work-dress may not be seen as legitimate – for example dress-down Fridays still have constraints what is and is not appropriate dress.

Structuration theory is said to be a general theory of social organisation and an account of social phenomena at a high level of abstraction rather than a detailed explanation (Jones, 2008). This has been born out by the way that it has been used, that is, not as a specific explanatory framework but as a framework for exploring particular areas of the interaction between the individual and the social setting in which they are placed. The theory has been seen by numerous authors (Jones, 2008) to be useful in understanding particular patterns of interaction between the individuals and other resources in an organisational setting, However, it focuses down on the individual and the cognitively held structure that regulates or enables their social behaviours. Therefore although structuration theory provides explanatory power relating to the specific influence of the social structures on the individual, it does not provide the wider perspective on the contributors to productive power that the researcher considers necessary in order to achieve the aims of the research.

Activity Theory

Activity theory was originally developed in Russia based upon theorising and research around work and cultural historical psychology by Vygotsky, Leontiev and Luria based upon the materialist concepts of the contribution of labour power to the productive power of an enterprise, developed originally by Marx and Engels (Engeström and Miettenen, 1999). More recently, activity theory has been developed further, centred around Finland and Denmark but used by researchers across the world studying a wide range of socially based human activities (International Society for Cultural and Activity Research, 2005)

At the heart of activity theory is the concept of a subject engaged in meaningful activity on an object with some outcome and motive in mind (Engeström, 1993). This relates directly to Marx's concept of the application of labour power to some subject matter in order to produce use-value as discussed in the literature review. Activity is defined as a set of coordinated actions related to an object-related motive (Engeström and Miettenen, 1999). In carrying out activity, the subject makes use of artefacts - tools and signs which mediate between subject and object reflecting Marx's (1930) concept of the role of instruments. Relating to the subject, object and artefacts are rules, a community with a shared interest in the object and division of labour. The subject is the individual or group whose agency is chosen as the focus of the analysis. Thus activity theory may be used in examination at the level of the individual or organisation (Engeström, 2000).

Activity theory is based around a hierarchy of levels of act – operations, actions and activities: 'The approach distinguishes between short-lived goal-directed actions and durable, object oriented activity systems' (Engeström, 2000, p 960). Operations are based upon immediate conditions, actions are based upon an immediate goal and activity is based upon subject/object combinations with a motive. (The apocryphal story of the role of the beater in the hunt who chases a possible meal away from themselves illustrates that the actions involved in beating, for example making much noise, may only be understood when contextualised to the activity of the hunt for food of which they are a part (Leontiev, 1981; Engeström and Miettenen, 1999)). This example also highlights the cultural and historical aspects of activity. That a beater in carrying out the beating is set within the culture of the society in which they live and that the practice of beating within a group will be based upon historical practices of division of labour and the spoils. Thus activity theory is focused on how individuals act when carrying out a task within a social and cultural setting. The application of labour power or individual capability within an organisation fits with this description.

Activity theory has been used as a research framework for range of investigations that bear similarities to the context of this study, investigating the work practices within an organisational setting and the relationship between individuals and their organisation. Examples are the operation of medical services in Finland (Engeström, 1993), interaction of aircraft pilots and airports ramp staff (Hutchins and Klausen, 1998) interaction of navigators on board ship (Hutchins, 1993), use of technology by teachers of foreign languages (Zapata, 2002) break up and reformation of companies as a result of internal dissonance (Artemeva and Freedman, 2001), living with renal failure (Faber, de Castell and Bryson, 2003), use of knowledge by distributed project teams (Rollinson, 2002) and multidisciplinary team working by care professionals (Daniels and Warmington, 2007). Thus activity theory has been used to support a wide variety of settings where individuals act within an organisational setting.

Activity theory provides a framework to overcome the dualism between individuals and their social environment by locating and analysing work related actions in relation to collective actions (Ardichvill, 2003). Activity theory is said to transcend the dichotomies of micro and macro, mental and material, observation and intervention in analysis and redesign of work, thus addressing the study of individuals at work within an organisational setting (Engeström, 2000).

These features enable the study of and contextualises the activity of the individual and concurrently the overall activity of the organisation and the influences of the elements of organisation that link the two levels. Therefore, activity theory provide a number of key perspectives that inform the research and the analysis of its empirical findings. How it has been used is described in the following sections.

How activity theory informs the research approach

Activity theory suggests that something is a tool when used for some useful purposeful action and that a tool may be used for different purposes depending on the intended outcome (Ardichvill, 2003). As shown above, activity theory as a research tool has been used to aid research with different desired outcomes. Engeström and others have illustrated use of activity theory in the context of research projects that have the intended outcome of resolving immediate problems and effecting changes in the real world (e.g Engeström in studying Finnish health services and Daniels in studying multi disciplinary teams). However activity theory has also been used as an explanatory framework in examining the actions and contexts of individuals and organisations, for example, (Keller and Dixon Keller, 1993; Miettinen, 1997; Artemeva and Freedman, 2001; Yamagata-Lynch, 2001; Zapata, 2002; Russell, 2009).

This research project is not based upon an organisation inviting the researcher to resolve a particular problem but the academic aim of researching the dimensions of organisational capability. The hospital management responsible for the research setting supported this endeavour. The intention is that the outcome of the research will be used as an explanatory insight for education and organisational development. Therefore an approach using intervention is not appropriate as a developmental approach that seeks to make changes to real life operations in an organisation do not fit with the objectives of the research project. However the findings of the research have been used already by the management of St George's in redesign of their organisational structure.

Linking of activity levels

An important feature of activity theory is the way in which interacting networks of activity system can be represented and analysed (Engeström, 1996; Engeström, 1999; Engeström, 2001). By examining the different levels of activity system from the individual to the organisation, connections between them may be identified and explained. One way of doing this is by examining the linking elements between the activity systems, for example the relationship between subjects at different activity levels (Engeström, 1999). There are two frameworks that conceptualise the inter-working of multiple activity systems. Tobach (1999) describes the concept of 'integrative levels'. This concept sees levels of organisation as an integration of structure and function. So levels are not independent but integrate together. Tobach (1999) gives the example of the human body where we can see integration between different levels from the atomic through succeeding layers of organisation (such as organs) to the body as a whole.

Engestrom's 3rd generation activity structure relates to multiple interconnecting activity systems (Engeström, 1996; Engeström, 2001). This is built conceptually by the development of the activity framework from the first generation base of subject/object/artefact (Leontiev, 1974). The addition of rules, community and division of labour represented a second generation (Engeström, 1993) then the realisation that organisations operated on networks of interacting activity systems led to the representation of a third generation of activity system (Engeström, 1996; Engeström, 2001).

Since the research objective and unit of analysis is related to the activity system of doctors within the hierarchically placed activity system of their department, Tobach's (1999) concept of integrative levels provides a conceptual framework that meets the research aim of investigating the hierarchical linking between individual and organisational capability. This is conceptualising an activity system at individual level within one or more activity systems at organisational levels. Additionally the concept of a network of interacting activity systems provides a perspective for understanding the broader multiple activity systems operational in the field of study. The contextual dimensions associated with Engestrom's 3rd generation model add further analytic perspectives and include multivoiceness, historicity, contradictions as a basis for change and developmental growth, expansive transformation through the zone of proximal development, the role of dialogue, multiple perspectives and boundary crossing (Engeström, 1996; Engeström, 2001). Tobach's (1999) concept of integrative levels relates to systems within systems in a hierarchical structure of levels thus represents a special case of multiple interconnecting activity systems. In Chapter 6 (MAU study) these frameworks are used to analyse the patient care activity system of the doctor in relation to the other interacting patient care related activity systems in the field of study.

Contradictions

Engeström (1993) discusses the concept of contradictions in activity. These are events that do not 'go to plan' or disruptions to the hoped for flow of events. They are described by 'lightning flash' connections in the activity theory diagram (Engeström, 1993). Engeström (1993) provides the example of the doctor and patient consultation that had differences in desired and thus actual outcome, the difference in desired outcome representing a contradiction. Since this research project is associated with the enactment of capability, contradictions are of interest as they may be representative of a lack of individual or organisational capability thus giving a further perspective on the links between individual and organisation capability.

The cultural and historical basis of activity systems

The cultural and historical dimension of CHAT recognises that any activity is founded in both historical and cultural settings (Hedegaard, Chaiklin and Jensen, 1999). 'A historically evolving collective activity system; seen in its network relations to other activity systems, is taken as the prime unit of analysis against which scripted strings of goal-directed actions and automatic operations are interpreted' (Engeström, 2000, p 960). Any artefact and the relationships between the elements of the framework are reflections of historical development and are culturally dependent (Davydov, 1999). It is recognised that current practice is based upon a historical and cultural development, therefore, understanding of the empirical findings is sought through using a historical and a cultural lens.

Operationalising activity theory in relation to this study

Engeström (1999) describes activity theory as a general conceptual system rather than being highly predictive. Activity is seen in two ways, both as an explanatory principle that relates the individual to their environment and at the same time as a concrete process as an object of study, subject to empirical observation (Fitchtner, 1999) and as such is used as a perspective on the individual and organisational relationship in this study setting.

The enactment of organisational capability was identified in the previous chapter to be through individual action and the interaction between individuals and other resources influenced by organisational processes and structures. Activity theory reflects these through the elements of rules, community, division of labour and mediating artefacts (Engeström, 1993; Engeström, 2000).

Artefacts, 'things that have been made' (Fowler and Fowler, 1966) are culturally embedded tools and signs and play a central role in activity theory analysis being seen as a mediator between the subject and object thus reflecting Marx's (1930) concept of instrument as being the conductor of activity between the individual and the subject matter of work. Organisational artefacts are representative of what makes the difference between an individual action and the action of individuals within an organisational setting. Culturally embedded artefacts are important in studying activity because they have an impact on people's response to events and achievement of productivity (Woods, 1998; Tulviste, 1999; Xiao, 2005; Clements-Croome, 2006a). Artefacts are described as representing three types, primary artefacts such as tools, secondary artefacts such as internal or externally represented models and tertiary such as 'alternative imaginative perceptual models that are representations of possibilities which go beyond present actualities' (Wartofsky 1979, p 208). In this research setting, the physical and cognitively held artefacts are posited to be the way in which the other resources and the administrative organisation supporting organisational capability are reified.

The second generation activity theory framework (Engeström, 1993) provides a basis of analysis using primarily the concepts of subject, object, mediating artefact and motive/outcome which related to the study of the individual or organisation carrying out tasks for a purpose and making use of resources in doing so. These elements of the activity framework are as below but will be related in following paragraphs in more detail to the research setting of doctors and their hospital.

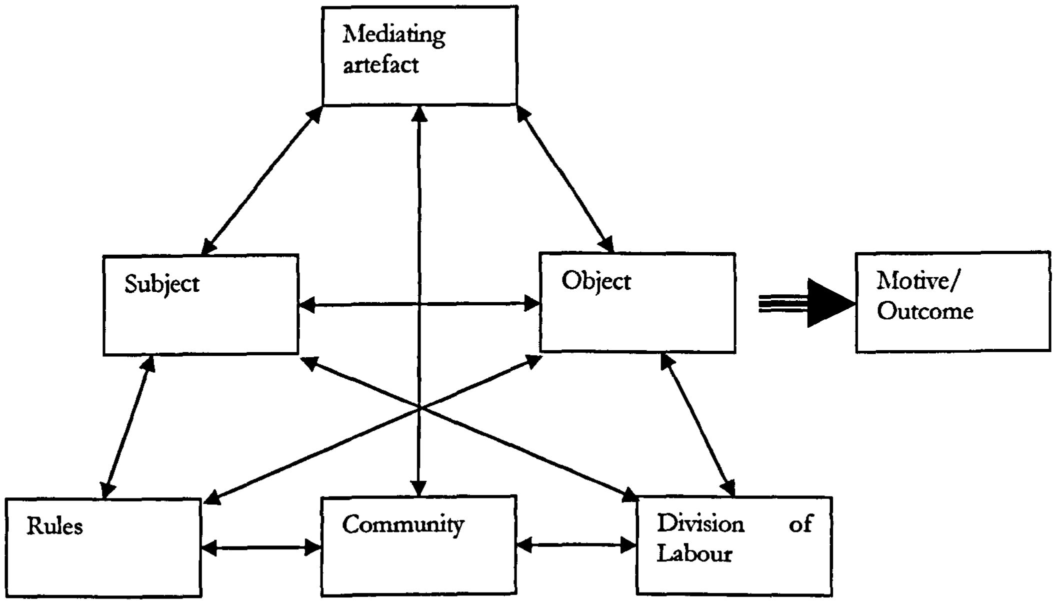


Figure 4 Activity theory framework based on Engeström (1993)

The activity theory framework has been applied conceptually at both individual and organisational levels and enable analysis of these levels and the linkages between the levels (Engeström, 1993; Tobach, 1999). This is within the framework of multiple inter-relating activity systems described by Engeström as 3rd generation conceptualisation (Engeström, 1996; Engeström, 2001).

The individual level subject and activity is the doctor carrying out the coordinated actions associated with attending to a particular patient situation with a desired outcome, for example a decision being taken for the next treatment of the patient. Taking an individual as subject, the object is that taking the attention of the subject with some particular desired outcome and motive therefore represents the work task. The artefacts used by the subject are those personal and organisational tools and signs that mediate between subject and object. These are the technical systems and written materials used by the subject such as computer systems and procedures manuals. The artefacts are also assumed to be the 'spaces' made available by the organisation by which interaction by the subject with other people may be carried out. The organisational processes followed by the subject are assumed to be represented by the rules element of activity theory, the human organisation by the community element and the division of labour the organisational structure.

At the organisational level, the activity system studied is of the hospital (HAN study) and unit (MAU study) and their role in caring for a population of actual or potential patients. The object that is the focus of attention of the subject with its outcome and organisational motive, for example its customers and the services the organisation is seeking to provide. The artefacts are those elements that are used by the subject in attending to the object – so may include human roles and technical systems. The rules are those guiding and constraining the subject organisation such as the legal environment. The community comprise those people inside and outside the organisation with a stake in the object and outcome. The division of labour is how this organisation is structured and also fits into its environment.

Then the linking between individual and organisational activity systems are identified and analysed for both HAN and MAU studies (Engeström, 1996; Tobach, 1999; Engeström, 2001). Conclusions are then drawn from the analysis and synthesis of the findings from the two studies in line with case study good practice (Yin, 2009).

Conclusion – research questions reframed from an activity theory perspective.

Activity theory provides a perspective for studying people at work in a way required to achieve the aims of this study. As activity is seen to be the way by which individuals and organisations enact their capability, this implies the necessity to understand the activity systems relating to the focus of the study. This means understanding the individual and organisational subjects and objects and the way in which organisational artefacts mediate between them. It is also necessary to understand how the other elements of the social setting in which the activity takes place influences the activity – rules, community and division of labour.

The AT structure provides a basis for restatement of the research questions based upon the questions posed in the previous chapter.

1. What are the characteristics of the organisational activity system under investigation? With the organisation as subject, what is the object and desired outcome? What are the artefacts, rules, community and division of labour influences?
2. What are the characteristics of the individual activity system under investigation? With the individual as subject, what is the object and desired outcome? What mediation through artefacts occurs? What are the rules, community and division of labour?
3. How do the individual and organisational activity systems relate? What is the role of artefacts, rules, community and division of labour in linking between individual and organisational subjects and objects in achieving desired outcomes.

Thus activity theory provides a perspective for the empirical research and a framework for interpretation of the observations of individuals working in an organisational setting and how interaction, technology, processes and structures influence individual and organisational achievement.

Use of Queue Theory for MAU study analysis

Queue theory relates to the operation of systems where people (or objects) wait in queues for attention by some kind of server – either human or inanimate and 'whether or not a physical queue is observed' (Littlechild, 1991, p 153). Queuing theory provides a set of tools for understanding the relationship between the entities waiting for service, the nature of the server and the wait encountered. In the analysis of the empirical data from the MAU study, queue theory has been used to investigate the patient care activity carried out by the doctor. This is because the MAU operation comprised an intensive queue system identified as highly dependent on the decision making by doctors. The use of queue theory identifies the relationship between the decision making of doctors and use of patient test facilities. Whilst it would be possible to analyse the HAN operation from a queue theory perspective, the lack of intensity of the operation, it terms of patient demand would not highlight the doctor/test facility relationship so clearly as with the MAU study.

In queue theory, there are a number of conceptual elements (Wilkes, 1989; Littlechild, 1991; Bose, 2005) The object or person to receive attention is called the 'customer' and customers have a pattern of arrival. The element providing the service is known as the server mechanism (Littlechild, 1991, p 155). The wait in any queue for any individual also depends on the way in which customers are served. Customer arrival pattern is important to the operation of a queuing system (Littlechild, 1991) therefore to analyse a queue system it is necessary to understand the pattern of arrivals of customers.

In the MAU, the entity awaiting service was the patient and the server was the doctor and other hospital facilities of which the patient may require attention. The observational data show that use of such facilities by MAU patients was quite intense, diagnosis being dependent often on a series of tests within a relatively short time period (compared to a hospital stay). In the case of the HAN study, the requirements of patients for service by a doctor was relatively sparse, especially during the early hours of the morning so queuing theory analysis would not be so useful. The performance of the MAU was very dependent on the way in which the patients achieved attention by doctors and other facilities. Queuing theory served to describe the patient care system and highlighted the importance of the doctors' individual decision making capabilities in patient care.

Mathematical Basis of Queuing Theory

Queuing theory has been interpreted in mathematical terms (Wilkes, 1989; Littlechild, 1991; Bose, 2005) that makes it possible to make calculations about the performance of queues. This is only generally possible for simple queue systems and complex systems are reckoned to need simulation in order to model their behaviour.

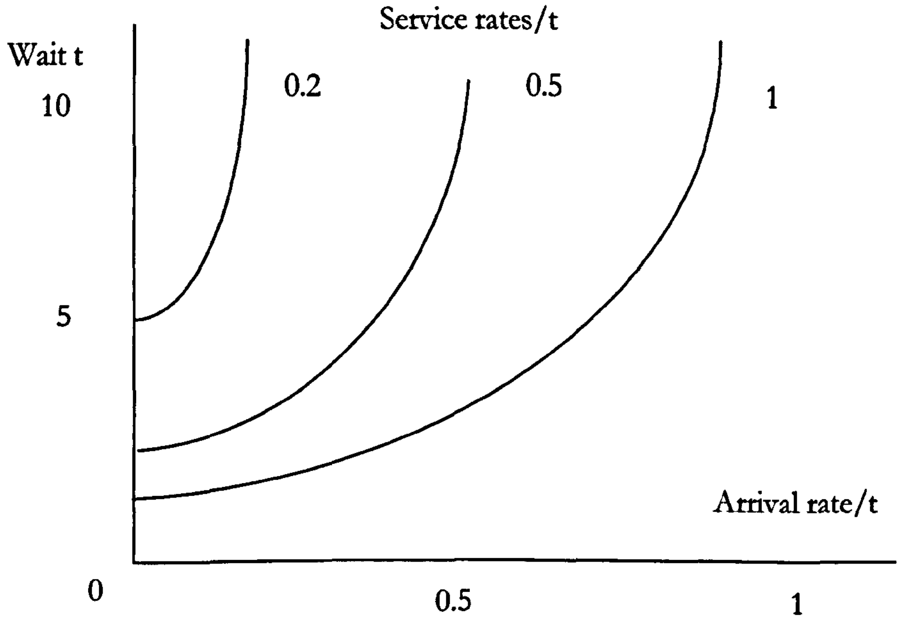


Figure 5 Relation between arrival rate and service rate and average wait in the system, sketch based upon Littlechild (1991)

The basis for calculating the queue behaviour is the traffic intensity which is the average arrival rate divided by the average service rate. This is represented as $\rho = \lambda / \mu$ where ρ is traffic intensity, λ is arrival rate and μ is service rate. Where λ is greater than μ in any one period, the queue increases in length whilst if μ is greater than λ then the queue decreases in length over time.

Thus queue length is directly related to average arrival and average service rates λ and μ. We have seen previously from the figure showing the relationship between arrival rate, service rate and average time in the system (figure 5) that the time in the system is very dependent on the closer that the traffic intensity λ / μ gets towards 1.

The relevance of queuing theory is that it can be used to describe the operation of systems where throughput is important (Littlechild, 1991) as is the case with doctors treating patients in the St George's MAU. Queue theory provides a specific perspective on the emergent relationship (Penrose, 1959) between the St George's doctors and the resources they use in providing patient care. Queuing theory analysis is complementary to that achieved using activity theory and fits with Yin's (2009) recommendation for the use of mixed methods in Case Study research.

3.4 Research design

This section will describe the way in which the case study strategy was translated into the approaches for collection of primary and secondary data on both cases and context. Yin (2009) emphasises the importance of the context as well as the unit of analysis in case study research. The data collection process is summarised in the following data needs table and described in further detail below. The questions are developed from those posed in the previous section, taking an activity theory perspective.

Research Question	Data needs
1. What are the characteristics of the organisational activity system under investigation? With the organisation as subject, what is the object and desired outcome? What are the artefacts, rules, community and division of labour influences?	Identification of the aims, objectives, desired outcomes and organisation in patient related terms of the unit or hospital, as applicable to the context of the study of doctor activity related to question 2 below.
2. What are the characteristics of the individual activity system under investigation? With the individual as subject, what is the object and desired outcome? What mediation through artefacts occurs? What are the rules, community and division of labour?	Identification of the characteristics of the doctor as subject. Description of what a doctor does during patient care, the interactions they have with others and the artefacts they use or are influenced by.
3. How do the individual and organisational activity systems relate? What is the role of artefacts, rules, community and division of labour in linking between	How the interaction of doctor with others and with artefacts during patient care activity relates to the organisational activity of patient care and the

individual and organisational subjects and objects in achieving desired outcomes.	organisational aims, objectives and desired outcomes.

Table 1 Research data needs

For the situation to be understood, it was necessary to describe the activities and objectives at both individual and organisational levels. For the organisational level, secondary and primary sources were used in order to understand what the organisation was seeking to achieve. At the individual level, secondary sources were used to understand the generic capabilities aimed for in UK NHS hospital doctors and local hospital sources to understand the desired outcomes. For the research question regarding the nature of doctor activity, empirical observation was carried out identifying the actions of the hospital doctors in carrying out patient care and how they used the available hospital artefacts. To build an understanding of the patient care activity, data on the treatment of real patients was collected, thus grounding the study in a live situation. The HAN study gave an opportunity to look broadly across general doctor activity in order to build an understanding of practice and the use of artefacts. The study was carried out of overnight doctor activity which was focused on essential doctor interventions since patients would normally be getting ready for sleep or sleeping during the study period. After completion of the HAN study, the MAU was selected as an appropriate department for a more detailed observational study of doctors carrying out the specific patient care actions associated with the decision whether patients should be discharged or admitted to a main ward. This was in order to identify in more detail and with a richer context how the doctor made use of artefacts in patient care.

Use of secondary sources

With the emphasis on the importance of context, mixed modes of data collection are deemed appropriate to case study research (Yin, 2009). Therefore, secondary sources were used to provide information about the general characteristics of doctors as subject and an understanding of how the patient care by doctors related to the aims of the hospital or unit. Materials on hospital and unit capability and context were examined in order to identify the factors associated with the objectives and operations of the whole hospital and of the MAU. Reference was made to St George's strategic materials and the generic NHS resources guiding hospital operations. Job descriptions for the MAU Consultant role provided a useful picture of St George's expectations of both the Consultant and the MAU itself. (St George's Healthcare NHS Trust, 2006b; St George's Healthcare NHS Trust, 2007; St George's Healthcare NHS Trust, no date) (Appendix H) These sources were interpreted on the assumption that the objectives set reflected what the hospital was expected to achieve, that is, its expected competence (Prior, 2004). Furthermore, it was assumed that staff and systems within the hospital would generally seek to achieve or support the objectives, again being sensitive to where this may not to be the case.

Materials on doctor characteristics were studied in order to identify the background and expected capabilities of doctors. These included medical school descriptive materials and other medical literature such as guidance to student doctors on the diagnosis process and use of investigations.

Records of MAU patient throughput were used to build a fuller picture of the operations of the MAU against which the detailed view of doctor activity could be set. These materials are described further in the next section on data collection and examples may be found in the Appendices.

Denscombe suggests that the validity of documentary sources should be assessed with regard to their meaning, authenticity, credibility and whether representative (Denscombe, 2007). In each case, because of the context in which these documents were published as live hospital artefacts, used day to day by hospital staff, they have been taken to be valid for the purpose described but with appropriate reservations regarding accuracy and use (Garfinkel, 1986).

Use of primary sources

In order to answer the research question relating to actual doctor activity, it was necessary to identify what doctors did and the way they used artefacts during their patient care activity. Observation of doctor behaviour was identified as a way in which this could be carried out. The study was of the events that happened when a doctor was presented with a patient with some specific problem that the doctor needed to deal with in the short term. In the HAN study, this was carried out by third year medical students using a pre-prepared questionnaire (described below) and in the MAU study by direct observation by the researcher. People's motivation for taking action are invisible, individual and complex, relating both to the characteristics of the individual and contingent on the specific situation. Therefore, based on previous research practice, e.g. (Orr, 1990; Narduzzo, Rocco and Warglein, 2000; Argote and Darr, 2000) and fitting with the research aims, the approach followed in this research study is to focus on behaviours or actions as the appropriate unit of analysis. Individuals in taking action are by definition assumed to have been motivated to do so.

The MAU study also included discussions between the researcher and doctors and other staff in order to achieve a richer picture of the situation and meanings of observed activities. Observation and discussion are described as being appropriate methods for research into cognitive processes such as diagnosis (Banister, Burman, Parker, Taylor and Tindall, 1994; Potter, 1996; Gilhooly and Green, 1996; Symon and Cassell, 1998). For this element of the study, the researcher sought to be very sensitive to the situation in which the doctors were working so negotiated the appropriate times and situations in which to carry out the discussions.

Role of the researcher

In the study, the role of the researcher was as observer and interpreter with the specific objective of causing minimal influence on events. For the HAN study, data collection was carried out by medical students whose role was to provide an accurate recording of events. In the MAU study, the researcher directly observed and recorded the research data and had discussions with the observed doctors. The researcher used an audio recorder for a short period but realised from the doctors' reactions on spotting the device that this caused the doctors concern. As a result, the researcher ceased use of the device as the intention was to observe the doctors in their normal practice. After the empirical observations, the role of the researcher was to analyse the event data and observations then interpret them as shown in the findings and analysis chapters.

3.5 Field procedures for data collection

The study commenced in July 2004 with a set of observations of doctors on duty overnight during a two week period (HAN study). The data collected were analysed and were then used as a sensitiser (Flick, 1998) to inform the next part of the research - the MAU study carried out in May 2005 and early 2006. The details of how the two studies were carried out are given below.

St George's Hospital at Night (HAN) Study

The HAN study comprised essentially a snap-shot of two nights of doctors' patient care related activity and the resources they used across the main wards of the hospital. This provided a means by which to collect data on the activity of 38 doctors and their use of artefacts. A total of 1165 actions were recorded for the two nights of which 265 included use of at least one artefact. This provided an appropriate data set to meet the needs of this part of the research project.

The actions recorded were those taken by the doctors when called to a specific patient having a problem that the duty doctor had the responsibility for resolving. Observers were tasked and trained by the researcher with shadowing a specific doctor and recording the doctor's patient related activity and their use of artefacts (See Appendix E). The observations covered all the doctor grade/specialty combinations scheduled on duty during the overnight period. The recording sheet was based on a format obtained from the NHS Modernisation Agency (Appendix B) and used in the national Hospital at Night pilot study. The standard sheet covered most of the data needed but the sheet used for the HAN study had two items added by the researcher to support this project – a code change to identify peer to peer discussions and an additional field for recording use of artefacts (See Appendix C). An example of a completed form is given in Appendix F.

The investigation had the following characteristics:

• During the hours of 9.00pm and 8.00am, each doctor scheduled for observation was shadowed and details of each patient related action undertaken by each doctor during each call was recorded on the pre-printed data sheets.

• The rota of observations was that each specialty/grade combination that carried out overnight duty was observed for two full nights (except in three cases where only one full night was observed for St George's logistical reasons). The actual doctor filling the duty was effectively randomly selected by the hospital based on the duty rota operating at the time. This is to say that no specific person was selected for observation.

The medical specialties, doctor grades and the details of observation periods that provided the data needed for the study was as below.

	Specialty	**Grade of doctor**	**Observation Date in July 2004 + (calls recorded)**
1	General Medicine	SpR	20th (32), 29th (11)
2	General Medicine	SHO	19th (44), 28 th (50)
3	General Medicine	PRHO	22 nd (70), 27 th (46)
4	Haematology/Oncology/Infectious Diseases	SHO	21st (45), 29 th (11)
5	Renal	SHO	20 th (13)
6	Paediatric	SHO	20 th (13), 29 th (55)
7	Paediatric	SpR	22 nd (34), 26 th (53)
8	General Surgery	SHO	26 th (18)
9	General Surgery	PRHO	20 th (49), 28 th (39)
10	ENT	SHO	19 th (13), 27 th (19)
11	Trauma and Orthopaedics	SHO	21st (45), 29 th (21)
12	Anaesthetics PICU	SpR	19 th (11), 29 th (32)
13	Anaesthetics St James wing	SpR Junior SpR Senior	19 th (11), 26 th (15), 21st (7), 28 th (3)
14	Oral	SHO	26 th (51) 27 th (8)
15	Cardiac Anaesthetics	SpR	26 th (38), 22 nd (76)
16	Neuro Anaesthetics	SpR	19 th (4), 27 th (36)
17	Neurosurgery	SHO	20 th (24), 28 th (15)
18	Cardiology/Cardiac Surgery	SHO	22nd (77), 27 th (64)
19	Neurology	SHO	22 nd (9)

Table 2 HAN doctor observation schedule

Where appropriate, for understandability the data charts shown in the findings chapter show a single night activity, based upon the average of the activities recorded over the two nights with the addition of the data from the single night observations. (These were of Renal, Neurological and General Surgery SHO which together represent around 6% of the total number of observations and in the context of this study is considered by the researcher not to represent a significant impact on validity). In order to identify the doctor actions, their use of artefacts and background context, the data collected from observations for the study comprised the following items (See Appendix C).

Doctor details (specialty and grade)
Time of call and time of intervention
Who called the doctor e.g. nurse, own team.
Who else attended the call, e.g. nurse, consultant
Skill needed e.g. less than or more than the doctor concerned
Where the doctor was needed e.g. ward, A&E, by telephone
Details of the actions carried out (see below)
Artefacts used during the call

Table 3 HAN study data collection items

These data provided a basis for understanding the nature and context of the doctor activity and the artefacts they used and are described in the findings and analysis chapters in this thesis.

Note regarding recording of artefacts

The students who were tasked with recording the doctor activity were instructed to make a note of physical resources used (Appendix E and F), however, it is important to gauge the way in which this was carried out as this influences the accuracy of the data collected and acts as a limitation on the research.

The study took place in St George's hospital, mainly located in wards where patients were being accommodated. Therefore, for each activity, there was by definition a set of physical hospital resources being used, for example the building, the ward, the bed, bedside table, trolleys etc. This is what is described by Clements-Croome (2005) as the work environment. It would not be expected (and did not happen) that these would be recorded as it is assumed the student observer will have taken these facilities for granted.

The means of collecting the data cannot be depended upon to be completely accurate because of the nature of the recording activity and the constraints of collecting the data as part of the wider study. Although briefed by the researcher, it is possible that the observers failed to note use of certain artefacts either because they took them for granted or missed attention to their use because of concentration of other elements of the observation – such as understanding the nature of the observed doctor's activity. However, it is assumed that the observers have not invented use of artefacts because of their training, the nature of their assignment and their responsible position. Therefore the records of the artefacts used by doctors are assumed to represent either their use of a sub set of their use and sheds light on the students' perception of what was used by the doctors during their interaction with patients but should not be interpreted statistically (See Appendix G List of Recorded Artefacts).

The St George's MAU Activity Study

Having completed the HAN study, the data derived from the study were coded (See Appendix D) and analysed by the researcher and provided a picture of multiple doctor patient interactions and the artefacts that were used in them. Then the MAU study was carried out to supplement the HAN data to provide 'thick descriptions' (Geertz, 1993) of doctor activity needed to provide better understanding of doctor activity and its context. The function of the MAU was the assessment of patients who presented themselves at Accident and Emergency or were referred by their primary health doctor and who appeared to have a health problem relating to a medical condition. This provided a discrete organisational aim in the form of the decision on whether the patient should be admitted to a main ward or discharged to provide the broad context for the doctor patient care activity (see Appendix H).

The first step of the MAU study was preliminary observation of the Unit in May 2005. This helped to clarify the form of the research to be carried out and enabled it to be described appropriately for submission to the Wandsworth Research Ethics Committee. The Ethics Committee approved the project with no additional constraints in October 2005 and the field work, comprising observations of the MAU by the researcher commenced in January 2006 and continued until March 2006.

The layout of the MAU at the time of the study was as the diagram below produced by the researcher (not to precise scale). The MAU comprised 7 beds, a table, chairs and storage.

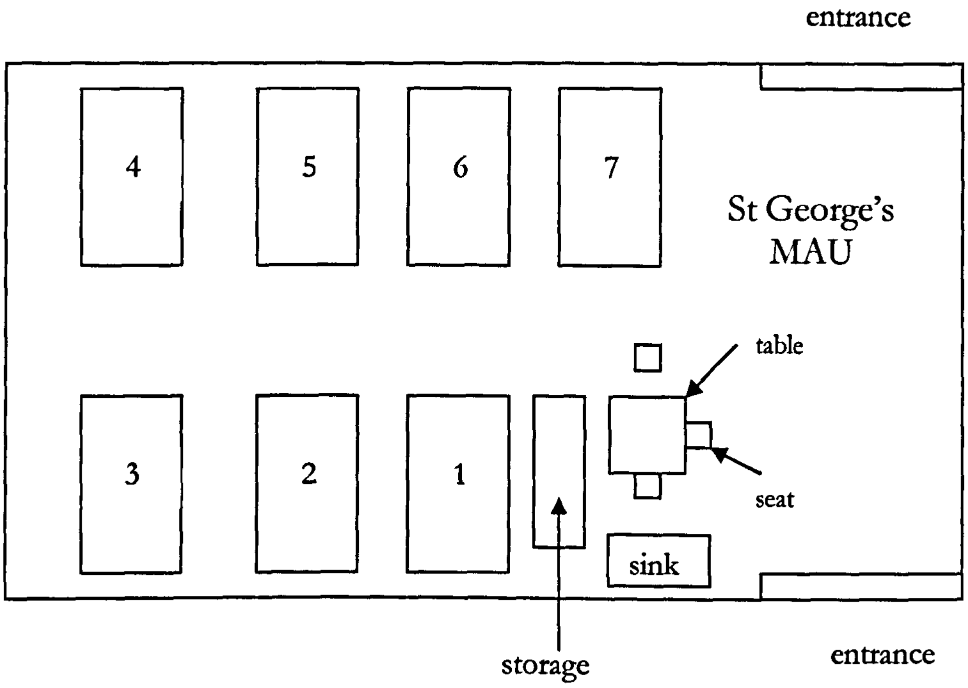


Figure 6 MAU layout with 7 beds and doctors' table and chairs

Doctors were observed personally by the researcher in order to understand in greater detail how the actions of doctors and their use of other organisational resources related to the decision on the patient. The study was of doctors' actions in carrying out the process of deciding whether each patient should be discharged or admitted to a main ward. From the initial observations in the MAU, it was observed the main process of diagnosis and treatment decision making occurred at the MAU table rather than at the bed side. Therefore the data collection method used was for the researcher to sit at the table used by the doctors and observe and record as a diary (Appendix Y), the patient related actions of doctors, nurses and other staff within the MAU and the doctors' use of artefacts. The table provided an excellent vantage point for observing the comings and goings, for example patients being brought into the MAU and being taken by porter for test procedures and the doctors' actions and interactions with other MAU staff. Thus the study took place in the doctors' natural work place setting.

A feature of the research protocol was that no direct patient observation was carried out. This was considered appropriate firstly for ethical reasons (the researcher is not a medical practitioner) and secondly that observation of the doctors at the table provided appropriate research data. Information for the study was also gained from the MAU patient record book, held on the central table and in which were recorded the key details of each patient's stay in the MAU (See Appendix M). The observations took place during 13 separate days and lasted between 1 and 9 hours duration each day, in total 63 hours, an average of just less than 5 hours per observation day (though this included taking refreshment and reflection breaks from time to time). Different days of the week were observed during the main study in order to provide variation thus minimising any particular effects of particular days of the week though statistically based generalisation was not part of the research aim (Yin, 2009) Observations were carried out as follows: Monday *2, Tuesday * 1, Wednesday * 5, Thursday * 2 and Friday * 2. Because of the method of scheduling doctors in the MAU, a number of different doctors were observed but also some doctors were observed more than once. By the nature of the doctor activity in the MAU whereby the doctors were event driven in a far more dynamic way than was recorded in the HAN study, the researcher wrote a diary which acted as a record of the stream of events and actions rather than a definitive record of one doctor/patient interaction as was the case in the HAN study. A transcription of this diary may be found in Appendix Y.

As a case study, the intention was that the observations would provide data by which the diagnosis and treatment decision making process could be understood (Yin, 2009). As the observations progressed and the researcher built a sense of the MAU operation, focus was applied to different parts of the MAU process and use of particular kinds of artefact thus reflecting a flexible approach (Yin, 2009). The observations were interrupted at times by outbreaks of a sickness virus affecting both staff and patients. This virus led the hospital to shut the MAU temporarily which meant that observations were not possible. However the way in which this issue was handled provided insights into the broader operation of the hospital.

A level of trust was established between researcher and MAU staff in order that the normal activities could be observed. Details of the research had been circulated by email to doctors by the Medical HR Manager. The researcher introduced himself and the research project to duty doctors and nurses on each day of attendance. The researcher sought to be very sensitive to the situation in which the doctors were working so negotiated the appropriate times and situations in which to carry out any discussions. This is described by Flick (1998) as a 'good faith membership' relationship, as differentiated for example with peripheral membership where no contact is made between researcher and subject (Flick, 1998; Baker, 2004). The objective was that no distorting influence would be applied to the activities of the doctors. This was helped by the apparent familiarity of all MAU staff to having unknown hospital staff in attendance in the MAU. The researcher's presence in the MAU in close attendance to doctors and nurses at the MAU table were not remarked upon and it was only on some occasions when the researcher used a voice recorder that any influence on events was perceived (some doctors seemed less happy being aurally recorded than by written notes). This reflected a comment made after the researcher presented the research proposal to the Research Ethics Committee that some doctors on the Committee were suspicious that the researcher was a spy on behalf on the hospital management. Sensitivity to this suspicion led to the researcher continuing to use written methods for data recording rather than the sound recorder. The effect of this is discussed further below.

As is appropriate for case studies (Yin, 2003), patient cases were a convenience sample based on the days selected by the researcher for observations. The Acting Matron observed that the patient throughput at the time of the study represented a normal patient profile. Observation days ranged randomly from the busy (e.g. 27 patient arrivals) through to the less busy (e.g. 8 patient arrivals). Observations took place mainly during the hours of 10.00am until around 6pm. This was generally to avoid interfering with Duty Consultant morning and evening visits which represented a specific and sensitive form of doctor activity. In order to observe this activity, a limited number of these visits were observed, normally after the researcher made himself known to the duty Consultant.

The main data collection methods used in the study were observation and recording of events and doctor actions. Dialogue between doctors where relevant was noted. (Doctors also 'chatted' with each other whilst on duty and these conversations were not generally noted). The nature of the environment and research subjects did not allow for full recording of dialogue so the researcher recorded some actual dialogue and also descriptions of the dialogues in progress. In the findings section elements of dialogue are used for illustration of the constructs being discussed. Additionally, the researcher discussed particular events of interest with doctors in order to gain clarification of the processes being used. Artefacts were catalogued and samples of documentation used by the doctors were collected.

For the observations, the researcher followed good practice (Robson, 2002; Yin, 2009) and used a note book in which the diary of the observation was kept in order to record a combination of details of cases and their context. Data recorded comprised the researcher's time of arrival, number of beds in use, patient movements, notes of doctor and other staff actions, notes of doctor conversations with other staff and with the researcher. The time of each event observed was noted for subsequent analysis. (See Appendix Y) In between noting the activities in the MAU, the researcher transcribed or made photocopies of the MAU patient record book and made copies or took discarded examples of other forms in use, for example the doctors' 'jobs to do' sheet and extracts from patient record sheets showing the note-taking by doctors (See Appendices). These were made anonymous in order to meet the ethical standards set out in the research protocol. These recordings and evidence have been maintained by the researcher in order to carry out further analysis and meaning building. In addition to the written and visual records described here, the audio records from the voice recorder used for a short time have been maintained and used for limited analysis and illustration purposes in this thesis, however the ambient sound levels in the MAU were such that full dialogue cannot be interpreted.

The observations and interviews were reviewed in line with a flexible approach (Yin, 2009) and were continued until theoretical saturation occurred – that is when no further significant insights were deemed by the researcher to be forthcoming (Seale, 1999; Yin, 2003; Peräkylä, 2004). The overall outcome of the study was a diary of events recording activities in the MAU and the way that doctors made use of the organisational artefacts during the process of diagnosis and treatment decision making (See Appendix X).

The MAU patient record book was used to identify details of patient throughput and thus provided a window on the context of doctor activity (See Appendix M for an example). This book was generally used by MAU staff as a primary recording mechanism within the MAU and as a source in order to transfer information into the hospital computer based record systems. However, recording in the book was observed to be an ancillary activity to the main activities of patient care. It is evident from the book (Appendix M), the data for January 2006 as transcribed by the researcher (Appendix W) and observations that although it is probable that all patients were logged in the book, some records are incomplete or appear to have levels of inaccuracy, for example in the recording of time of events. Therefore, the record book cannot be treated as being fully accurate but providing strong indications of events in the MAU, i.e. it is neither completely reliable nor unreliable for the purposes of this thesis. This is similar to the observations and conclusions drawn by Garfinkel in his study of patient records in a mental health environment (Garfinkel, 1986).

3.6 Data analysis - interpretation and achieving meaning

Data analysis was based primarily on the perspectives of activity theory (Engeström, 1993; Engeström, 1996; Tobach, 1999; Engeström, 2001) that provided a way in which the actions of doctors and their use of artefacts related to the patient care activity of the organisation for both HAN and MAU studies. During the preliminary part of the MAU study, carried out in June 2005 the researcher identified that queuing theory could add additional analytical power as an explanatory framework, in particular in relating the activity of doctors to their context of the MAU. Queuing theory (Littlechild, 1991) provided a particular analytical perspective for relating the actions of doctors and their use of artefacts to the context of the capability of the MAU in deciding on patient treatment. The overall process of analysis used was based upon building pictures of the ways that the doctors acted and in so doing, used different types of artefact as a resource (Seale, 1999; Yin, 2003). The process used in analysing the data was based upon analytic induction, that is analysing and conceptualising in an iterative process by coding, categorising, tabulating, recombining and model building using rigorous thinking and presentation of evidence (Flick, 1998; Yin, 2003). This was done differently for the HAN and MAU studies because of the nature of the data collected. More specific analysis methods were also used as described below.

Observation data analysis

The studies were of whether and how organisational resources were used by doctors when carrying out their patient care activities, also bearing in mind the need to search for disproof (Seale, 1999; Yin, 2003). The aim was to build something similar to the 'thick descriptions' suggested by Ryle and Geertz (Ryle, 1968; Geertz, 1993) that builds not only a description but also an interpretation of the actions and the relationship with the use of other resources of the hospital doctors being studied (Yin, 2003).

For the HAN study, the data recorded on data collection sheets were entered by the researcher on an Excel spreadsheet that detailed 1165 patient related actions. Because the data included a few single nights for certain doctor specialisms (Renal SHO, Surgical SHO, Nuorology SHO), these were repeated so that two nights for all specialism/grades was represented, resulting in 1230 actions. The data were then analysed by manipulation of the spreadsheet by categorisation and sorting then summarisation by means of the graphs and tables as shown in the findings and analysis chapter. The observations of artefacts used by the doctors was collated and listed then classified to hypothesise what purpose they served (See Appendix G). The data on doctor actions were analysed in order to build an understanding of the context of the study setting and the way in which the actions of doctors and their use of artefacts linked with the operation and objectives of the hospital. For the analysis, activity theory was used as a theoretical perspective in order to relate the observations to theory.

For the MAU study, the researcher built a growing understanding of the significance of events and how they related to the conceptual framework during the duration of the study. This was by sense-making in relation to the observation of events in the light of the growing diary of observations (Robson, 2002). Subsequently, the diary of events was analysed by the researcher and 161 specific distinguishable events were identified and classified. These were typed by the researcher into an Excel spreadsheet (See Appendix X). Each event was dated and given a sequence number within the day and a general reference number in order to be able to refer back to the original diary entry. The descriptions of events were formatted such that they could be sorted into the categories and referenced during analysis and the writing of the findings chapters of the thesis. Example descriptions of events are 'all beds full so no movement', 'dialogue doctor and pharmacist', 'material use of portable ECG'. In order to make the relationship between events and the theoretical framework transparent, a 'day in the life of' table was produced by the researcher that reflected for 11 hours of observations the events that occurred in the MAU and how they are interpreted to relate to the theoretical framework.

This is shown in Chapter 6. A transcription of the MAU diary may be found in Appendix Y. Observation data were analysed using the activity theory and queuing theory perspectives in order to relate them to the theoretical framework relating to individual and organisational capability.

Triangulation and synthesis

The diary of events, documentary evidence and the recordings were analysed in order to build an understanding of the operation of the MAU and the way in which the actions of doctors and their use of resources linked with the operation and objectives of the MAU and hospital. For the analysis, both activity theory and queuing theory were used. The activity theory analysis was carried out at individual and organisational levels, respectively using the doctor and the MAU as a whole as subjects. The principles of queuing theory (Littlechild, 1991) were used for modelling the patient flows and identifying the role of the doctor and other artefacts thus providing an understanding of their relationship with the MAU operational level. The results of these two forms of analysis were combined in drawing conclusions regarding the role of the doctor and their use of resources in relation to the aims of the MAU operation.

Document analysis

Samples were taken of documents used in the MAU which were then analysed with regard to their role in the light of the recorded observations of their use. (See Appendices L to V) A number of these documents were found to relate to artefacts recorded in the HAN study thus providing further insight to the results of the HAN study.

For the studies, the actual working documents were either retained or photocopied. The fact that the materials were produced for St George's own purposes was taken into account and is discussed within this thesis as appropriate (Saunders, Lewis and Thornhill, 2003). Documents are said to have two purposes (Prior, 2004). They are containers of information but are also representative of a broader intention thus act as agents in their own right. By analysing documents in the context of the way in which they were used, it was possible to conceptualise the world of the body that produced the document and draw conclusions about how the body expected the contents of the document to be used (Prior, 2004, p 80). Thus the documents used in the hospital provided a window on the resources, administrative organisation and intentions of the hospital.

Analysis of dialogue and discourse

Conversations between people were analysed using some useful principles of conversation analysis and discourse analysis. Principles of conversation analysis helped by the understanding that the meaning of the words used in MAU talk were grounded in the situation of the MAU and the role of the doctor within it and that the talk was constitutive of the social situation of the MAU (Bryman and Bell, 2003). This means that the content of the talk (and lack of talk) was not only meaningful in its own right but that the utterances and silences were representative of a wider social situation within the MAU. This was particularly important with reference to the investigation of interactions between individuals and roles. For the MAU study, discourse analysis lent meaning to the interpretation both of the conversations recorded and also the written materials examined. The principles of discourse analysis used in interpretation of the data were that discourse is not just a neutral way of imparting meaning but reflect the things people are seeking to achieve when they talk or write (Bryman and Bell, 2003). However, it is recognised that this interpretation is a constructionist process between the events and the researcher, therefore the evidence for such interpretation is made apparent in this thesis for transparency purposes.

3.7 Ethics of the research

Research writers state it is necessary and appropriate to consider the ethical considerations of any intended research (Sekaran, 2000; Bryman and Bell, 2003; Silverman, 2004). In this study, there were a number of specific ethical considerations that had to be addressed. In this section, the ethical considerations of the research approach will be described along with the way in which the research was given ethical approval by the Research Ethics Committee that oversees any patient related research in St George's.

Ethical considerations

Confidentiality- it was necessary to agree levels of confidentiality with the individuals personally involved in the research and with the management of the hospital departments involved. Failure to establish an agreement impacts the validity of the research by reducing the willingness of participants to take part (Flick, 1998). It was an aim of the research that no data would be used that would break the confidentiality agreement and approval for the research was gained on this basis.

Honesty of objectives –The subject of the research was generally to look at good practice so it was possible to be honest about the research. However the extent to which the detail of a research agenda is described potentially impacts on the way people carry out their activities and thus the validity of the research (Saunders, Lewis and Thornhill, 2003). Generally the research was not covert as all observation participants were informed. The HAN study was carried out under the umbrella of St George's own study of doctors' overnight activity in the situation of the publicised need to conform to the European Working Time Directive (Great Britain. Department of Health, no date) and the medical student observers were notified of the research interest of the researcher. The MAU study was carried out by the researcher sitting alongside the doctors who were subject to the observation and were briefed about the research.

Anonymity – individuals are anonymous in work to be published. It would be possible to make the hospital anonymous however the terms of publication were agreed with the hospital such that the hospital can be named.

Power relationships – The intended power relationship in both studies was that participant behaviour would not be affected by power difference. For the HAN study, the observations were carried out on behalf of and with the power of St George's management, however was in the context of conformance to the European Working Time Directive which would generally be seen as beneficial to both observed and observers (that future working hours may be shortened). In the MAU study, the aim of the researcher was for a peer to peer relationship with informants and no specific power was applied. As mentioned previously, the researcher acted with sensitivity in view of the possibility of being regarded as a management spy, in particular in ceasing use of an audio recorder.

The health research ethical committee

Any research in the health sector that may affect patients is subject to agreement by the appropriate local ethical committee, Wandsworth Research Ethics Committee in the case of St George's. A full description of the method of the research and potential impact on stakeholders was provided for agreement by this Committee. The outcome of the assessment process was that the research was approved in October 2005 as specified with no additional constraints applied.

3.8 Research protocol - role of the protocol as a standardising agenda

Yin (2003) suggests the development of a Research Protocol as a way in which the quality of case study based research may be defined and thereby assured. A Research Protocol document was developed in preparation for the research study that reflected Yin's suggestions in that it:

-laid out a protocol that supports the reliability and validity of the research through definition of a unified approach to data collection

-through the use of the protocol enables following researchers to audit and if appropriate repeat the research thus providing a basis for validation and possible extension of knowledge.

-provides a source of information about the study for the stakeholders in the research and provided a basis for approval by the Research Ethics Committee.

3.9 Conclusions relating to research methodology

In order to build an understanding of the relationship between doctors and their use of organisational artefacts in patient care, it was necessary to carry out empirical research. The way in which this research was carried out has been described in the preceding sections. The results of this research is described and analysed in the following chapters. There are said to be two ways in which findings and analysis can be laid out in a thesis (Dunleavy, 2003). The following section integrates the findings and analysis elements in order that the findings may be related to the research questions being answered. This starts off by a review of secondary sources describing the characteristics of doctors and the aims and objectives of the hospital Following this are the findings from the HAN study, followed by the findings of the MAU study that describe the activities of patient care thus contributing to identifying the linking between individual and organisational capability. In line with suggested good practice by Yin (2009), conclusions are drawn after each element of these then some broader conclusions in relation to the research questions are drawn that bring the findings of the different parts of the study together.

Chapter 4 Individual and Organisational capability in the Setting of an NHS Hospital

In this chapter, the findings of the literature and secondary source research relating to capabilities within a hospital medical setting will be presented and discussed in order to identify how the enacted capabilities of individuals are related to the intended competence of their medical organisation. This will set a foundation to the findings and analysis of the empirical research carried out in St George's Hospital. In Chapter 5 the findings of the HAN study will be described and discussed, which identifies the way that doctors carried out activities during the overnight period that contributed to the hospital's care of its patients. In Chapter 6 the findings of the MAU study will be described and discussed, which deepens the understanding of the relationship between doctors' care of individual patients and the hospital's care of its patient population. Chapter 7 will then discuss and draw conclusions from the two studies about the nature of the links between the individual and organisational capability. Chapter 8 will then discuss the implications of the research for academia and practice.

Dosi and his colleagues call for operationalisation of the organisational capability concept (Dosi, Nelson and Winter, 2000). It has been discussed that competence is a value judgement on achievement and capabilities are the elements deployed in a particular situation that may lead to competent action. It is proposed that in the context of this research study, looking at purposeful activity, a suitable proxy for competence would be found in the objectives being addressed by the activity. This is explored in the following sections for the organisational and individual levels based upon a range of secondary sources relating to the capability structures and expected competence of the hospital, medical assessment unit and doctor.

In reviewing the literature, it has been found that that most strategic management writing on organisational competence has been focused on large companies, often with regard to the search for competitive advantage (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Hamel and Heene, 1994; Campbell and Summers-Luchs, 1997; Heene and Sanchez, 1997; Dosi, Nelson and Winter, 2000; Bhamra, 2003). Since this research project has been carried out in a UK National Health Service hospital and its medical assessment unit, the question is raised how the concepts discussed previously in the literature review relate to this context and what relevant research has been carried out previously. Therefore, in this chapter, the relevance of the concepts and models described previously will be examined in the context of the doctor and the hospital.

4.1 Competence and capabilities of the hospital doctor

The purpose of this section is to relate the general discussions on capability and competence to the specific context of the hospital doctor as a foundation for understanding the behaviours observed in the empirical study. From the literature review, the capability of the individual is related to the organisational setting and aim therefore is apparently equally applicable to individuals in the public sector as the private.

There are numbers of sources which discuss the factors associated with doctor's capability, with regard to patient care and diagnosis in particular, which are of interest to this thesis. Gale and Marsden (1983) assert that a doctor's competence in diagnosis is based upon how they can use different forms of knowledge. Meyer (1992) describes that a key difference between novice and expert doctor is in the amount of knowledge available and the way that the knowledge is used thus reflecting and building on Gale and Marsden's description. For factual knowledge, the expert doctor is better at recognising abnormal conditions and distinguishing between normal and abnormal, for example diagnosing the problem apparent in a chest x-ray (Gale and Marsden, 1983).

Using semantic knowledge, the expert doctor is better able to tie together all the clues into a meaningful pattern that links symptoms to possible causes. An example of this is quoted by Polanyi (1969, p 123) who describes that a distinguished psychiatrist finishes the arguments of a class of students about a particular condition by stating 'you have seen a true epileptic seizure. I cannot tell you how to recognise it, you will learn this by more extensive experience'. Using schematic knowledge, the expert is better able to recognise a pattern of symptoms and to hypothesis the causes (and relate them to the patient history) of the symptoms. Polanyi discusses the alternating between seeing the particulars and the relationship between the particulars, describing how people notice the individual elements as focally and subsidiarily respectively. He suggests that the expert is better at carrying out this alternating and building a coherent picture from it and sees this as an inductive or gestalt operation (Polanyi, 1969). Using induction, Polanyi (1969) describes the alternating between seeking to identify firstly if there is a link between a set of particulars then the search for what the link is between them. Using strategic knowledge, the expert is more likely to identify multiple hypotheses about causes and systematically to eliminate them until the most likely cause is identified (Mayer, 1992).

Reflecting on the different views of knowledge, it is clear that knowledge in the situation of patient care may not be simply related to a specific and unquestionable truth, but may be socially constructed in the situation, the people and social situation in which it is used. It may be apparent and explicit or may be subjective and in the minds of the actors involved and thus not completely understandable in the same way by others. Therefore a limitation of the research is that a complete and 'true' understanding of the knowledge of an individual doctor is not possible and that other means of understanding the patient care process is required (Robson, 2002).

Diagnosis and treatment decision making as case of problem solving

The points that have been made above may be compared with the practical approaches that are recommended to medical students. In 'Core Paediatrics – a problem solving approach' (Ryan, Gregg and Patel, 2003) a number of insights into doctor capabilities are provided. Firstly like a number of books covering different medical areas, it is based around problem solving in specific situations, for example diagnosing the cause of tiredness in a teenager. The approach emphasises history taking, examination and investigations and learning 'about the children and their families' (Ryan, Gregg and Patel, 2003, p 1) that may be seen as obtaining essential diagnostic information, the acquisition of factual data. Students are also advised to build an understanding of the process of diagnosis which may be seen as strategic information. Patient situations are presented in the form of case histories with tests such as 'which of the following conditions are associated with asthma?' (Ryan, Gregg and Patel, 2003, p 2). These relate to the semantic knowledge described by Mayer (1992). Other factual knowledge is also described, for example the appearance of jaundice (Ryan, Gregg and Patel, 2003 p6). Test result provide a value that could be compared against the 'normal range' expected in humans and thus an abnormality identified (Orient, 2004; Fields, Isaacs and Stroobant, 2005; Exarchos et al. 2006). Broadly, the guidance given in medical books reflects the situated nature of learning seen in the doctor training programme pointing towards practice rather than theory (St George's Hospital Medical School, 2004). This suggests an emphasis on the understanding of (situated) cases rather than a database of facts and relates to the situated knowledge applied by the engineers described by Orr and Narduzzo and his colleagues (Orr, 1990; Narduzzo, Rocco and Warglein, 2000).

Elstein, Shulman and Sprafka (1978) describe diagnosis as a hypothetico-deductive process where data are collected through history taking for the purpose of generating hypotheses then additional data are obtained for the purpose of checking the old hypotheses and if necessary generating new ones. This theory was tested by the authors in laboratory conditions but not using real patients. In this test, medical knowledge in the form of the ability to generate hypotheses was found to be the most important element in correct diagnosis (Elstein, Shulman and Sprafka, 1978). This points towards the use of associative and semantic information (Meyer, 1968). Another view on knowledge use is the emphasis on the use of tacit knowledge by the expert in the distinction between expert and novice (Sternberg and Wagner, 1986). Kathryn Hunter in contrast emphasises the role of narrative as a knowledge medium

(Hunter, 1993). She sees the whole process of knowledge transfer and cognition as being one where narrative plays a central role, for example in the narrative of the patient in describing their situation and in the narrative of the doctors in telling and retelling the story to themselves and other doctors – for example during the Consultant round where doctors have to report the condition and diagnosis of the patient to the senior medic in their firm. This relates to Xerox engineers' use of war stories in sharing knowledge (Orr, 1990). In both the description of medical training and the theory about how doctors go about diagnosis and treatment decision making, there are multiple elements and models of the process of diagnosis but it is clear that a wide range of personal knowledge is potentially brought to bear.

The doctor handles a complex situation including both content – in the form of information and process in the form of further options - in order to arrive at a solution. Thus this process has similarities in use of techniques and knowledge to that relating to equipment repair described by both Orr and Narduzzo et al. (Orr, 1990; Narduzzo, Rocco and Warglein, 2000) a conclusion also drawn by Boyatzis in the context of the capabilities of doctors and computer engineers (Boyatzis, 1982).

4.2 Competence and capabilities of the hospital

The purpose of this section is to explore the nature of and research into the competence and capability of hospitals. The main focus of organisational capability research and theorising has been focussed on large commercial organisations in the search for competitive advantage e.g (Prahaled and Hamel, 1990). The first part of the discussion will look at the nature of organisational competence of an NHS hospital as a foundation for the later discussion on the particular situation of St George's hospital and its medical assessment unit.

It may be suggested that the competence of a hospital is judged on the effective treatment of the population attending or being referred to it within the budget allocated. (see (St George's Healthcare NHS Trust, 2006a) and Appendix A). Competence should reflect that patients are treated successfully at a level appropriate to existing science and medical practice, that is, patients achieve the best outcome. However the overall expected competence of an NHS hospital is not well defined. The NHS plan (Great Britain. Department of Health, 2000) focuses on changes to existing practice such as increase in standards and incentives and de-centralising power to Trusts and the patients. Expectations of competence are best reflected through targets and standards such as the four hour target for Accident and Emergency treatment (Great Britain. Department of Health, 2006).

A perspective on competence may be gained from examples of situations where in-competence has been seen such as the poor patient care exhibited by Northwick Park Hospital Maternity Unit (Great Britain. Healthcare Commission, 2006a). Issues were reported in 2006 where patients were found to have received inadequate care. The Healthcare Commission recognised that although problems had been identified and an action plan produced, the hospital did not actually learn and take action after the identification of the problems. Action was not taken until a second inspection was carried out. This means that the accumulated capabilities of the unit were either non existent or were not managed in such a way that the unit performed to the level expected. More recently, problems of lack of organisational competence were identified at Mid Staffordshire Health Authority that related to poor care of emergency admissions resulting in unnecessary mortality (Great Britain Healthcare Commission, 2009).

With regards to the Medical Assessment Unit, Wood and Rhodes (2003) describe that it should be a dedicated unit or ward. Patients should undergo rapid and rigorous assessment, and investigations in order to establish their need for admission or discharge from the hospital (Wood and Rhodes, 2003). This reflects advice provided by Alberti (2003) – See Appendix J and K. Thus the competence of the MAU is demonstrated by fast and accurate assessment of the patients presenting with suspected medical problems.

Searches in academic sources found only three specific references to the MAU. These were the study carried out into staffing requirements by Oddoye, the potential for avoidance of admission by Falk-Whynes and a report on discharge notes by Featherstone (Falk-Whynes, 2000; Featherstone, 2001; Oddoye, 2006), therefore it may be concluded that MAU operations while supported by some guidance is a little researched area of hospital activity. However the MAU equivalent in the form of the Emergency Admission Unit (EAU) was central to the problems experienced at Mid Staffordshire NHS Foundation Trust (Great Britain Healthcare Commission, 2009) so its effective operation is an important component in good patient care.

By examination, it is concluded that the models of organisational capability discussed earlier, although set out in the situation of commercially competitive companies may also be applied to the NHS hospital. The resource based view has been applied already to hospitals (Lai et al. 2007; Su, Lai and Huang, 2009). The conclusion from the discussion of the models was that organisational capability may be seen to be represented by the people and their interactions, technical systems, processes and structures. From the previous discussion, it is concluded there is nothing in this list that would not apply in principle to the operation of a hospital.

4.3 Conclusion regarding competence and capabilities relating to patient care

From the analysis of the medical sources, the models of individual and organisational capability discussed in Chapter 2 would seem generally to be applicable to the processes of patient care. The personal competence of the doctor is taken to be achieved through the appropriate application of skill and knowledge to the care for particular patients in the situation that has led to the doctor/patient interaction. Other resources are implied or described through references to test results and procedures. The doctors' capabilities are the various elements of skill and knowledge the doctors hold that enable them to carry out the job in hand. At the organisational level, the activity system of interest is that relating to the way that patients are cared for in the context of the activity of doctors, generally that of diagnosis and provision of appropriate treatment. The linking elements being studied are the social interactions between people, the technical systems, processes and structures that relate the individual capabilities of the doctors to addressing the patient related objectives of the hospital.

4.4 The intended organisational competence of St George's Hospital

This and the following section discuss the characteristics of the capabilities and competence of St George's and its MAU. They provide a foundation for understanding the relationship between individual doctor action and the organisation, reported in the following chapters.

At the broadest level, it may be suggested that a hospital will be seen as competent if it satisfies the healthcare requirements of its public to recognised standards and within the budget set for it. Competence relates to both patient care and financial performance (Great Britain. Healthcare Commission, no date; St George's Healthcare NHS Trust, 2006a), see also Appendix A – St George's Corporate Objectives 2006/7. However this thesis will focus on the clinical rather than the financial. The clinical strategy (St George's Healthcare NHS Trust, 2005b) provides details of its intention to be a major centre for clinical care, teaching and research. It aimed to do this through providing the services of a district general hospital services for people living in Wandsworth, Merton and the western parts of Lambeth – about 330,000 people, district general hospital (secondary care) and specialist (tertiary care) hospital services for the 1.3 million people who live in the six boroughs of south west London, specialist services for the 3.5 million people from Surrey and Sussex and further specialist services for people from across the South East of England and nation-wide. St George's also provided a range of general non-emergency medical, surgical and diagnostic services.

Therefore the clinical strategy describes St George's aim to provide care to patients both as a local general hospital and as a centre of excellence to people from a wider area, as well as providing training and research. Ways in which it aims to carry out patient care may be identified from its response to the Healthcare Commission 'Core Standards Assessment' (St George's Healthcare NHS Trust, 2006c). In this document the relevant assertions are that St George's take into account nationally agreed guidance in planning and delivering treatment and care, that care and treatment are carried out under supervision and leadership, that clinicians continuously update skills and techniques and carry out audits and reviews and that patients, staff and visitors are kept safe. Thus the Trust is asserting that it follows both external and organisational specific processes that should provide good patient treatment and care. Performance of the Trust against targets set for patient care may be gleaned from the Healthcare Commission data set for St George's. Examples are the proportion of patients who were treated in A&E within four hours (97.68%) and patients who had delayed transfer of care (2.1%) (Great Britain. Healthcare Commission, 2007). These targets are either time or service based and provide a view of the patient care objectives being applied to the trust.

Thus it may be concluded that St George's is seeking to meet the health care needs of its population whilst conforming to external guidance, standards and targets, both in terms of outcome and process. St George's states 'we provide all the usual care you'd expect from an NHS hospital' (St George's Healthcare NHS Trust, no date). However, the exact nature of this 'usual care', other than specific targeted areas and descriptions of process are apparently taken for granted. A common sense view of this patient care objective would be that patients have their health problems diagnosed and that appropriate treatment is given within the broader objective of keeping the patient safe and comfortable. This suggests the three important steps and capabilities of diagnosis, a decision on treatment and the provision of that treatment, whilst also providing general care of patients.

4.5 The intended competence of the St George's Medical Assessment Unit

The role of the MAU in St George's patient care was providing part of the process by which patients presenting at Accident & Emergency were assessed and either accepted onto a treatment ward or discharged. From discussions with MAU staff and observations, the elements of the chain and the potential patient flow associated with this were as shown in the diagram below:

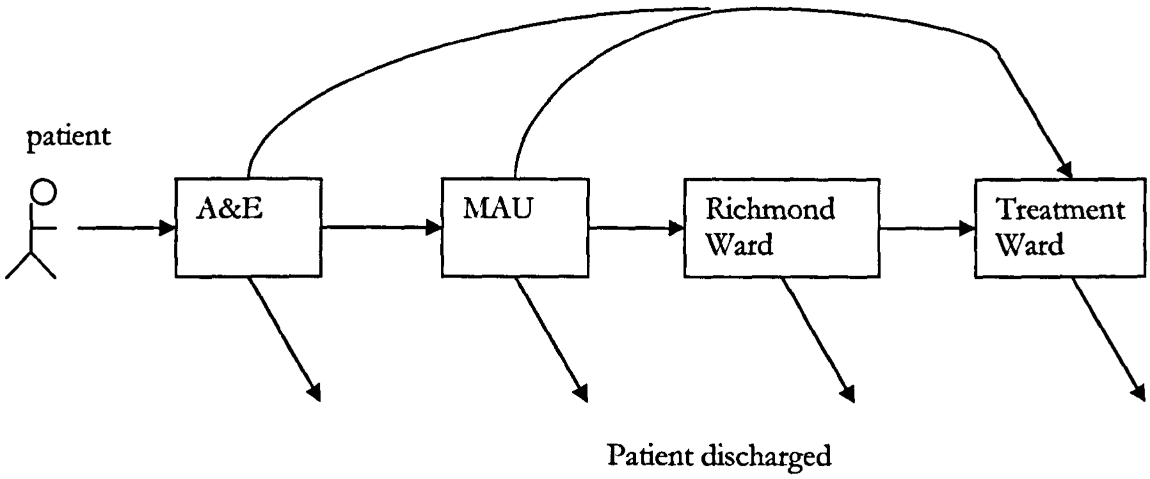


Figure 7 The MAU within the St George's acute pathway

Patients presented themselves at A&E and had an initial assessment. If they had a non critical medical problem that needed further investigation then they were allocated to the MAU. In the MAU they were assessed by a member or members of the MAU doctor rota. After this the patient might have been discharged or sent directly to a specialist treatment ward. However, if a diagnosis and decision could not be made in the MAU within 12 hours, the patient was moved on to the adjacent Richmond Ward where further medical assessment was carried out.

There are two key written sources that provide a view at the time of the study what the MAU was expected to achieve and thus its competent performance. The first is the description in published sources of what is expected of a generic MAU as discussed in the literature review. In short, these describe the need for rapid and accurate diagnosis of patients (Society for Acute Medicine, no date; Wood and Rhodes, 2003; Alberti, 2003). The second and more specific is the job description published by St George's for a Consultant to manage the MAU. See Appendix H. The objectives of the Consultant directly relating to the diagnosis role of the MAU were stated as:

- Ensure appropriate specialty triage for each patient
- Ensure investigations are ordered in a timely fashion and work with professional and scientific directorate to provide a quick turnaround of these investigations
- Determine whether discharge home is appropriate
- Discharge patients

- Provide senior clinical opinion on General Practitioner referrals
- Identify seriously ill patients who need immediate intervention
- Manage emergencies in an effective and timely way
- Continuing responsibility for the care of patients in his/her charge
- Provide assistance to the admitting medical team with unusually difficult emergency procedures

Thus these objectives show the hospital management's view of patient care in terms of diagnosis, investigations and treatment, as well as how emergencies should be handled.

Objectives that relate to the effective running of the MAU but that have an indirect relationship to the diagnosis role include:

- Responsibility for the proper functioning of his/her department
- Undertake the administrative duties associated with the care of his/her patients and the running of his/her clinical department
- Be responsible for effective use of beds and ensuring that patients move through the unit effectively
- Directing junior staff of the in-taking team
- Support for junior staff
- Contribute to protocols on the wards
- Ensure all standards agreed with regard to emergency admissions are met by the medical teams working with the Service Delivery Unit leader for General Medicine
- Maintain databases and performance records of admissions and assessment provision and act as resource for the network for this information

These relate to the organisation and operation of the MAU as a unit suggesting that the proper functioning in the ways described will support the effectiveness of the unit.

Other objectives that relate more to the role of the MAU within the hospital as a whole include:

- Ensure date of discharge is predicted on admission
- Ensure junior medical staff provide a brief discharge summary for discharged patients
- Increase the number of patients discharged directly from Richmond Ward and the MAU
- Reduce the overall length of stay in the MAU and Richmond Ward

Thus the objectives of the Consultant relate to the diagnosis role of the MAU and the administration of the MAU as an operational function within the hospital. The operation of the MAU is positioned in the situation of the overall acute service in that the MAU 'improves the management of emergency admissions' and has a 'clinical interface with Accident and Emergency' (St George's Healthcare NHS Trust 2004, p 1). Therefore the MAU and Richmond Ward are seen as part of the emergency admissions process and linked with (but separate from) A&E.

From the foregoing, it may be concluded that the intended competence of the MAU in patient related terms is that patients should receive accurate diagnosis and have recommended an appropriate forward path whilst keeping them safe. This relates directly to that described in the literature and quoted earlier (Society for Acute Medicine, no date; Wood and Rhodes, 2003; Alberti, 2003). Additionally, the hospital wishes MAU patients to be cared for and not admitted to further assessment wards or main wards unless necessary.

4.6 Individual capability as it applies in the hospital setting

This section relates to the nature of the archetypal hospital doctor and provides a foundation for interpreting the observed actions of the doctors in St George's reported in the following chapters. It is based upon the examination of documentation as cited and discussions with the Medical HR Manager.

The doctors in St George's reflected the standard medical hierarchical career structure of UK NHS hospitals applying at the time of the study e.g. in ascending order of seniority, Pre-Registration House Officer (PRHO), Senior House Officer (SHO), Special Registrar (SpR) and Consultant. (Note the junior doctor roles are being changed as a result of the 'Modernising Medical Careers' initiative (NHS Modernising Medical Careers team, no date). In the HAN study the doctors were specialists in particular areas of medical knowledge – medical, surgical, paediatric etc. The doctors on duty in the Medical Assessment Unit were from the General Medicine specialty. Each medical specialty comprised a number of 'firms', each firm being headed by a Consultant and a combination of different levels of more junior doctor. Within the hospital, each patient was allocated to an appropriate Consultant depending on the perceived main illness category of the patient and was thus the responsibility of the doctors within that Consultant's firm. Correspondingly, each doctor was a member of a 'firm' of a Consultant. The relevance of this structure to the thesis is that as a patient, one may be seen by any doctor from a firm or a specialty (depending on situation) and no specific doctor/patient relationship is defined, other than that a patient is the responsibility of a particular consultant. This has implications for the way that the hospital provides patient care that are explored in the following chapters.

The structural definition of doctor capability.

Doctors within the NHS at the time of the study generally followed a defined and structured course of development and competency assessment. This was based upon two main stages. Firstly, intended doctors followed a regulated medical studentship and had examinations and assessment in stages through the process to assess readiness for continuing and finally graduation. Secondly, when doctors were working, they followed a programme of continuing professional development and examination in order to progress through the levels (St George's Hospital Medical School, 2004).

The Student Handbook for the St George's Medical School doctor training programme (St George's Hospital Medical School, 2004) provides an insight into the foundation competence that a doctor completing the programme is assumed to possess. Students are told to have read the whole handbook by the end of their first term so this is taken as an indication that the handbook is meant to be an accurate statement of the objectives of the programme (St George's Hospital Medical School, 2004).

The stated aim of the curriculum is broadly defined, relating the cognitive and physical elements of capability as discussed in the literature review with competence in terms of practice, stating:

'to produce graduates with the essential foundation of knowledge, understanding, skills and attitudes required for the practice of medicine' (St George's Hospital Medical School, 2004, p 9)

This suggests that a graduate is competent to actually practice medicine after graduation, that is, there is no further study needed before starting to practice medicine.

The St George's student handbook describes the various capabilities that the programme seeks to attain in their students. These comprise appropriate knowledge of the working of the body and of disease, to be proficient in basic clinical skills, have appropriate behaviours and communication skills, to have demonstrated intellectual curiosity and capacity for critical understanding and the potential for further development. This is supplemented by the 'readiness to perform pre-registration house officer jobs competently' (St George's Hospital Medical School, 2004, p 9) which is another indication of the competence expected, that is they are the first level of practicing doctor. Detailed curriculum objectives define the areas of knowledge and practical skills that match the broader capability descriptions described above. For example, in the knowledge category, 'concepts of normality and abnormality, and what constitutes illness, disease and disability' (St George's Hospital Medical School, 2004, p10) and in the skills category 'reach a provisional assessment of the patient's problems and with the patient, formulate plans for investigation and management'. Thus student doctors learn the connection between symptoms and causes, learnt first by rote then through clinical practice (Polanyi, 1969). These are relevant to the competent practice of diagnosis and treatment decision making to be discussed in the chapters relating to the HAN and MAU studies.

The handbook describes the assessment of students which occurs in each term with a final assessment in the final year. This assessment is used as a basis for determining whether the student is to progress and graduate. The assessment takes a number of forms that test both the students' knowledge and skills using realistic scenarios. Thus it tests the situated rather than theoretical use of knowledge (Suchman, 1987). In summary the most junior level of practicing doctor is assumed (by testing) to posses the knowledge and set of skills (i.e. capabilities) that will enable them to take on and competently practice the role of Pre-registered House Officer. This comprises the basic knowledge and skills required to diagnose and treat patients within a structured environment and with an understanding of the human situation in which the patient resides.

The medical education system contributes not only factual medical knowledge, but also process based knowledge in two areas of particular interest to this thesis. The training identifies a method of diagnosis through hypothesis building as discussed in the literature review e.g. (Orient, 2004) and at a broader level, the training aids doctors' understanding of how organisational processes operate through the practical work carried out by student doctors on the ward. Further levels of doctor qualification are based on the build up of experience with assessment of suitability to attain a higher level. Thus the more senior levels of doctor bring more experience and knowledge to their activities giving them the capabilities to handle a wider range of circumstances. In summary, the educational and in-work development of doctors aims to give them a range of knowledge and skills enabling them to practice competently in their specialty at their level of seniority within a structured environment. Thus the training and development of the doctors provides knowledge and skills but also the situational opportunities and practise that enables learning by doing (Teece and Pisano, 1994).

4.7 Conclusion relating to competence and capability in St George's.

From the foregoing, St George's is seeking in medical terms to meet the health care needs of its population whilst conforming to external guidance, standards and targets, both in terms of outcome and process. Competence comprises carrying out patient care in the expected way as defined by the quality measures in terms of both patient treatment and speed, also the safety of staff, patients and visitors. The exact nature of patient care, other than specific targeted areas and descriptions of process are apparently taken for granted. Within St George's, the intended competence of the MAU in patient related terms are that patients should receive accurate diagnosis and have recommended an appropriate forward path whilst keeping them safe. For the doctor, the educational and in-work development aimed to give them a range of knowledge and skills enabling them to practice competently in their specialty at their level of seniority as being able to carry out the diagnostic and other patient care activities as appropriate to their grade. This included not only medical knowledge but also an understanding of how this knowledge is applied both in the situation of the patient problem and the hospital processes.

This understanding of the intended competence at the organisational levels and the characteristics of the doctor form a foundation for understanding how the actions of doctors relates to the intended competence of the hospital. This is identified through the findings of the primary research in St George's described in the following chapters. The next Chapter 5 describes the snap-shot of doctor activity and the resources they use across the whole hospital during the overnight period and the following Chapter 6 describes the activity carried out and resources used by the doctors in the Medical Assessment Unit.

Chapter 5 Findings and Analysis - the Hospital at Night (HAN) study

The purpose of the HAN study was to use observations of the overnight patient care by doctors to understand what the doctors did, what organisational artefacts they used and the relationship of the activity to the intended patient care competence of the hospital. As a case study the data collected provides a multi-perspective view of doctor/patient interactions and their context, the separation of case and context being sometimes indistinct (Yin, 2009). The findings of the study will be described and analysed within the chapter rather than having separate findings and analysis chapters (Robson, 2002). Activity theory is used as a framework for relating observations to the theoretical concepts (Engeström, 1993; Engeström, 1996). The study contributes to the research aims by addressing the following research questions in succeeding sections within the chapter.

1. What are the characteristics of the organisational activity system?

The activity system in this case is St George's overnight care of its patients.

2. What are the characteristics of the individual patient care activity system?

The individual activity system in this case is related to the actions taken by specific doctors with particular patients as a result of a call.

1. How do the individual and organisational activity systems relate?

What is the role of artefacts, rules, community and division of labour in linking between subjects and objects in achieving desired outcomes in and between the individual and organisational activity systems.

The study comprised the observation of the doctors in the main wards of the hospital between 9pm and 8am over a two week period in July 2004 and was scheduled to represent two nights of activity for each of 14 medical specialties and mix of the three grades PRHO, SHO and SpR. This resulted in records of 660 doctor/patient calls and included 1230 separate actions. Appendix F provides a sample of a completed observation form. In order to represent the activities during one night of doctor activity, the charts that follow show the mean of the two nights of observations. It is evidenced or implied that others such as nurses played a role in patient care but were not within the scope of the study unless they were directly related to the actions of an observed doctor.

5.1 What are the characteristics of the organisational activity system?

This first analysis is of the characteristics of the organisational activity system so that the role of the individual within it may be identified. This relates to the patient care provided by the hospital in relation to the patient care by doctors. In this case, the subject is taken to be the hospital and object the population of resident patients and their care between the hours of 9pm and 8 am. As no scheduled patient interventions were carried out overnight, the intended outcome was assumed to be (Medical HR Manager) keeping the patients well by resolving any patient problems that had arisen. This was within the broad objective of 'providing the care expected of an NHS hospital' (St George's Healthcare NHS Trust, no date). The activity system comprised the different elements organised to resolve any patient medical problems that arose. These are viewed through the actions of the different specialties of doctor scheduled for overnight duty as listed below.

Description	Specialty	Description	Specialty
N SURG	Neuro Surgery	**NEURO**	Neurology
ANAES	Anaesthetist	**TRAUMA**	Trauma
RENAL	Renal	**ORAL**	Oral
ENT	Ear, nose and throat	**GEN SURG**	General Surgical
N ANAES	Neuro Anaesthetist	**CARD/CS/CAN**	Cardiac, Cardiac Surgery, Cardiac Anaesthetist
PAN	Paediatric Anaesthetist	**PAED**	Paediatric
HOI	Haematology, oncology, infectious diseases	**GEN MED**	General Medical

Table 4 HAN study doctor specialties observed

The view of the activity taking place and the context of the research setting is through the demand for doctors' attention. The chart below shows that doctors were needed by the hospital in response to the patients' needs for medical intervention. This is shown through the number of patient related actions carried out each hour by each specialty of doctor between 9pm and 8am the following morning.

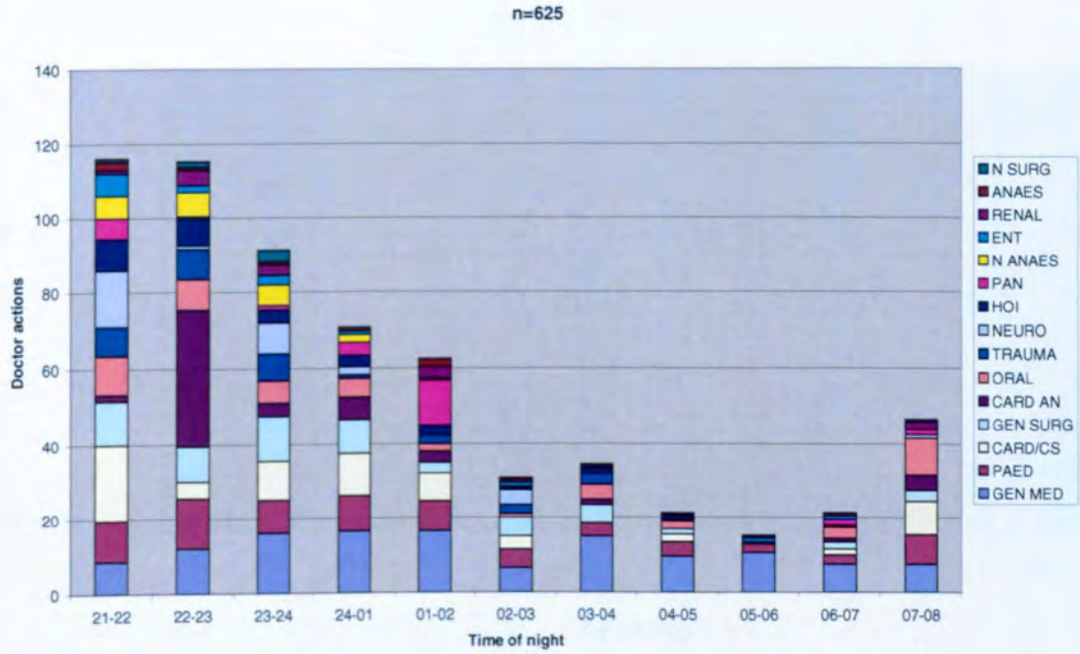


Figure 8 HAN study doctor actions between 9pm and 8 am

Each vertical bar represents the actions taken during the hour indicated. Each sub section of the bars represents the actions taken by individual doctor specialties. Demand for doctor attention was throughout the night but at a reduced level between 2am and 7am. The mix of doctor specialties represented the standard staffing pattern during night periods at the time of the study and it may be seen that the demand for the different specialty doctors was uneven with General Medical being the greatest in demand. Other specialities had little or no calls at times e.g. Renal and ENT. The large number of actions between 22.00 and 23.00 by the Cardiac Anaesthetist represents a ward round process where the doctor reviewed and took actions for 13 patients.

The chart shows that the doctors played a part in patient care even when planned procedures were not being carried out by being available to treat patient problems that arose. This is taken to mean that the hospital's competence in patient care was reflected by the availability during the night of an structure of doctors with particular knowledge.

The kinds of action taken by the doctors in carrying out the patient care activity is identified in the chart below.

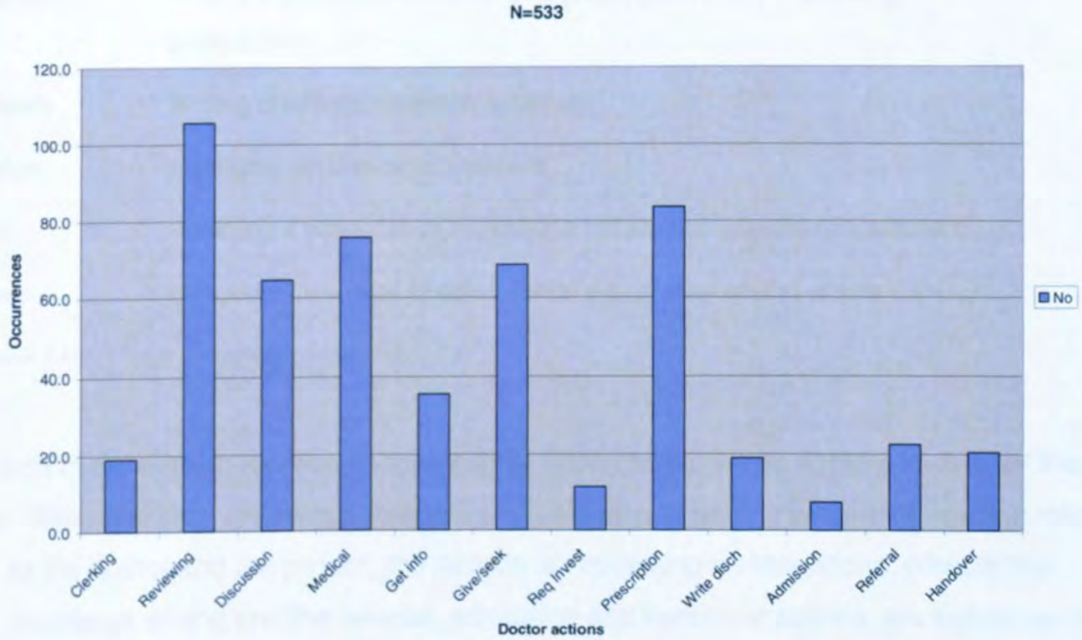


Figure 9 HAN study recorded action types and frequencies

The chart shows the number of occurrences of each kind of doctor action. Shown below are the categories of action recorded with their descriptions (Reference the Medical HR Manager and medical texts e.g. (Gale and Marsden, 1983)). The bold text indicates the name of the data item shown in the charts.

Action	**Description**
Clerking	The doctor discussing with the patient their problem and obtaining background information as appropriate
Reviewing	Checking on patient condition and deciding if any further intervention is needed
Discussion	Discussing a patient condition with another doctor.
Medical	A minor procedure e.g. venepuncture, cannulation, taking blood gas composition readings. A medical procedure e.g. insertion of a central line, carrying out a chest drain, addressing a cardiac arrest. An operation or anaesthetic procedure.
Get info	Finding/looking at a patient's x-ray result, investigation or test results, hospital notes file.
Give/seek Advice	Giving advice about a patient to colleagues or patient family. Seeking advice about a patient normally from another doctor
Req Invest	Requesting an investigation or test

Prescription	Writing a patient prescription or a prescription chart – renewing prescription.
Write disch	Writing discharge notes for a patient
Admission	Arranging admission of a patient.
Referral	Referring a patient to or receiving a patient from another department.
Handover	Handover from or to another doctor e.g. at start or end of shift

Table 5 HAN Study doctor activity categories

Each of the actions represents the hospital taking steps, via its doctors to care for the patients. While clerking, reviewing, discussions, medical and getting patient information relate directly to the doctor and the patient, the actions of requesting investigations, prescription writing, discharge writing and the referral, admission and handover actions, are indirect as they link the patient to the broader operation of the hospital. Requesting investigations instigates the process by which investigations are ordered and recorded, prescription writing instigates action in the hospital's pharmacy function and writing the discharge note instigates the hospital's patient discharge process. In activity theory terms, these actions had some immediate goal within the overall patient care activity system but were indirect with regard to the patient (Leontiev, 1981; Engeström, 2000). A remarkable feature of the chart is the amount of interaction between doctors reflected in the discussion and give/take advice actions along with the amount of reviewing taking place. This was concluded by the Medical HR Manager to be related to the act of 'deciding what to do next'. Since effective interaction and team working represent organisational capability (Klavans, 1994; Payne, 2000) examining how people work together sheds light on the human interaction element of St George's patient care capability.

Because each patient was under the care of a 'firm' under a particular Consultant, the reviewing activity as well as being a direct doctor/patient transaction can also be seen as the firm managing the treatment or recovery process of the patient in their care. Understanding the 'firm' structure also sheds light on the referral activity which comprises the process of the controlled transfer of a patient from one 'firm' to another. Handover is the transfer of information from one member of a 'firm' to another who has taken over responsibility for the patient. Similarly, admission as well as being the physical location of a bed for a patient also includes the acceptance of responsibility for a patient by a 'firm' (Medical HR Manager).

In these actions, the doctor is taking part in the broader hospital level patient care activity rather than a specific doctor/patient interaction. Each of the doctor actions relate to instigating further action through the hospital's organisation and responsibility structure. Thus the chart reflects a dimension of the capability of the hospital to address the unscheduled needs of patients and illustrates the combination of the diagnostic capability of the doctor, interaction between doctors, structure (e.g. firms and functions) and processes (e.g. for handover of patient responsibility) that influence the hospital's patient care process. It shows that the doctor is used as part of the hospitals patient care structure but also instigates actions in other parts of the hospital organisation and reflects Penrose's (1959) 'administrative organisation' through which organisational resources are deployed.

The community and division of labour in organisational patient care

Community is an element of the activity theory framework and all activity is seen as being within a social setting (Engeström, 1987). The community identified in the St George's patient care activity system include the patients, the different levels of doctor, nurses, and other hospital staff such as porters and test department staff. Implied in the situation of the study are also the patients' families and friends, the hospital management, other parts of the NHS and the public at large. However for analysis of the HAN study, the concept of community is most useful as a window on the way that work was divided.

At the organisational level, the division of labour represents the way in which the hospital has structured its people and their skills. The chart above (figure 9) has illustrated the division of labour between specialties. The chart shows that there was not an even division of labour in terms of number of actions. This reflects that the calls to doctors were based upon the patient needs that had arisen rather than some other method of work allocation. The intensity of patient needs itself reflects how the hospital is structured by specialty – for example, patients with renal problems are based in a renal ward and attended by renal specialty doctors. Thus the organisational structure influences the kind of doctor the patient is attended by and the kind of skills and knowledge the doctor should possess.

The record of who called the doctor, analysed below, provides a further view of division of labour in the hospital.

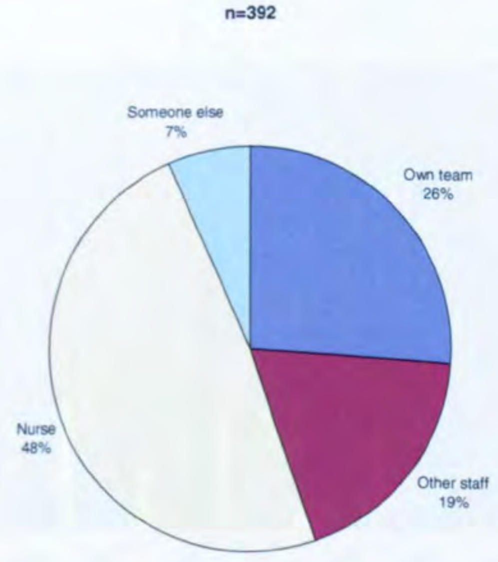


Figure 10 HAN study who called the doctor

This chart shows that doctors did not work independently but as part of a linked organisational structure. The calls to the doctors by a nurse or other doctor shows the inter-linking between the roles as part of the hospital activity system. The chart shows that in around 26% of cases, the call came from another doctor in the firm ('own team') illustrating team-working at the firm level and around 19% came from a doctor in another firm or other staff ('other staff') illustrating team-working across firms or specialties. This reflects that although doctors are part of a 'firm', there were links between firms and specialties that represents organisational working and thus a capability of the hospital. The chart shows how doctors were part of a hospital wide structure of interacting capabilities but are also able to mobilise this structure for particular patients, thus reflecting an emergent deployment of the organisational resources (Penrose, 1959).

Another element of the hospital's division of labour and the organisational structure was the doctors' grade levels of PRHO, SHO and SpR. This raises the question of whether the grading structure was significant – were there differences in the actions taken by the different grades? The charts below provide two perspectives on how the patient care actions were split between the three grades of doctor. The standard overnight staffing pattern at the time of the study was four of the lowest grade PRHO, nineteen of the middle grade SHO and fourteen of the higher grade SpR. The first chart shows the distribution of actions across each of the three grades. The second chart shows the same information but showing numbers of actions 'per head' to compensate for the different grade representation.

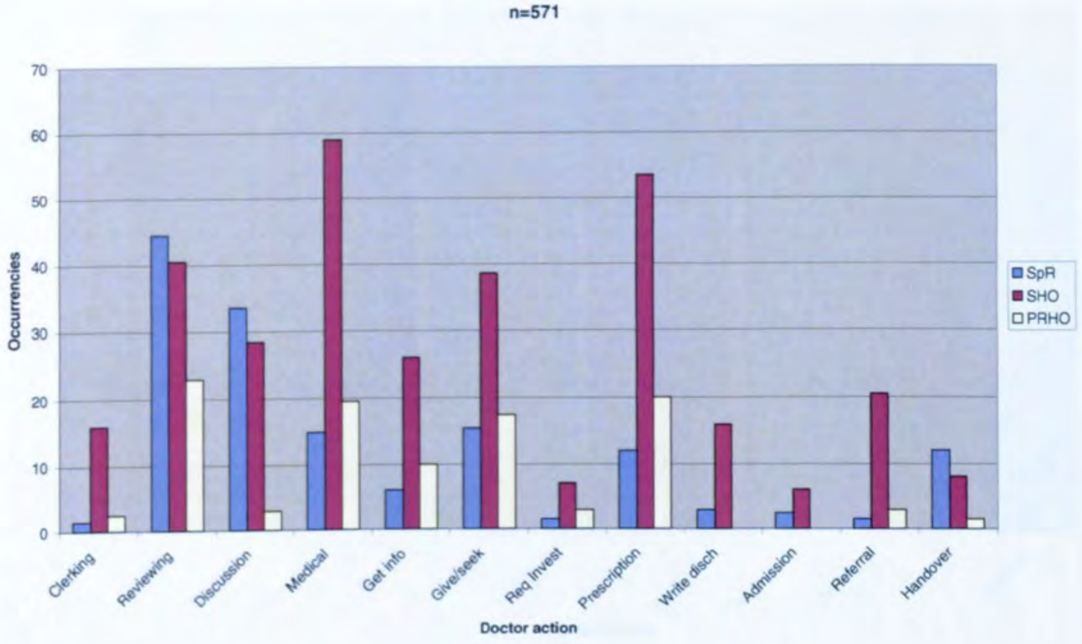


Figure 11 HAN study actions by grade

The chart shows the numbers of each kind of action taken by each of the grades. Most kinds of action were carried out by the SHO grade but the question is raised whether this was because they were most in attendance. A common pattern of actions per grade would be reflected in the size of the three grade bars for each action type being proportional to the numbers of doctors of that grade (14 SpR, 19 SHO, 4 PRHO). No action appears in this proportion so it can be seen that the different grades have taken different patterns of action, for example, the SpR grade took a greater number of reviewing and discussion and handover actions. The question whether the distribution of actions was purely because of the uneven representation of the different grades is answered in the chart below. In this chart, the number of actions taken by each grade has been adjusted to compensate for their uneven representation by calculating number of actions per head for each grade.

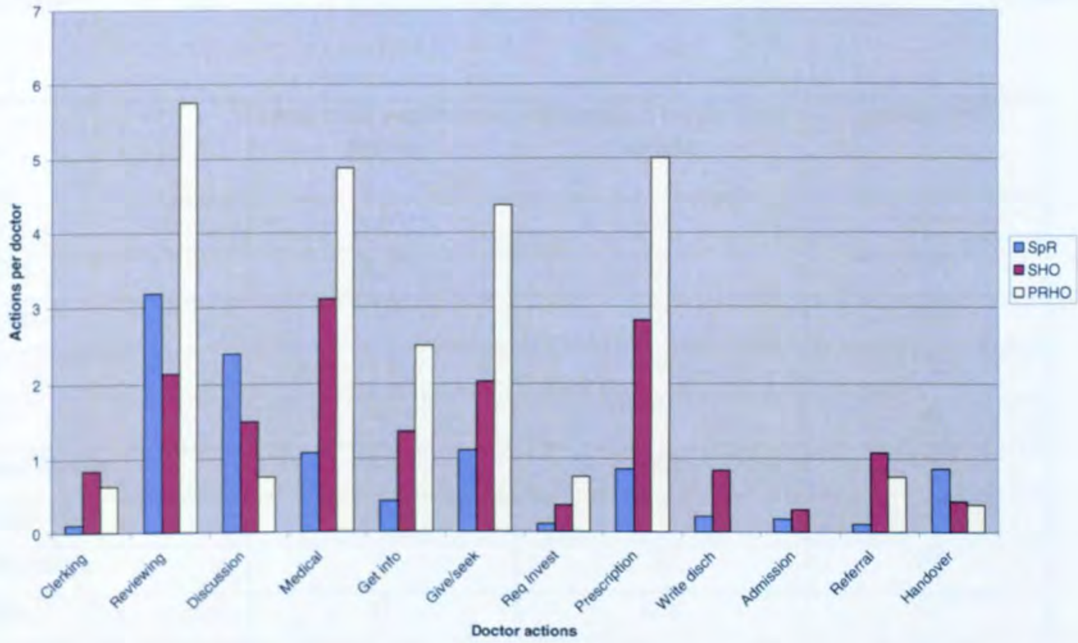


Figure 12 HAN study average actions per doctor

The chart provides a different view of how the doctor grade is reflected in particular kinds of action. For each kind of action relating to ongoing patient care, the PRHO grade took a disproportionate number compared to the two more senior grades, however the PRHO took a lesser proportional role in the organisational actions of writing discharge, admission, referral and handover. The action of clerking is interesting in that both the SpR and PRHO took a lesser proportionate role in the task. Clerking may be seen as a inferior activity for SpR but one that needs more expertise than provided by a PRHO. (This is discussed later in the MAU study where the Lead Consultant stated that the higher grade should take less time over clerking because of knowing which questions to ask to identify the relevant information needed.) From the chart, the handover action appears to be more the responsibility of the SpR being the most senior scheduled duty doctor.

The above charts show that different roles did take on different patterns of action thus suggesting that the role structure was significant and the hospital's patient care system made use in a differentiated way of the structure of doctor levels, again reflecting an element of Penrose's (1959) 'administrative organisation'.

A further aspect to consider in understanding the hospital's organisation structure is the level of skill required to carry out the tasks at hand. The table below shows the results of the question whether more or less skills were required by the doctors for the particular action. The numbers relate to the activities where the doctor had specified to the recorder that the skill needed was in their view more or less than that appropriate for their grade (i.e. PRHO, SHO or SpR).

Action	Less skill req'd than grade	More skill req'd than grade	(skills OK)
Clerking	1	1	34
Reviewing	6.5	1	180
Discussion	2	2	105
Medical	11	3	116
Get info	4	1	56
Give/seek Advice	6.5	3.5	103
Prescription	6	1	146
Write discharge	5	0	27
Admission	0	0.5	12
Referral	5	1	33
Handover	1	0	32
Totals	48	14	844

Table 6 HAN study actions where less or more skills were required

The actions where more and less skills were required is shown in alternative form in the following chart.

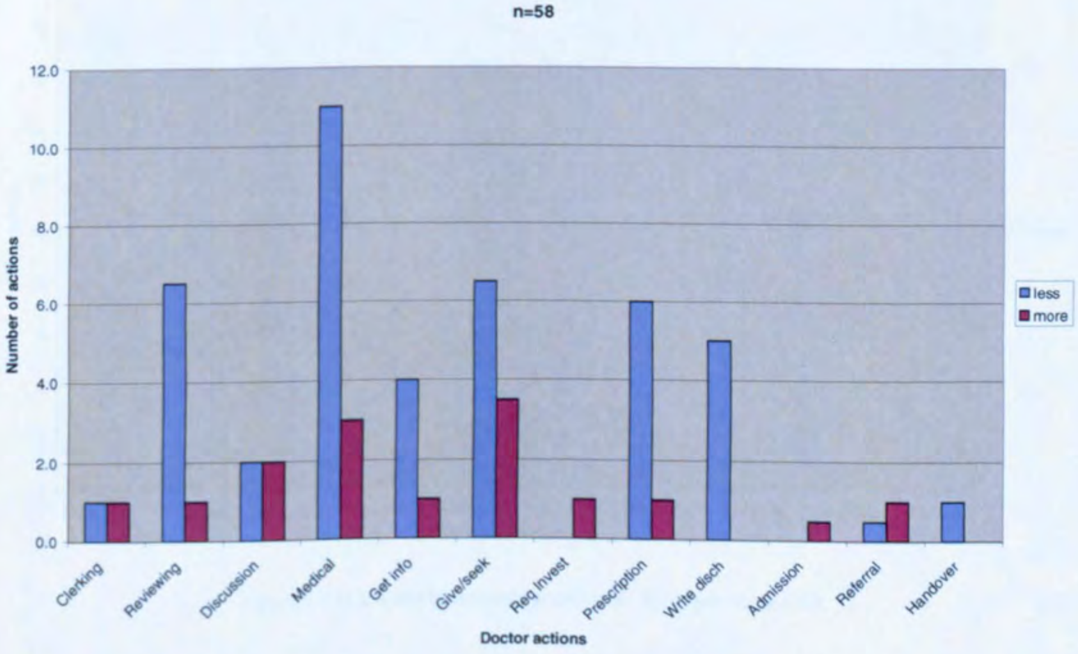


Figure 13 HAN study actions where more or less skills were required

Around 7% of the recorded actions required either more or less skills than those possessed by the doctor who answered the call. This shows that the organisational structure was not perfectly matched to the patient need. Overall slightly less skills were needed than the doctor possessed. Where less skills were required, this should reflect competent performance by the doctor but potentially inefficient use of resources. Also, the perception that being made to do tasks that are appropriate to a lower level of staff may have a negative influence on performance (Sutermeister, 1976; Hall, 1980). Where the table shows that more skills were required, this shows a lack of organisational capability, that is, the appropriate level of skills was not available to meet demand. This is particularly disturbing for the medical procedure category. These miss-matches between skill needed and available are what Engeström describes as a contradiction (Engeström, 1999) where an activity system's effective operation is disturbed. It also reflects Penrose's (1959) assertion that the particular combination of resources may lead to organisational incompetence.

Activities carried over from previous shifts

Another view of the effectiveness of the resourcing and skills structure may be gained by a view of whether all work instigated by a doctor was completed within the shift. The study recorded the actions carried over from one shift to the next as described in the chart below.

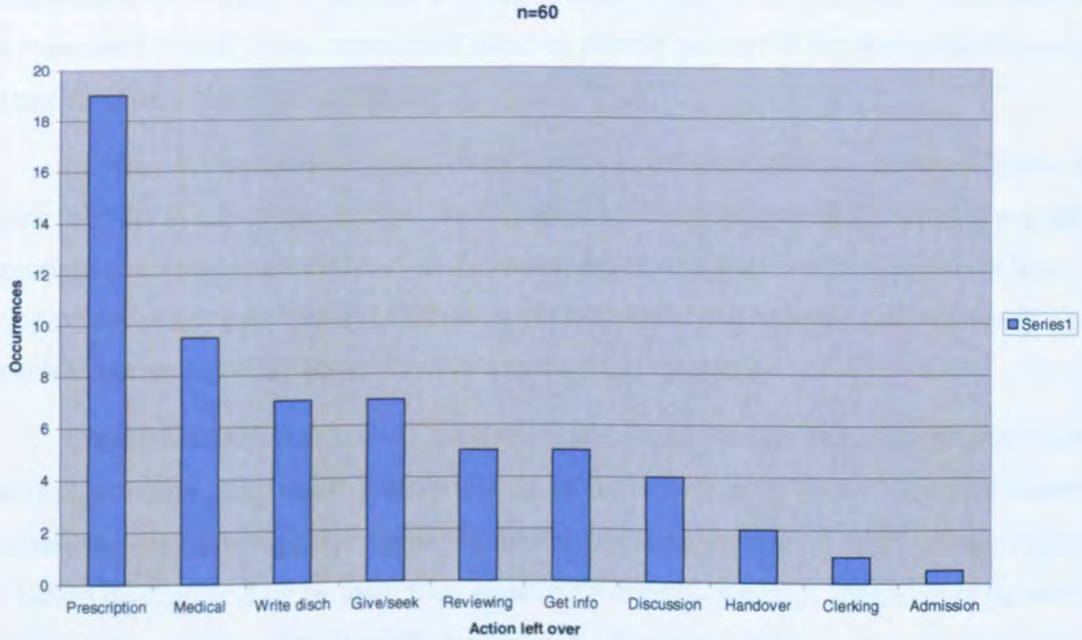


Figure 14 HAN study actions carried over from previous shift

From the chart it may be seen that 60 actions were carried over at the end of shift. The main areas of work carried over were either writing centred – writing prescriptions and prescription charts and discharge notes or some directly patient centred - minor medical routines, advice giving/discussion, reviewing and finding results. These results correlate with the deployment of doctors as a generic resource, that the action was not reliant on a specific doctor. The fact that certain tasks were carried over suggests a lack of doctor's time or willingness to complete tasks by the end of the shift thus reflecting a potential lack of organisational capability. There is no evidence of the effect on the quality of patient care of this carry over however, the chart suggests there may be possibility of actions not being carried out that should be, thus having a negative effect on the competence of the hospital.

Use of artefacts in support of patient care at the organisational level

A central interest of this study, informed by activity theory (Leontiev, 1978), is the use of artefacts and how they support patient care and thus the hospital's competence. Use of artefacts was noted in around a quarter of all calls and the list of those recorded may be found in Appendix G. The list of artefacts has been analysed by the researcher, categorised and conclusions drawn about their role in support of the hospital's patient care aims. The way that artefacts were used in care of specific patients by doctors is discussed in the next section. Artefact descriptions are based upon those recorded by the medical student observers.

Communications equipment 'bleep, telephone' By enabling communications between doctors and others, these technologies supported the hospital in operating as a structured whole rather than just a collection of independent doctors and other staff. They represent some of Penrose's (1959) 'other resources' used by people as part of the administrative organisation supporting organisational capability.

Forms - 'chest x-ray request, investigation forms, prescription, protocol' These artefacts were the way in which the doctors were guided to follow the hospital's procedures and also acted as a communications medium between the doctor and other hospital functions. They support the structural division of labour and skills within the hospital and represent a way in which Penrose's (1959) administrative organisation operates.

Patient related information - 'patient record, observations records, computer patient list, admission notes, drug chart, history sheets, observation chart. These technical based knowledge artefacts represent how the details of the population of patients was communicated between doctors and other roles thus enabling the cross hospital operation of patient care. They represent parts of the knowledge, seen by Penrose (1959) to mediate between people and other resources in pursuit of the organisational objectives.

Investigation tools- 'abg analyser, abg mc in itu, abg mc on other floor, O2 sats monitor, ecg, heart monitor, resp monitor'. These technical artefacts acted as tools in order to support the hospital's patient care system by making appropriate information about patient condition available to doctors and other staff. They represent another class of resource used by people to provide a (diagnostic support) service in support of the organisational objectives (Penrose, 1959).

Thus, each of these classes of artefact may be seen to support organisational capability in particular ways. This is related to specific kinds of use by the doctors by mediating between the doctor and the patient or between doctor, patient and other hospital patient care functions or systems. For example the O2 sats monitor, a device for measure oxygen saturation in the blood provides the doctor with specific information about the condition of the patient, whereas completion of a chest x-ray request would instigate action at some later time by the x-ray function of the department or hospital.

The record of artefact use also makes it possible to identify rules relating to the patient related actions. The activity theory concept of rules suggests that actions are not random but operate within guidelines and constraints to which the subject complies. Forms of various kinds were noted, such as for requesting investigations. It may be assumed that form design was meaningful (Prior, 2004), that is, the sections laid out on the forms had the intention of guiding the person completing the form in what they should write. Therefore form design acted as a communicator of rules. Protocol use was also noted – a protocol is a specific guidance to how procedures should be carried out (Orient, 2004). It is implied that the use of forms and protocols were a way in which the hospital provided rules for the doctors thus controlling the process by which patient care was carried out and thus was part of its capability.

At a broader level, activity theory recognises that cultural norms (Engeström, 1993) also provide a set of rules that influence individual action. The study implies a number of these rules set within the St George's culture, for example that the duty doctors responded to calls, attended to patients and did take action. Additionally they talked to and worked with each other and it was accepted to leave work for others at the end of a shift. The doctors also carried out actions representing a broader cultural setting than St George's alone, for example the actions representing the diagnosis and treatment decision process as documented in medical texts (Gale and Marsden, 1983; Orient, 2004; Fields, Isaacs and Stroobant, 2005). Therefore the doctors carried out rules based processes ranging from those that were specific such as completing a test form to the looser accepted practice at St George's such as leaving work over at change of shift to the broader profession specific process of diagnosis that are common to trained doctors. This suggests that St George's had direct control of certain rules and processes but was subject to others from outside the hospital, in particular those applying to the medical profession.

Conclusions regarding the HAN organisational patient care activity system

This section has investigated the characteristics of St George's overnight patient care activity system. It has identified that patient care for the population of patients resident in wards or in A&E was carried out through an organisation structure based on specific roles such as doctor and nurse, medical specialty and a hierarchy of grades. Unplanned patient needs were addressed through the actions of the doctors using their own knowledge and skills, interaction with others and artefacts. These artefacts were based on a range of technologies including telephony, computer based information and paper based materials for recording and guidance. It was concluded the artefacts either linked the doctor to other functions of the hospital, assisted the doctor in direct patient care or enabled the doctor to instigate actions in or link the patient to the hospital's patient care functions and processes.

5.2 What is the individual patient care activity system?

This next analysis is of the operation of the hospital but at the individual doctor level, examining how the doctors operated and the other organisational resources they used using the activity theory framework (Engeström, 1993). At an individual level, the activity being studied comprises the steps taken by the doctor at the time to resolve the patient problem for which the doctor had been called. Thus, the subject is the observed doctor and object is the patient for whom they have been called. The intended outcome was assumed to be (Medical HR Manager) the resolution of the immediate patient problem.

To provide a snapshot of the sequences observed, the following are examples of actions taken and artefacts used in the patient care activity.

Case detail	Actions taken and artefacts used
Case 1 General Medical SHO in A&E at 22.00 on 19 July 2004	Clerking Minor procedure Write prescription Arrange admission Request investigations Get/look at X-ray Get/look at lab results Using investigation request forms and computer based patient record
Case 2 General Medical SHO in ward at 01.30 hrs on 19 July 2004	Review of patient Clerking Write prescription Minor procedure Using PACS and ABG analyser.
Case 3 General Surgical PRHO in ward at 23.35 on 20 July 2004	Clerking Minor procedure Write prescription

	Using test results.
Case 4 Trauma SHO in A&E at 21.52 on 19 July 2004	Clerking Give advice Minor procedure Other paperwork Using venepuncture equipment, investigation forms, patient history sheet.
Case 5 Cardiac SHO in ward at 07.20 on 22 July 2004	Discussion Review patient Write prescription Give advice Using computer to check ECG monitoring and patient notes.
Case 6 Neuro SHO in ward at 21.45 on 20 July 2004	Clerking Minor procedure Find/look at test results Find/look at patient notes Give advice Update patient drug chart Using blood results, patient notes, patient drug chart.
Case 7 Oral SHO in A&E at 21.16 on 26 July 2004	Clerking Minor procedure Write other Minor procedure Write prescription Using patient record system and prescription form.

Table 7 HAN study example doctor calls

The examples above were calls where the doctor has taken a number of actions. Some of the actions relate directly to the patient such as clerking or carrying out a minor procedure, others relate indirectly to the patient, such as prescription writing, by instigating actions in other parts of the hospital. In addition to the multiple action events, there were also many events where the doctor had taken only one or two actions such as giving advice, reviewing, checking the patient drug chart etc. An overall view of the actions taken by the doctors in direct aid of their patients are shown in the table below.

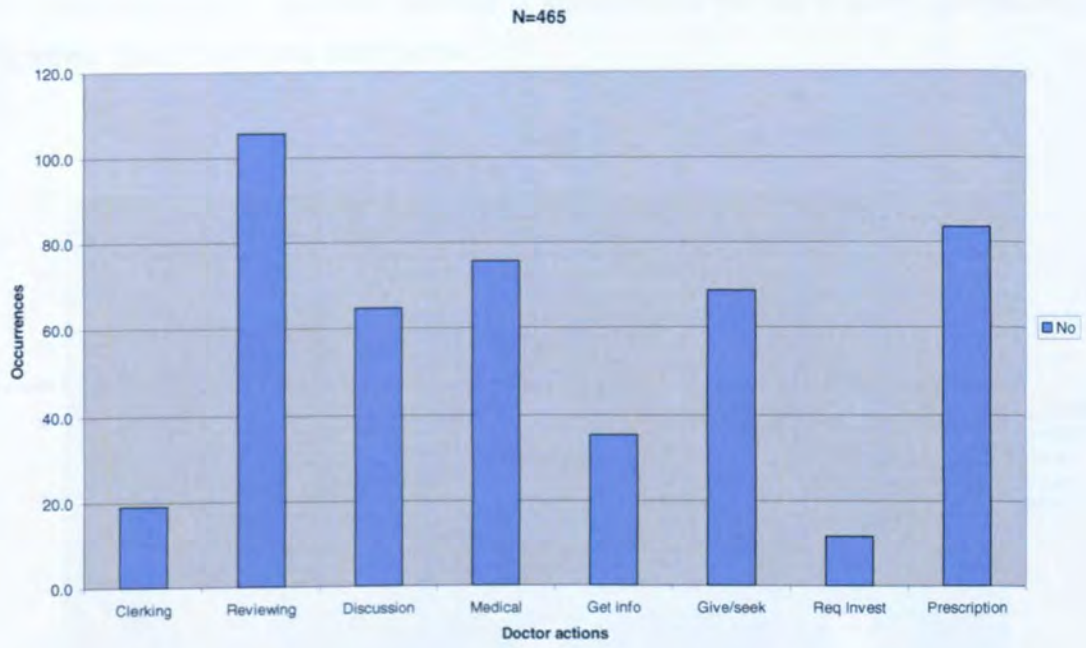


Figure 15 HAN study doctors' direct patient care actions

The chart shows the actions relating specifically to individual patient care by the doctors. Clerking, reviewing, medical procedures, discussions, giving/seeking advice and getting patient information are key parts of the process of diagnosis described in the literature - the gathering of information, investigations or tests and hypothesis forming/options sorting. (Orient, 2004; Fields, Isaacs and Stroobant, 2005). Each action represents the patient as object but some are direct and others indirect. For example, writing prescriptions represents an indirect action as the doctor was writing the prescription form with the goal of having drugs given to the patient and thus alleviating the patient problem. In this indirect action, the doctor was using the hospital systems, in this case the prescription system, pharmacy and drug supply system as mediating tools for his/her patient care activity.

Doctors were also observed to have other doctors in attendance to support their patient care activity or in activity theory terms, instigate a division of labour between themselves and another doctor. The call by a doctor on another (figure 10) represents how the doctor got help from other doctors either in their own specialty or another. The discussion and giving/seeking advice actions (figure 15) illustrate use of another doctor or others such as the patient for purposeful dialogue where the 'occasion' set up for such dialogue is concluded to be an artefact of the second order (Wartofsky, 1979). The data on team working provides a view of the role of interaction of the human resources (Penrose, 1959) in pursuit of the organisational aims.

Another view of this team working or interaction is the mix of doctor grades who attended together, described in the chart below.

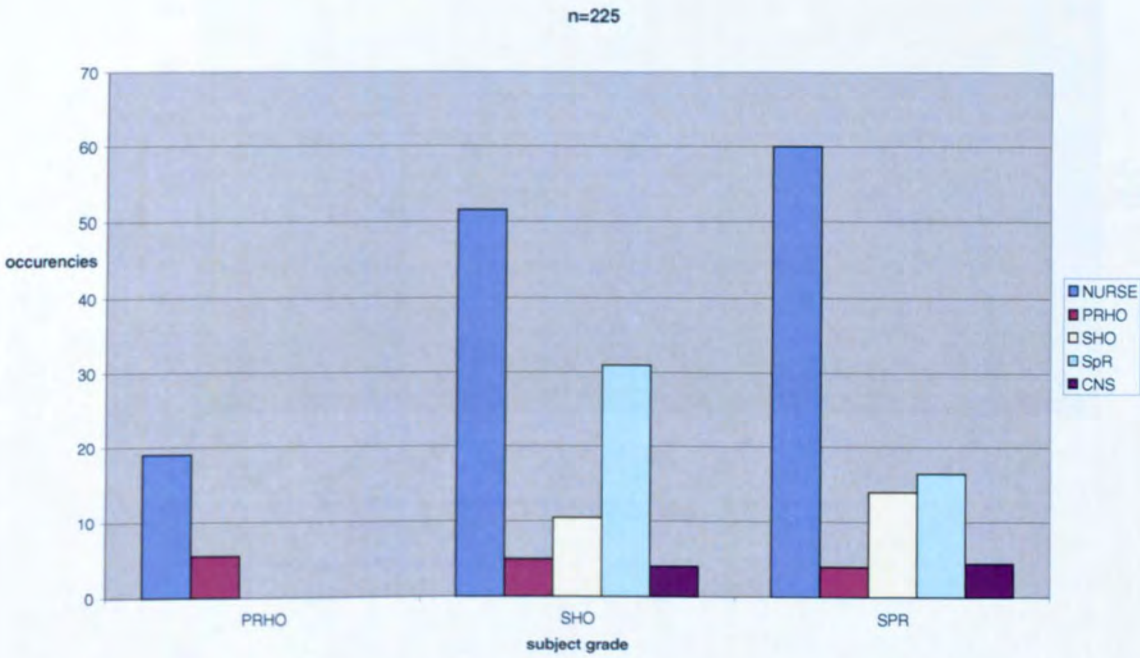


Figure 16 Whom doctors were attended by

This chart shows when the observed doctor was working with someone else, the grade or role of the other person. The doctors worked mainly with nurses which correlates with the 48% of calls where it was a nurse who called the doctor. Where a doctor was working with another doctor, the PRHO worked only with their own grade, SHO worked mainly with SpR and other SHO and SpR worked mainly with other SpR or SHO. Both SHO and SpR worked sometimes with PRHO and Consultant grade (CNS). Thus the chart shows that particular patterns of joint working between doctors occurred suggesting a social effect, based on hierarchy. The relationship between joint and individual working and particular kinds of action is described in the chart below.

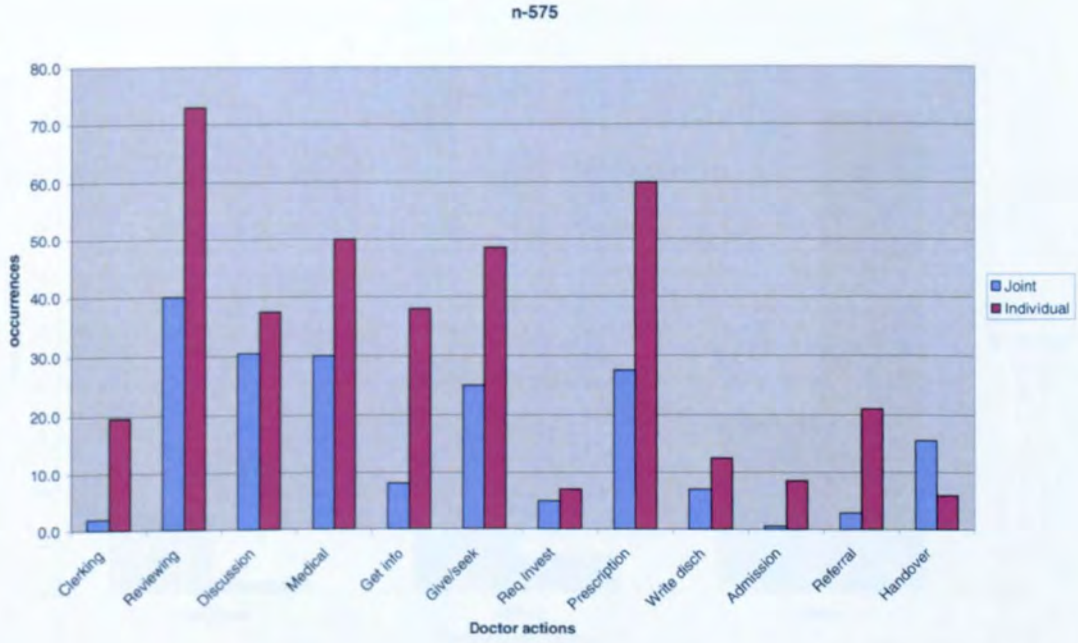


Figure 17 HAN study activity - joint and individual working

This chart shows numbers of actions carried out jointly - attended by other staff and individually. The chart shows that around two thirds of actions were carried out alone. The direct patient actions of clerking, getting information and the more organisationally oriented actions of writing a discharge, admission and referral were more often carried out alone. Reviewing, discussions, medical treatments and prescription writing were quite often joint actions. The split on discussions and giving/seeking advice reflects the cases of dialogue with colleagues as a joint action and dialogue with patients or families which was carried out by one doctor alone. Thus the chart shows that particular kinds of action were more individual in nature whilst others, sometimes by definition were joint. A breakdown of the medical actions is shown below which further highlights the effect of situation on joint and individual working.

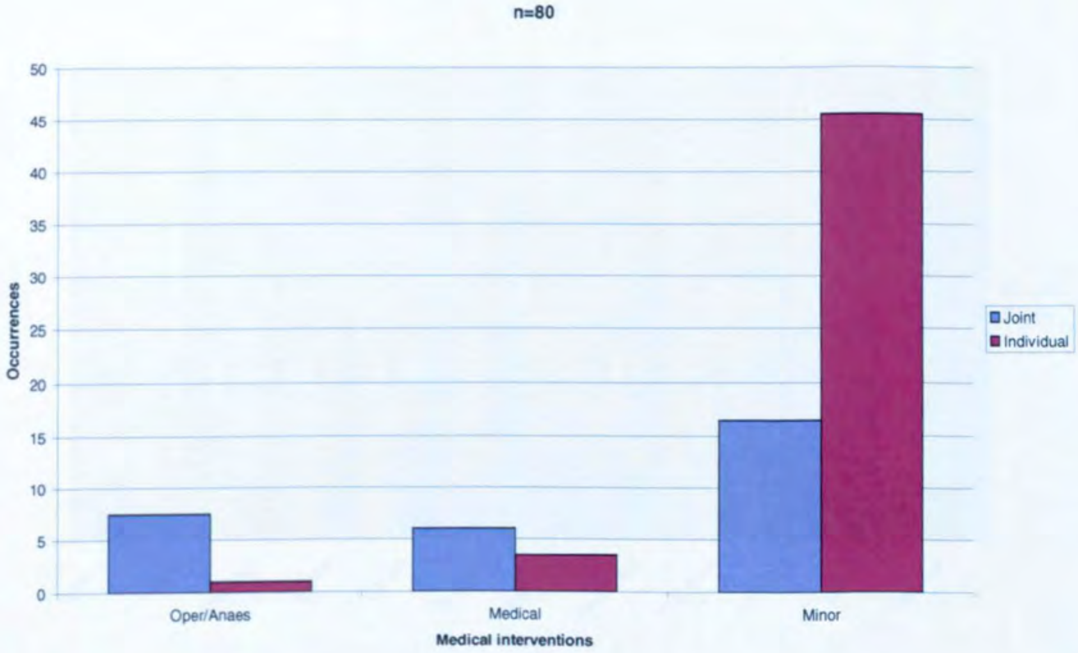


Figure 18 Joint and individual working on medical interventions

The chart shows the number of occurrences of joint and individual working on the medical intervention actions. Operations/anaesthetics and medical interventions were more often joint whilst minor treatments such as 'taking bloods' were more individual. This suggests that the minor category is quite different to the operation/anaesthetic and medical categories. It reflects that the minor actions were carried out as part of diagnosis, similar to clerking and getting patient information, where the others were specific patient interventions in order to treat the patient. Thus the pattern of joint and individual working is situation specific and the different actions reflect the needs of patients for individual or joint attention.

The three charts have shown that doctors' interaction with other doctors occurred and the nature and incidence of such interaction varied by grade and type of action being carried out. This suggests that the grade structure and the opportunity to inter-work with other doctors influence the way in which the patient care activity is carried out and thus the competence of the hospital but not how. This is a question addressed in the following chapter describing the MAU study.

Use of artefacts in support of patient care at the individual level

The doctors were observed to make use of a range of artefacts in their resolution of the patient problem as described in the chart below (and See Appendix G).

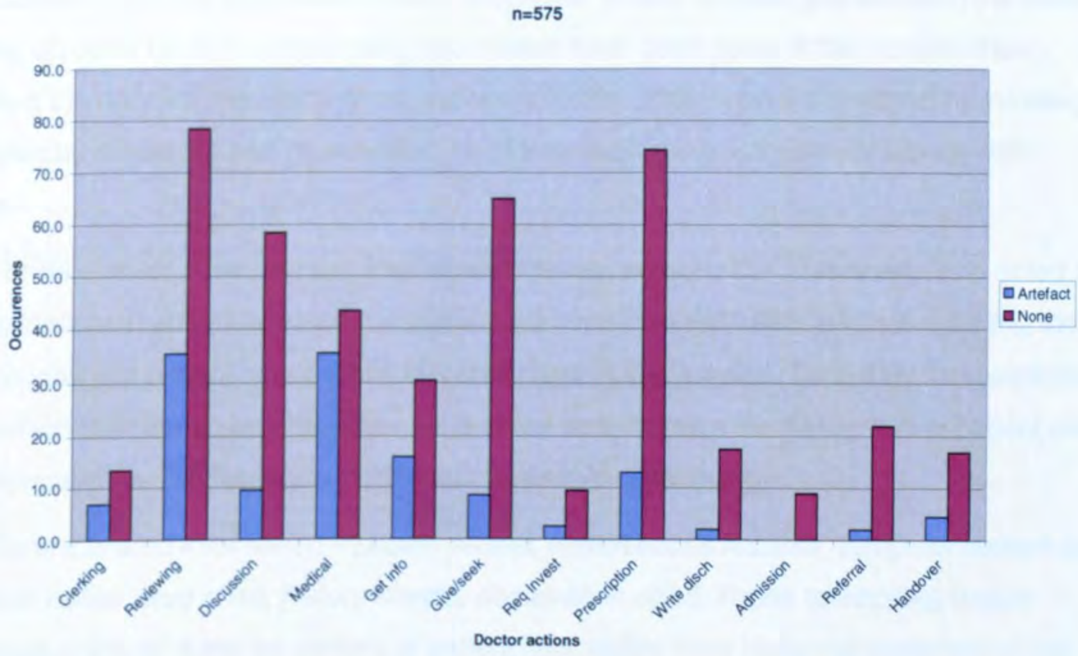


Figure 19 HAN study use of artefacts with types of doctor action

The chart shows for the occurrences of each kind of action, whether or not an artefact was associated. It shows that certain actions such as the medical procedures were more likely to have an artefact associated with it and others such as discussions were less likely.

On inspection of the observation records, the details of associated artefacts are in many cases unsurprising, so for the operation/anaesthetic actions, artefacts including anaesthetic agents, operation equipment, bypass machine and arrest trolley have been noted by the observer. For the minor, diagnosis related actions, blood gas equipment, cannulae, catheter, ECG equipment, investigation forms, needles and syringes have been noted. These appear to be the natural artefacts for the actions described. Of more interest is the artefacts listed for the reviewing actions as these show the artefacts chosen by the doctor to support their diagnosis or 'deciding what to do next'. Those noted include computer and paper based patient record information, observation data, patient drug charts and test results, individual test equipment such as oroscope tongue depressor, needles and syringes. Also noted are more general reference materials such as the BNF, PICU Medicines for Children and use of an emedicine website for looking up a rare condition related to the patient problem. Each of these may be correlated with the documented diagnosis process e.g. (Orient, 2004).

The role of artefacts in the organisational activity system was discussed in the previous section. In contrast, the role of the artefacts in the individual patient care activity system are concluded as follows. Artefact descriptions are as recorded by the medical students.

Communications equipment 'bleep, telephone' These technologies assisted the doctor in calling on other doctors or accessing information from other parts of the hospital thus facilitating the doctor's resolution of the patient problem. They provided a way of harnessing other hospital resources and represented the doctor instigating a division of labour with another.

Forms - 'chest x-ray request, investigation forms, prescription' These artefacts acted as a communications medium between the doctor and other hospital functions thus enabling the doctor to instigate patient care actions by other parts of the hospital. Thus they represent the way in which the doctor uses the other parts of the hospital as a mediating tool in patient care. They represent part of Penrose's (1959) administrative organisation.

Patient related information - 'patient record, observations records, computer patient list, admission notes, drug chart, history sheets, observation chart. These technology based knowledge artefacts acted as carriers of patient information from historical treatment of the patient and was used by doctors in diagnosis. They represent Penrose's (1959) concept of knowledge as a mediator between individuals and other resources in pursuit of the organisational objective.

Investigation tools- 'abg analyser, abg mc in itu, abg mc on other floor, O2 sats monitor, bronchoscope, ecg, flexible nasdendoscope, oroscope tongue depressor, heart monitor, resp monitor, portable x-ray mc, stethoscope, tendon hammer, thudicums'. These technology based artefacts acted as tools in order to produce the sign based artefacts that assisted the doctors in the diagnosis of the patient problem and represent Penrose's (1959) other resources.

Patient test results - 'x-ray on film, PACS, bloods cts, abg results, comp blood res, com ecg monitoring, comp biochem res, ct scan, lab results, D-Dimer results'. These patient related artefacts contained the results of the tests that assisted the doctors in diagnosis. They represent the outcome of previous actions by the same or a different doctor and contain sign based artefacts that were used by the doctors in diagnosis. They also represent Penrose's (1959) knowledge mediator.

General reference information sources- 'BNF, emedicine website to look up rare condition relating to patient, Oxford handbook clinical med, Grey book on computer, online atlas of dermatology, paed formulary, picu medicines for children, pocket meds for children (bnf for children), protocol' These knowledge based artefacts assisted doctors, through the supply of general information, in the diagnosis and treatment decision making aspects of patient care. They represent another category of Penrose's knowledge mediator.

Patient Treatments- 'warfarin, anaesthetic equipment, antib perfus fluids, blood from blood bank, platelets from blood bank, bypass mc, cannula, arrest trolley, catheter, central line

+ equip, resus room, cpr resus, fluid set up catheter, needles, syringe, iv antib, morphine, iv cannula, ng tube, plaster cast, saline, dressing, epidural central line GA, pads, ascitic drain pack, blood culture bottle, gloves, scissors, spray, swab, patient trolley, intubation, vacutainer bottles, venflon, water bowl'. These technology based artefacts, supplied by the hospital, acted as tools and enabled or facilitated the direct treatment of the patients by doctors. They represent Penrose's other resources used in pursuit of the organisational objective.

Thus the artefacts played a role either in direct treatment of the patient or in supporting the diagnosis process, directly by providing information to the doctor, or indirectly by instigating actions that may result in diagnosis being aided such as calling for another doctor or instigating a patient test. They also represent both Penrose's (1959) other (i.e. non human) resources and the way in which the administrative organisation was put into practice.

The artefact use by the different grades of doctor were also analysed as in the chart below.

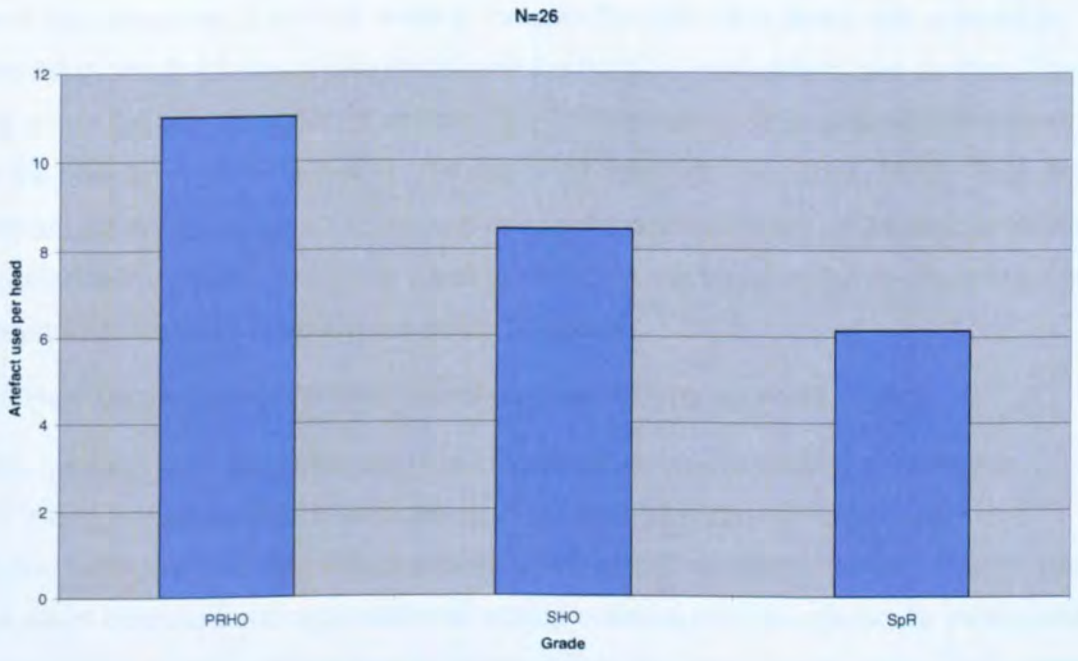


Figure 20 Artefacts used by the doctor grades

The chart shows the number of different artefacts used per head by the three doctor grades. Because of the way in which data collection was carried out, this should not be regarded as statistically significant but as an indication of differences in artefact use, that PRHO grades were observed to use the most artefacts and the SpR the least. Of greater significance, by examination, the nature of the artefacts noted to be used by each grade differed. The PRHO grade were noted to use more basic diagnosis and treatment related items – blood gas analyser, cannula, catheter and the patient records, drug charts and test results.

The SHO grade used a wide range of both the kinds of item used by the PRHO but also additional items such as central line equipment, an emedicine website, the Oxford Handbook of Clinical Medicine, Paediatric Formulary, a protocol, oroscope, tendon hammer and thudicums. The SpR used more specialised items in addition to the diagnosis related items used by the lower grades. These included anaesthetic agents and equipment, arrest trolley, arterial line equipment, bipap monitor, broncoscope, bypass machine, patient treatment consents, CPR resuscitation equipment, heart monitor, oxygen saturation monitor and D-Dimer results. In addition to the direct patient related artefacts, the SHO and SpR grades used more materials for relating the patient to the organisation of the hospital – for admission, referring and discharge. Each grade used both computer and paper based patient record and test information. Thus it is implied that the artefacts played particular roles in relation to the different kinds of activities carried out (Figure 19) which were themselves in relation to the different grades or degrees of expertise of the doctors (Figure 20).

Each of the classes of artefact may be seen to support the doctor in their patient care. A number of the categories of artefact relate to the specific action of a doctor with a particular patient whilst others link between the doctor and the hospital level patient care system. These two roles mirror the way that doctors' actions may relate either to direct patient treatment or towards the hospital system. Therefore, the role of the artefacts was on two levels. They acted to directly aid the doctor by providing general or specific patient related information or act as a tool in relation to the patient. They also acted to provide a link between the doctor, patient and other hospital functions and patient care related systems.

5.3 How do the individual and organisational activity systems relate?

This question asks what the roles are of artefacts, rules, community and division of labour in linking between subjects and objects in achieving the desired outcomes in and between the individual and organisational activity systems (Engeström, 1996; Tobach, 1999). The analysis of individual and organisational activity systems provide a particular perspective on the relationship between doctor and the hospital providing an understanding of how people and other organisational resources are deployed in pursuit of the organisational objective.

The charts of activity in previous sections show that the doctors took a range of object related actions during the overnight period that were representative of both an organisational and individual patient care activity system (Engeström and Miettenen, 1999) that enacted the capability of the hospital. Within the hospital level activity system aimed at care of the population of patients, the doctor was also the subject of an individual activity system related to the resolution of a particular patient's problem that had arisen and for which the doctor had been called. The characteristics of these organisational and individual patient care activity systems are represented in the diagrams below.

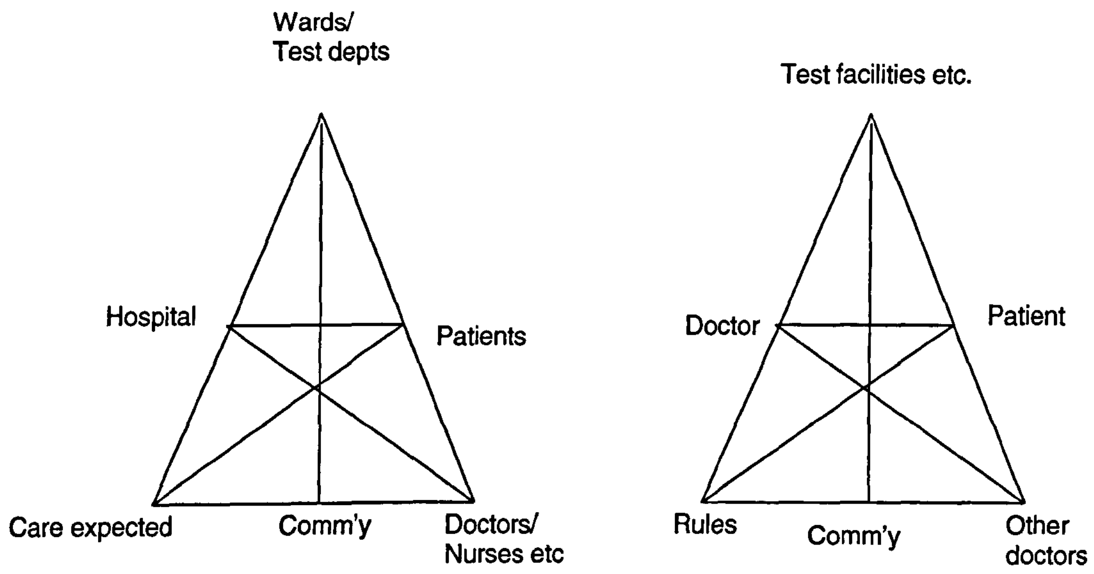


Figure 21 HAN study organisational and individual patient care systems, source author based upon Engeström (1993), Tobach (1999) and Engeström (1996)

In the organisational level system, the subject is the hospital and the object is the population of patients being cared for in wards. The activity system comprised the different elements organised to resolve any patient medical problems that arose and operated broadly to provide the 'care expected' (St George's Healthcare NHS Trust, no date). Along with nurses and other roles, the doctor was part of the community and through division of labour was tasked with and was called on to resolve patient problems that arose. Doctors of a specific specialty and grade were treated as a generic resource (Medical HR Manager) and no ongoing relationship between doctor and patient existed other than through the firm structure. The demand for doctors' attention varied by time of night. Demand also differed for the different specialties of doctor as care was based on an organisation structure related to the kind of illness of the patient. The overnight organisation structure was purposeful in relation to expected demand and for the actions actually needed by patients, the combination of specialty and grade closely matched the skills needed. The hospital level activity system used the wards, test departments and equipment as artefacts supporting patient care. Communications systems enabled the hospital to operate as a network of skills such that patient care was broadly individual doctor and time independent.

In the individual level system, the subject is the doctor and the object the particular patient for whom the doctor had been called. The doctor worked to rules embedded in hospital procedural artefacts, in local accepted practices and as taught at medical school. The doctors took direct action in relation to the patient as an agent of the hospital, however, the relationship between doctor and hospital also effectively reversed. The facilities of the hospital such as test departments effectively become an agent of the doctor to support the doctor's care of their particular patient. This was by the doctor instigating patient related actions to be carried out elsewhere in the hospital system.

The artefacts used by doctors played a role in the linking between doctor and patient and the hospital's patient care system. Artefacts were used that related directly to the patient as object. These included those providing information about the patient and their condition or tools that enabled the doctor to investigate the patient condition. Artefacts also provided guidance to the doctor, either hospital specific such as the 'Grey Book' (St Georges Healthcare NHS Trust, 2006) or more general such as medical websites, handbook and British National Formulary. Since the actions that used these artefacts were those associated with descriptions of diagnosis in the literature e.g. (Orient, 2004), it suggests that these artefacts supported the doctor in carrying out diagnosis.

Other artefacts connected the doctor to the hospital level patient care activity. These included the communications tools such as the bleep and telephone, forms used for instigating action in other parts of the hospital such as for blood tests and x-ray. Artefacts also connected the patient with the hospital wide system – the patient record, drug chart and test results. These patient records enabled the hospital to carry out its care of the patient irrespective of time and which particular doctors were on duty.

Doctors also used other doctors to assist them in patient care. This was reflected in the calls to doctors by other doctors, by dialogue and by joint working on patient care actions. The way in which the doctors used others appeared to be related to their respective grades and the situation of the action, for example whether a medical action was carried out as part of diagnosis or as direct treatment of the patient

5.4 Conclusions of the HAN study

The analysis of the HAN study has identified that in pursuit of the hospital aim of patient care, the doctors exercised labour power through using their individual capabilities, interaction with others, using technical artefacts and following organisational processes whilst operating within a defined spacial and social structure.

During the night period from 9pm until 8am, the patients in St George's needed the expertise of doctors to resolve problems that had arisen. The doctors used their own capabilities to decide how to resolve the patient problem, take appropriate action and in around a quarter of cases, use appropriate resources in assisting them to do so. The actions of the doctors were not independent of others and joint working with others was used. Some artefacts used by the doctors were for identifying the state of the patient, the results of which were used in the diagnosis process. Paper based forms and computer systems were used enabling both the instigation of action in other hospital functions by the doctor or for feedback of previous actions by the same or different doctor. The telephone and 'bleep' also played a part in enabling communications across the hospital and thus supported its cohesive operation. The effect of the use of this technology was to make the patient care process time, place and individual doctor independent.

For the hospital level patient care system, the actions relating to admittance, referral and handover were the processes by which the hospital ensured responsibility for the patient was clear and the condition of patients was communicated between sequential shifts. Doctor discussion and advice giving was a way in which the hospital shared the knowledge of the doctor community. It is suggested that use of such process based rules influenced the patient care and thus the enactment of organisational competence.

The study illustrates that the hospital's activity of patient care was one that involved a structure of roles, each role taking some particular part in patient care. In particular the grade and specialty structure were reflected in different skills and artefacts being used and different levels of demand on doctors. Doctors were part of a Consultant firm that also influenced the way care was provided. The organisation structure was seen to be reflected in the pattern of actions taken and artefacts used during patient care at both individual and organisational levels. The physical structure of the hospital is also evidenced. The patient was located within the purposeful structure of the hospital, medical specialty ward and bed. This thesis suggests these elements each influenced the effective performance of the doctors in support of the hospital's patient care objectives.

Each of the areas discussed above show that the doctors with their colleagues took action in response to patient problems that contributed to the enactment of the organisational capability. Artefacts in the form of facilities, tools, and information also played their part linking between the doctor and the patient and the hospital as a whole. Artefacts were used to guide specific actions of the doctors and for direct patient treatment, to provide information to support diagnosis and to instigate action in other parts of the hospital. Artefacts also supported the cohesive care of patients by communicating their details between doctors and hospital functions.

The doctor was seen to directly treat the patient whilst for the hospital level system, the doctor was acting as an agent – inter-acting with the other elements of the hospital level system. This is illustrated in the diagram below. In Penrose's (1959) terms, the doctors as human resources were seen to work with other people and use a range of other resources in the form of equipment and supplies, mediated by organisational knowledge in pursuit of the organisational aim of patient care. The administrative organisation by which the resources were deployed were pointed towards by the kinds of artefact used by the doctors such as prescription forms.

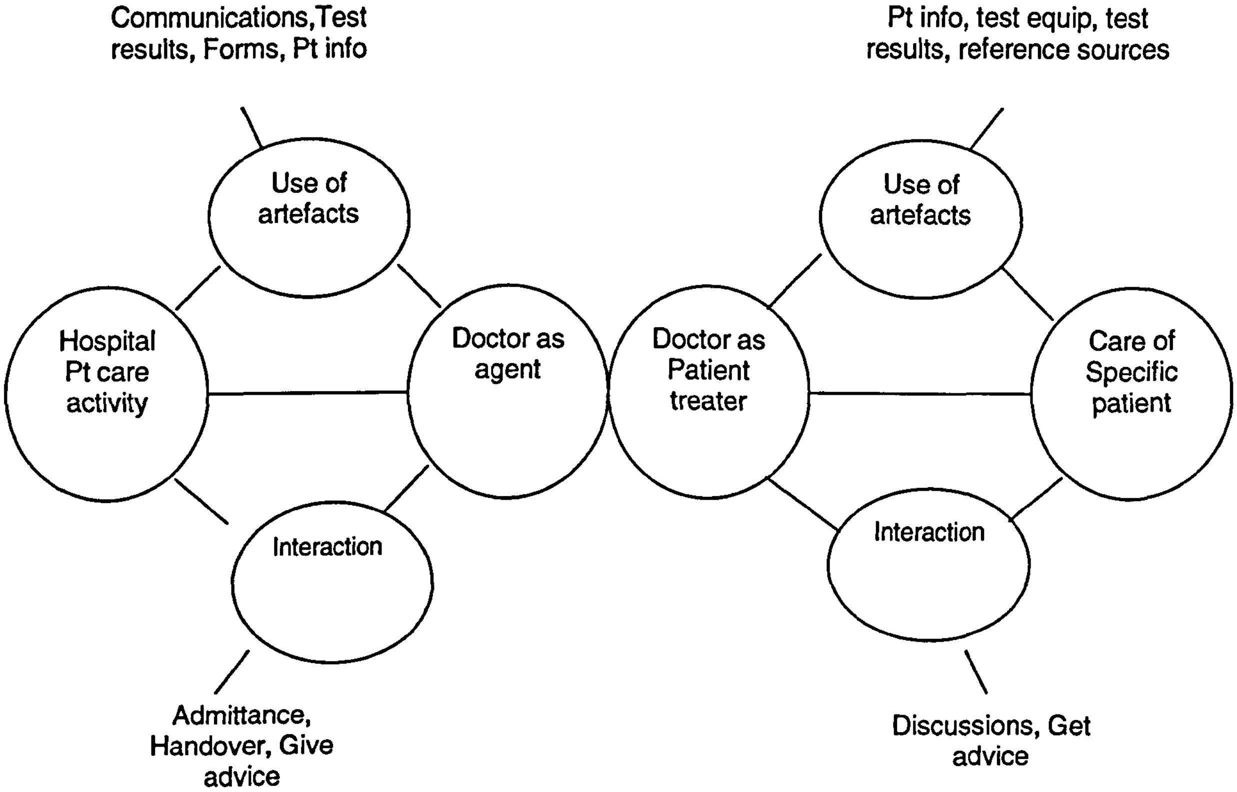


Figure 22 Doctor as patient treater and hospital system agent (source author)

Some actions related directly to the 'patient as object' or doctor as a direct treater of the patient. The doctor obtained specific information about the patient either from clerking or from patient notes and records. The doctors carried out tests to understand the condition of the patient and minor procedures to achieve some medical aim. Other actions carried out by the doctor related to the hospital level patient care activity with 'patient population as object'. In the latter case the doctor acted as agent taking actions that related to other parts of the hospitals care system such as other doctors or other departments. These actions included writing prescription forms, ordering investigations and arranging referral and discharge. A particular action carried out by doctors that related to the organisational level was handover, the provision of information to doctors on the next shift. This action would be important to the cohesive care of patients and thus reflecting organisational capability.

The data show considerable numbers of actions around reviewing and peer discussions. From discussions with the medical HR function these were implied to be part of the process of checking patient status and the decision on what action the doctor should next carry out. This implies that patient care has an emergent character and decisions about treatment were part of the ongoing process by which the hospital cared for its patients. This is clearly a significant activity in that its correct operation will be representative of the competence of the hospital. Thus the HAN study has identified a number of components or enablers of organisational competence with the activity of diagnosis and treatment decision making being highlighted as one of importance and worthy of more detailed study. This sets the scene for the next part of the empirical research at St George's – the MAU study that examines the process of diagnosis and treatment decision making in greater detail in the situation of St George's Medical Assessment Unit.

Chapter 6 Findings and Analysis - the Medical Assessment Unit study

'It's a factory!'

Doctor on duty in the MAU, March 2006

The purpose of this study was to build on the data derived in the HAN study to identify in the specific organisational context of the St George's Medical Assessment Unit (MAU), the way that the actions and interactions of doctors and their use of artefacts related to the organisational capability. As with the HAN study, the MAU case study provides a multi-perspective view of doctor/patient interactions and their context, the separation of case and context being sometimes indistinct (Yin, 2009). The findings of the study will be described and analysed within the chapter rather than having separate findings and analysis chapters (Robson, 2002). The chapter will be structured first with a general overview followed by a section describing 'The day in the life of' that will provide examples of events and how they relate to the theoretical framework. This will be followed by analytical sections that view MAU operations from activity theory and queuing theory perspectives, followed by a summary section pulling together the case study of MAU operations from the two perspectives with reference to the research questions (Yin, 2009).

6.1 Overview of the St George's Medical Assessment Unit (MAU)

In this section, the objectives and functions of the MAU will be described in order to provide a foundation and set the context for more detailed analysis of the activities of its doctors using the activity theory and queuing theory perspectives. The section is based upon the researcher's discussions with the Acting MAU Lead Consultant, Acting Matron and duty doctors plus the analysis of MAU related documentation and observations of events.

The function of the St George's MAU was to diagnose patients presenting with a suspected medical health problem and decide whether the patient should be discharged or admitted (St George's Healthcare NHS Trust, 2003). Patients were directed to the MAU either from the Accident and Emergency department (A&E) or by direct referral from the patient's General Practitioner (GP). See Appendix I for the MAU operational policy. For General Practitioner patient referral, the duty SpR provided a 'second opinion' to the GP regarding the seriousness of the patient problem and whether it warranted hospital attention. For all patients, the decision on treatment was either to discharge or admit the patient by referring them to a main ward. If a decision could not be made within around 12 hours, the patient was passed on to Richmond Ward where further medical diagnosis was carried out.

The chain associated with the MAU patient pathway was:

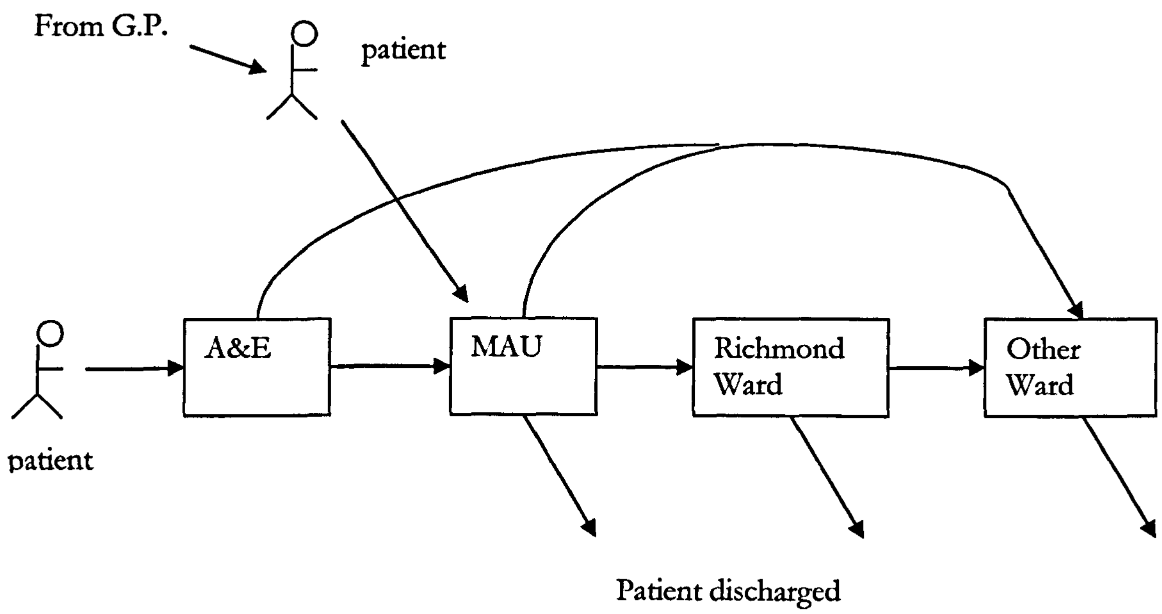


Figure 23 The MAU within the acute patient pathway

The MAU operated every day of the year and demand for service was maintained for twenty four hours per day with a slightly reduced demand during the early hours (based upon MAU statistics for January 2006). See Appendix W.

All patients were subject to acceptance into the MAU by the duty SpR. Once accepted, further action in the MAU awaited a bed becoming available and the patient arriving. Then information collection started and diagnosis and decision making on treatment carried out.

Patients were served hot breakfast, lunch and dinner from food provided to the unit and heated in the adjacent kitchen. Thus in addition to medical services, the MAU supplied more general patient care in a linked but separate function.

The photograph of the MAU below shows one half of the unit with beds 7, 6, 5 and 4, the ward furniture and patients' TV screen/telephone units. At the time, in March 2006, the MAU had no patients as it was being deep-cleaned after a bout of a sickness virus.

Figure 24 The St George's Medical Assessment Unit

The MAU operated under the overall responsibility of a Consultant from the General Medical Directorate and under the direct control of the MAU Lead Consultant and an Acting Matron. Whilst Nursing staff were allocated directly to the MAU, doctors were allocated to the MAU under a duty system that operated the MAU as part of the General Medical specialty (See Appendix U, the Medical on-call rota). Thus doctors on duty in the MAU also had responsibilities associated with patients located in General Medical wards (ref. Medical HR Manager). The MAU medics were observed to call at times on the expertise of other specialist doctors in St George's where needed for particular patient conditions. According to the MAU staff on duty sheet (Appendix U), the daily working organisation structure of the MAU comprised a Sister plus two nurses and a duty Consultant, Special Registrar and two Senior House Officers. It was observed that the regular staffing was supplemented at times by addition staff such as Nurse Practitioners and student doctors. At the time of the study, the MAU occupied the first bay of Richmond Ward and comprised seven beds.

The Medical HR Manager described that doctors were scheduled by the medical scheduling function from the pool of medical specialists. This was in the form of a rota that meant that all medical doctors spent some time working in the MAU. The major load appeared to be taken by the duty SpR and SHO grades with infrequent appearance by a Consultant other than during the ward rounds held in the morning and evening. At the time of the study, St George's was seeking to recruit a Lead Consultant for the MAU (See Appendix H).

Aims of the MAU study

The study contributes to addressing the research aims through answering the following research questions based upon those described in the methodology chapter:

1. What are the characteristics of the individual doctor patient care activity system – what does the doctor do and use as part of their diagnosis of patient problems?

2. What are the characteristics of the organisational activity system of the MAU – what is the organisational system of which the actions of the doctor are a part?

3. How do the individual and organisational activity systems relate?

What is the role of artefacts, rules, community and division of labour in linking between subjects and objects in achieving desired outcomes in and between the individual and organisational activity systems.

The analysis of operations in the MAU is from two perspectives, firstly to directly use the activity theory framework (Engeström, 1993) in order to make sense of the observations of events in the MAU, then using a queuing theory perspective (Littlechild, 1991) that identifies in greater depth the relationship between the actions of the doctor and other elements of the hospital patient care system.

In the study, the patient related actions of MAU doctors were observed by the researcher over 70 hours across 2 days in May 2005 and 13 days in January, February and March 2006. Patient throughput records were interrogated, operational documents were examined of which, sample copies were taken that may be found in the appendices. During the time of the study, over 1000 patients were seen by doctors in the MAU.

The remainder of the chapter comprises the following elements. In the first following section, a 'day in the life of' extract from the observations of the MAU by the researcher will be provided. Each observation is accompanied by a post-hoc commentary and interpretation of the events observed in order to illustrate the linking between the observations and the theoretical frameworks upon which the analysis is based. The following two sections will then relate the observed operation of the MAU to the theoretical framework using the activity theory perspective (Engeström, 1993), then from a queuing theory perspective. These two analytical perspectives provide complementary views of the mechanisms by which the actions of individuals and use of artefacts are related to the desired outcomes of the MAU operation. The analysis sections will reference as appropriate the data in the 'day in the life of' section, the records of key events observed (Appendices W and X), the observation diary (Appendix Y) and copies of relevant documents (Appendices L to V). The analysis sections are followed by a summary of the conclusions drawn from the MAU study.

6.2 A day in the life of the St Georges MAU - 6 March 2006

This section shows a day in the life of (DILO) in the MAU describing events over eight hours of an eleven hour period on 6 March 2006. It is a transcription of the observations recorded by the researcher. The section also includes a commentary describing how the activities have been interpreted in relation to the theoretical framework applying to the linking between individual and organisational capability. The commentary is based upon the researcher's sense making and theory building developed over the period of observations and post-hoc analysis of the whole of the data collected relating to MAU operations. The extract has been split into hourly periods with the first hours commented on in greater detail. The commentary follows the advice relating to the analysis of observational data described by Robson (Robson, 2002). Event data relating to the whole period of observation may be found in Appendix Y of which the 'day in the life of' event data is an extract. Note patient referencing is based upon the bed they occupied in the MAU – A1 to A7. Medical terms have been noted 'as heard' and are not necessarily accurate, this is considered by the researcher not to impact the validity of the research as the unit of analysis relates to the form of dialogue between individuals rather than specific medical content.

The diary of events illustrates the actions and inter-actions that were part of the multiple interacting patient related activity systems (Engeström, 1996; Engeström, 2001) operating in the field of observation. Focus is on doctor diagnosis and MAU patient care activity systems but other activity systems were evident such as the overall hospital patient care activity system and within the MAU activity system, the nurse patient care activity system.

Diary item	Commentary/Interpretation
10.15 Arrived in MAU.	
New MAU patient record book has arrived – entries start 18 February, then 20th then 2nd March. A1,2,3,4,5,6,7 beds in use.	The researcher arrived in the field and noted key artefacts including bed use. The MAU had all beds in use so was unable to accept further patients – a contradiction in relation to its functional objectives.
10.20 Doctor reads notes A2 and goes to see patient.	The use by the doctor of patient notes and records as an artefact in the doctor diagnosis activity system. Doctor actions as part of the MAU patient care activity system.
10.22 Nurse brings in notes (photocopy of A&E notes) for A1 and places them in A1 slot.	Illustrates inter-working between activity systems and boundary crossing mediation through the artefact of patient notes. Illustrates patient as common object across nurse and doctor activity systems.

Doctor looks through notes for A1 and updates MAU doctor notes.	The use by the doctor of patient notes and records as an artefact in the doctor diagnosis activity system.
Patient notes ex A&E include note of chest x-ray, history, patient condition and suggested problem.	Researcher's notes on nature of artefacts. The notes provides evidence of the artefacts used and indicates the emergent process of diagnosis.
10.33 Patient A5 in wheelchair – has blood pressure taken by nurse.	Illustrates inter-working of activity systems. This event shows how the nurses also play a role, as part of the nurse patient care activity system in providing artefacts (blood pressure data) that may be used by the doctors in the doctor diagnosis activity system. Shows test results as common object.
10.45 Nurse explains to patient A7 – doctors awaiting notes of previous visit then will decide if she has to return for outpatient based tests.	Illustrates nurse patient care activity system
10.50 John the porter arrives and is asked by a nurse to take patient A6 for chest x-ray. John asks nurse the name of the patient.	Illustrates inter-working of activity systems – portering and x-ray department activity systems.
1058 Pharmacist removes notes and goes to nurses station and makes phone call.	Illustrates inter-working of activity systems – pharmacy activity system.
Nurse asks another to carry out ECG on patient A3. Uses portable ECG machine on a trolley.	Illustrates inter-working of activity systems. Similar to 10.33. Also shows MAU based patient test artefact – ECG machine.

11.10 ECG output given to nurse and filed in record compartment A3	Illustrates inter-working of activity systems. This event shows how the nurses also play a role, as part of the nurse patient care activity system in providing artefacts (ECG data) that may be used by the doctors in the doctor diagnosis activity system.
1120 Nurse looks for drug chart for patient.	Operation of nurse patient care activity system
A nurse describes the tests that a nurse can take. These are done according to condition e.g ECG taken if any suspicion of a heart problem. Describes basically a battery of tests that are taken in preparation for doctors diagnosis for example blood sugars using prick of blood in blood machine, blood pressure taken every four hours and monitored by nurses to see if any changes present could indicate a risk to the patient condition	Researcher interrogates an actor to clarify MAU process. This report describes how the nurses also play a role, as part of the nurse patient care activity system in providing artefacts that may be used by the doctors in the doctor diagnosis activity system.
1130 Cleaner is cleaning the toilet area	Illustrates inter-working of activity systems – the MAU patient care activity system
Patient A6 returned by another porter and seated by the bed	Illustrates inter-working of activity systems – the hospital portering activity system.
The telephone rings and a nurse answer was no beds, estimate two hours and two or three other patients are coming	Telephone as mediating artefact between MAU and hospital patient care activity systems.
1150 patient A1 is taken to Richmond Ward	Illustrates inter-working of activity systems – MAU and hospital patient care activity systems.
Cleaner is now cleaning round the desk area. check with medical registrar.	Illustrates inter-working of activity systems. Illustrates interworking between different roles within the MAU.
A5 is admitted but has a social problem	The MAU patient care activity system
patient A2 awaits a bed available in the CDU. Also beds A3 and A2 awaiting	Illustrates inter-working of activity systems – relating to operation of CDU, A&E and GP patient

patient being clerked in A&E and a GP referral	care system.

1225 Registrar is looking at ECG of patient A5. "heart is a little fast but patient has chest infection so that could be the cause of the fast heart beat". Looks at old patient notes	Shows mediation through the artefact of patient notes. The use by the doctor of patient test results as an artefact in the doctor diagnosis activity system.
1230 Doctor is still looking through different patient documents	Mediation in the doctor diagnosis activity system through the artefact of patient notes.
1235 Registrar finishes and goes to talk to patient and patient's wife. (Patients may have had a stroke). The patient has constipation. The Doctor speaks to the patient's wife.	Illustrates patient as object as a sentient being and part of family community.
1240 The registrar is bleeped and uses the telephone. writes notes on Doctor 'jobs to do' sheet asking questions it's a referral from a general practitioner	Illustrates inter-working of activity systems. The Doctor 'Jobs to do' sheet is an artefact used as part of the MAU patient care activity system to ensure patients are attended to. Bleep, telephone and jobs to do sheet as mediating artefacts.
SPR talks to the patients wife. Asks about home condition and the support available.	Indicates the 'decision on what to do' is broader than simply diagnosing what illness the patient has.
1247 Registrar and the wife finished talking. SPR goes to the nurses station and uses telephone	Shows use of communications artefact.
1246 nurse returns blood sugar test form to the box.	Illustrates inter-working of activity systems. Nurse actions as part of diagnosis activity system.
There on no beds free at present. One is empty but a patient is expected.	Researcher MAU status observation.
1255 the registrar discusses patient and identifies a social problem describes situation to the acting matron to get the HIT team to pick up the patient	Illustrates inter-working of activity systems doctor diagnosis and hospital social care activity systems.
Researcher leaves the MAU	
Notes written on a train at 1330 after leaving st George's. a patient had been reported as behaving aggressively and had been exhibiting strange behaviours - strange grunts and shouts This reflects what the lead consultant said about the wider links of the MAU with social care through the H I T Team. It looks like the registrar had concluded from looking through the notes that there was no serious medical problem that needed resolution (a chest infection was being treated with antibiotics) the registrar said this to the acting matron	Researcher reflective note. Posits that intended outcome is not simply a definition of patient illness but a broader aim of identifying what to do for the benefit of the patient.

1550 back on the MAU. Bed A1 has a new patient. A3 and A5 are occupied all other patients have gone	Researcher MAU status observation. Illustrates context and operation of MAU patient care activity system through constant turn-over of patients

1600 patient A1 is being clerked	Shows doctor diagnosis activity system
1610 patient A5 goes to Richmond Ward and is "kept in overnight "	Illustrates inter-working of activity systems.
1630 SHO has taken blood sample and is writing blood bottles for patient A4 writes	Illustrates inter-working of activity systems blood test form and blood sample as boundary crossing

blood test form and is taken to a basket by the nurses station. This is for the patient who was admitted previously 3 March but discharged according to a record in the MAU admissions book.	artefacts. How the MAU instigates action for the patient in other departments of the hospital.
The staff nurse returns from taking observations of A4	Illustrates inter-working of activity systems. Nurse actions as part of diagnosis activity system.
1645 the registrar writes out a new Doctor 'jobs to do' sheet using the old sheet, has 3 bleeps	Job to do sheet as artefact in MAU patient care activity system.
1648 SHO is writing notes for patient A4 using notes written by the nurse	Mediation through the artefact of patient notes. Illustrates interworking between different roles within the MAU.
1650 SPR takes call and tells caller to ring a different number	Illustrates inter-working of activity systems.
1654 registrar continues writing in Doctor 'jobs to do' sheet	Job to do sheet as artefact in MAU patient care activity system.

1710 consultant Ward round. Registrar uses notes to describe patient condition and the consultant asks questions and gets responses from the Doctor	Mediation of the Hospital and MAU patient care activity systems through the artefact of patient notes.
Evening registrar arrives and day registrar describes patients and conditions using Doctor 'jobs to do' sheet. this is the new one written out by the day registrar	Jobs to do sheet as mediating artefact in the MAU patient care activity system
Registrar hands over bleeps to evening registrar	Bleep as mediating artefact in the hospital patient care activity system
Consultant leaves the MAU	Researcher MAU status observation illustrates context of MAU operation.
Evening registrar and SHO discuss the Doctor 'jobs to do' sheet list and allocate SHO to see to patient	Jobs to do sheet as mediating artefact in operation of the MAU patient care activity system
Another SHO arrives and is allocated a patient to see	Doctor diagnosis activity system and MAU patient care activity system.
1745 patient A6 arrives the nurse writes out notes for the patient	Mediation through the artefact of patient notes. Operation of nurse patient care activity system.
The consultant is with the day registrar with patient A4. the consultant discusses the patient with the day SHO and other SHO and day registrar	Operation of the MAU patient care activity system.

1805 nurse from A&E describes patient condition to MAU staff nurse who writes entry in admissions book the A&E nurse hands over patient notes	Illustrates inter-working of activity systems.
1808 consultant speaks to patient A1 and tells the patient what is happening - this is a stay overnight and have tests	Illustrates patient as object as a sentient being.
Patient A1 brought in on trolley and is clerked by the SHO	MAU patient care activity system
1810 Registrar takes a call about a patient condition and bleep goes. Registrar discusses new patient condition and takes notes.	Operation of the hospital patient care activity system
The nurses discuss patients. One says "I'm going to catheterise him"	Operation of the nurse patient care activity system.
Another doctor arrives and waits for the registrar	Researcher MAU status observation

1820 Registrar is still discussing and confirms the acceptance of patient and writes on the Doctor 'jobs to do' sheet	Operation of the hospital and MAU patient care activity systems. Jobs to do sheet at mediating artefact in MAU patient care activity system.
Registrar allocates a doctor to patient in A2 registrar says need to cut to the chase to identify why she is here today she has lots of history	Operation of the MAU patient care activity system
Registrar heads off to get notes for A6 and sees patient A6	Mediation through the artefact of patient notes.
1830 SHO is still clerking A7 Registrar is still clerking A6	Operation of doctor and MAU patient care activity systems.
1840 Doctor emerges from A7 and tells patient's friends that she will be taking blood test. Doctor returns with blood test equipment.	Operation of doctor and MAU patient care activity systems. Illustrates patient as object as a sentient being and part of community.
1843 staff nurse updates admissions book with details of patient A7 and does a general update	Nurse action as part of MAU patient care activity system
1844 registrar writes Doctor patient notes and looks at nurse patient notes and referral letter	Mediation through the artefact of patient notes.
SHO from patient A7 writes up blood test chart and checks notes	Mediation through the artefact of patient notes.
1850 Staff nurse updates nurse patient notes for patient A1.	Nurse action as part of MAU patient care activity system. Patient notes as mediating artefact in MAU patient care activity system.
Registrar looks at BNF and continues writing notes.	Mediation through the artefact of patient notes.
Staff nurse updates computer system with patient notes for patient A1 and A2	Illustrates inter-working of activity systems. Nurse action as part of MAU/hospital patient care activity system.
1855 SHO asks staff nurse to do 'Sats' and observations for patient A7	Illustrates operation of nurse patient care activity system and observations as common object between nurse and doctor activity systems.
Staff nurse tells patient A1 he will be transferred to Richmond Ward	Nurse and MAU patient care activity systems. Illustrates interworking of activity systems.
Registrar is on telephone discusses readings of a patient "she has been scanned " discusses whether patient should be scanned and suggests that she should.	Illustrates inter-working of activity systems.
Staff nurse writing out blood test form	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.

1901 SHO says to patient A7 and friends "we will not know exactly what's going on until we have done a few more tests"	Illustrates patient as object as a sentient being and part of family community.
Registrar writing out beige forms	Mediation through the artefact of patient notes.
SHO describes the patient condition to registrar	Inter-working between doctors.
Registrar suggests possible previous incidents	Inter-working between doctors
SHO and registrar discuss possibility of anticoagulation medicine and whether they should be given before blood test results are taken	Inter-working between doctors.
SHO writes out Doctor patient notes on white sheets uses blood gas sheet this is a white till roll	Mediation through the artefact of patient notes.

1907 a student Doctor is clerking patient A2 or A3	Indicates how students are trained 'on the job'.
SHO describes blood gases to staff nurse and describes general condition. SHO up dates the Doctor 'jobs to do' sheet then writes out blue chest x-ray request form and walks off towards A&E "she has a lactose level of seven" the registrar voices concern.	The use by the doctor of patient test results as an artefact in the diagnosis process. Illustrates inter-working between different roles within the MAU.
Staff nurse takes nurse patient notes with A7	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.
1922 patient A5 arrives in a wheelchair by porter.	Portering activity system
Researcher asks about lactose level - normal level is 1.2 and patient A5 has a level of seven	Researcher interrogates an actor to clarify MAU process and signifier.
SHO takes blood test kit to patient A5	The obtaining by the doctor of patient test results as an artefact in the diagnosis process.
Registrar orders x-ray using a blue form for patient A6	Mediation through the artefact of patient notes.
1940 SHO returns to the table with blood results and tells PRHO that patient A5 is really ill "bicarb is XXX why should lactose be so high?"	Mediation through the artefact of patient notes. Inter-working between doctors.
PRHO describes patient condition to another SHO (Ward cover)	Inter-working between doctors.
SHO asks about the patient's social situation PRHO describes patient ability and the doctors discuss the possibility of sending the patient home and what needs they have. "haemoglobin is chronic - white cells seven"	The use by the doctor of patient test results as an artefact in the diagnosis process. Inter-working between doctors.
PRHO says "it's not cellulitis". The SHO and PRHO discuss the patient. SHO describes possibilities "worth... normal criterion are", "people who need...." "see what other".	The use by the doctor of patient test results as an artefact in the diagnosis process. Inter-working between doctors.
Registrar puts head on desk and says "it's a factory it's a factory" referring to throughput of the patients	Doctor reaction to MAU patient care activity system.
1950 SHO is with patient A5	Doctor diagnosis activity system
1954 PRHO orders a chest x-ray on a blue form	Doctor diagnosis activity system Illustrates inter-working of activity systems – doctor and hospital test systems.
Staff nurse does blood reading for patient A2	Nurse action as part of MAU patient care activity system.

2005 staff nurse discusses booking beds in Richmond for patient A3 and A7	Illustrates inter-working of activity systems. Nurse action as part of MAU/hospital patient care activity system.
PRHO tells staff nurse that three patients can go for x-ray	Illustrates inter-working between different roles within the MAU.Illustrates interworking of activity systems.
Staff nurse is writing nurse patient notes	Nurse action as part of MAU patient care activity system.
Phone rings and staff nurse says " I have 2 empty beds at the moment" and writes on Doctor 'jobs to do' sheet. Says "I have to move 2 patients to Richmond then can	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.

accept them. I will phone you when I am ready"	
2010 PRHO still writing Doctor patient notes the white sheets for patient A2 files and writes beige form	Mediation through the artefact of patient notes.
Staff nurse returned to desk with beige forms for A6	Nurse action as part of MAU patient care activity system.
Phone rings staff nurse says waiting for porter for x-ray	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system. Indicates contradiction as the MAU patient care activity system is held up by lack of portering to take the patient for a test.
Phone rings staff nurse gives patient condition summary for transfer and says "that leaves me three empty beds"	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.
2020 staff nurse takes patient A6 for x-ray in a chair	Illustrates inter-working between different roles within the MAU. Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.
SHO asks student why patient would have "peaked right atrial... " student makes suggestion SHO Says not right - registrar returns and SHO describes condition and readings of bicarb reading. Registrar reviews condition elements and medication and comes to no conclusion "need to look up causes of lactosis" SPR suggests " keeping her hydrated and hope it goes away, need to check again before we go home"	The use by the doctor of patient test results as an artefact in the diagnosis process. Interaction/knotworking between doctors as part of doctor patient care activity system. Illustrates how student doctors gain knowledge through attendance on wards.
2030 SHO "could have had multiple PES which could cause the problem"	The use by the doctor of patient test results as an artefact in the diagnosis process. Interaction/knotworking between doctors as part of doctor patient care activity system.
A fat patient file for patient A3 arrives and is filed by a nurse in filing box for A3	Nurse action as part of MAU patient care activity system. The filing box system as a mediating artefact in the MAU patient care activity system (and see * below).
A2 is taken by the staff nurse to x-ray	Illustrates inter-working between different roles within the MAU. Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.
PRHO looks at patient file for patient A3	* The paper based patient record as a mediating artefact in the doctor diagnosis activity system.
Phone rings and staff nurse gives details of patient A7 and A4 for transfer. She reads out a description of the patient condition.	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.
SHO asks the pharmacist questions and checks bnf (British National Formulary)	Inter-working between doctors – link between MAU and other specialisms in the hospital.
2037 staff nurse takes blood pressure equipment to patient A5 and gives a blood pressure test	Illustrates inter-working of activity systems. Nurse action as part of MAU patient care activity system.
Staff nurse says "awaiting oxygen to be able to take patient A7 for x-ray"	Nurse action as part of MAU patient care activity system. Indicates contradiction as MAU patient care activity system is held up by lack of oxygen resource.
Researcher speaks to student doctor who has been in the MAU this afternoon. He describes the learning process as taking	Researcher interrogates an actor to clarify MAU process.

history and presenting to more senior doctors or consultant. He has clerked one patient today.	
Patient A3 goes to Richmond Ward	Illustrates inter-working of activity systems.

2115 day registrar is in a handover meeting with night team. The staff nurse asks "do you want patient A1 on cardiac monitor" SHO says "no"	Illustrates inter-working between different roles within the MAU. Nurse action as part of MAU patient care activity system.
Researcher leaves MAU	

In the above table, the events observed in the MAU over one observation day have been described and interpreted. The analysis carried out has shown how the actions of individuals have related to use of individual artefacts and co-working as part of what Engeström (Engeström, 1996; Engeström, 2001) described as the 3rd Generation of activity systems analysis relating to multiple interconnected activity systems. In the following sections, the operation of the MAU will be described and analysed from multiple perspectives as appropriate to building a case study of complex operations (Yin, 2009).

The cultural and historical basis of activity systems – the MAU in a historical context

The cultural and historical dimension of CHAT recognises that any activity is founded in both history and a cultural setting (Davydov, 1999). This means that it is important to place any activity system being studied in its historical and social setting. This is based on the premise that any artefact used in an activity is a reflection of historical development and is culturally dependent. The implications on the research is that it is necessary to understand how the activities and entities that are studied were historically and culturally founded. The operation of the MAU may be seen in two main historical situations, pertaining to the two levels of the study – the individual (doctor) level and the organisation (MAU) level. For the doctor, the role and practices may be seen to be embedded in the history of the development of medical practice and practitioners over mainly the last 200 years. Thus the role taken on by the medical specialty doctor is based on the practices of their predecessors and governed by their professional association – the College of Physicians. The influence of the College on broader MAU practice is demonstrated through the reference to College derived practice specified in the NHS Emergency Assessment Units guidance (Alberti, 2003).

For the MAU level, the setting may be seen as the development of hospital based acute services in the early 2000s and in particular the definition in 2003 of the MAU as a separate operational unit to the A&E unit (Great Britain. Department of Health, 2000; Alberti, 2003). Thus the operations of doctors within the MAU reflects the path dependency of both individual and organisational historical situations, the implication of which is that these histories were different and thus potentially contradicting. An example of this contradiction is the use of generic medical specialists for the specialist medical assessment function.

The conclusion from this historical view and the interpretation of discussions with doctors in the MAU is that the observed events in the MAU were based upon cultural embedded practices built up over time but related to the bureaucratic structures of the UK National Health Service. In the context of this research study, it has been necessary to limit the extent to which analysis in this historical dimension has taken place, that is an emphasis is placed on what happened, why it happened and the intended effect of it happening in relation to making sense of individual action in the light of desired outcomes.

6.3 What are the characteristics of the individual patient care activity system?

In this section, the individual patient care by doctors in the MAU, relating to diagnosis, will be analysed. The analysis is based upon the observations of events as described in the 'day in the life of' shown previously, the recording of events as shown in Appendix Y, the identification of key events in Appendix X, discussions with doctors, nurses and the Acting MAU Lead Consultant and examination of MAU documents. The following section will analyse the operation of the MAU level patient care activity system, then the linking between individual and organisational activity systems will be discussed in order to identify how the two levels relate, thus addressing the research questions. The analysis in this section is informed by the activity theory framework (Engeström, 1993) as shown below.

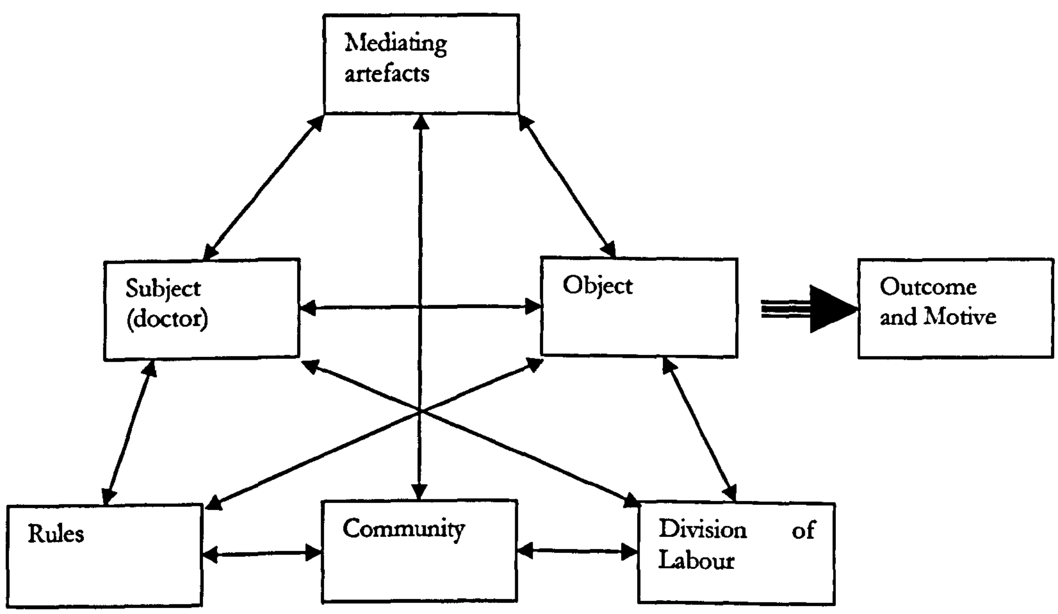


Figure 25 Doctor diagnosis activity framework based upon Engeström (1993)

The doctor as subject - capabilities of the doctor

The subject in the doctor diagnosis and treatment decision making activity system was the individual doctor. Each doctor on duty in the MAU was there because they had been allocated through the medical rota. To be qualified for this role, the doctor either had to be a member of the St George's General Medical team or an appropriately qualified locum (ref. interview Medical HR Manager, interview with locum 31 January 2006). Because of the doctor rota system, the observation carried out for this research was of whichever doctors were on duty on the observation day. Therefore the doctors observed in the study were assumed by the researcher to be neither unique nor fully representative of their peers. From the investigations of secondary sources recorded in Chapter 4 and discussions with the doctors in the MAU, they were assumed to be equipped with a range of knowledge about the body and its potential defects along with experience of particular cases. They also had knowledge and experience, gained through their practice, of the way that medical teams carry out their work, commenced from observation during their medical studentship and continuing through their work placements (ref. interview with doctors 31 January 2006,10 February 2006, 6 March 2006, 10 March 2006 (Wenger, 1998; St George's Hospital Medical School, 2004).

The nature of the object and outcome and motive of doctor activity

The object is the entity that is the focus of the activity (Leontiev, 1981) or the subject matter of work (Marx, 1930). From the descriptions of the diagnosis process in the literature (Gale and Marsden, 1983; Orient, 2004; Fields, Isaacs and Stroobant, 2005) and the observations of doctors in the MAU, what they uttered and discussions with them, there were three separate objects.

- The doctor's understanding of the patient condition. This was the particular set of circumstances that were combining to cause the signs and symptoms in the patient and that the doctor was seeking to identify or diagnose. This is illustrated by the doctors' examination of patient files and test results and the development of the doctor patient notes (Appendix P) e.g. DILO 20.10 (approx.) *Registrar reviews condition elements and medication and comes to no conclusion "need to look up causes of lactosis"*

- The patient as a sentient being with hopes and fears as well as a body with a medical history and a set of signs and symptoms. This is illustrated by events such as DILO – 12.35 *Registrar finishes and goes to talk to patient and patient's wife. (Patient may have had a stroke). The patient has constipation. The Doctor speaks to the patient's wife.*

- The decision about the next action or course of actions for the patient – what further investigations should be carried out to achieve diagnosis or should the patient be discharged or admitted to a main ward. This is illustrated by events such as DILO – 19.40 (approx.) *SHO asks about the patient's social situation PRHO describes patient ability and the doctors discuss the possibility of sending the patient home and what needs they have. "haemoglobin is chronic - white cells seven"*

From observations and discussions with doctors, during diagnosis and treatment decision making, the doctor's attention switched between the objects. Regarding the patient as sentient being, there has been recently a greater emphasis in medical schools on doctors being able to communicate with the patient in a more peer to peer relationship rather than from a position of power (Orient, 2004). This is reflected in the MAU objective of doctors developing treatment plans 'with the patient' (St George's Healthcare NHS Trust, 2006b). The decision on the course of action also included whether the doctor had sufficient evidence upon which to justify the diagnosis at the Consultant ward round (Ref. DILO 20.37 interview with locum doctor).

Outcome and motive of the MAU doctor activity system

The outcomes of the MAU activity were a diagnosis of patient condition and a decision regarding treatment e.g. DILO 19.40 (approx) *SHO asks about the patient's social situation PRHO describes patient ability and the doctors discuss the possibility of sending the patient home and what needs they have.* A further outcome was that the patient record had been completed with diagnosis and treatment information (Interview with MAU consultant 10 March 2006). The direct motive of the activity was to 'clear the bed', that was to reach a decision on patient treatment that has been put into action. This was so that another patient may be admitted. (comment by doctor on 31 January 2006 'objective is to see as many patients as possible' which also contextualises the comment made by the duty SpR reported in the DILO (19.40 approx.) of 'it's a factory!' as it often appeared that an endless queue of patients were waiting to attend the MAU). A potential contradiction in examining the outcomes and motive for the doctor was between the imperative to reach a decision on treatment and the perfection of a diagnosis. Potentially the doctor may wish to continue diagnosis even after a decision on treatment has been identified. This could be for the motives of safeguarding in preparation for interrogation by the duty Consultant during the MAU ward round or from professional interest.

Doctor diagnosis and treatment decision making activity system

As seen from observation as reflected in the DILO, diagnosis and treatment decision making comprised firstly 'clerking'. Clerking is the term given to the gathering of patient data by a doctor as part of the medical diagnosis and care process (Gale and Marsden, 1983). Information was also gained from hospital records, general practitioner notes and through ordering and using the results from diagnostic tests. This was followed by the generation, sifting, rejection or confirmation of hypotheses about the cause of the complaint and the identification of suitable treatment. (White, 1959; Meyer, 1968; Polanyi, 1969; St George's Hospital Medical School, 2004; Fields, Isaacs and Stroobant, 2005). From observation and discussions with doctors, the results of diagnostic tests were used by the doctors as a pointer towards patient condition and as an aid to diagnosis. The Acting Matron stated that it was a practice for certain tests to be carried out as a matter of course, either in the MAU or A&E department. These included basic observations – blood pressure, temperature and blood tests. (See Appendices Q, R and S) Additional tests were carried out as a matter of course depending on the patient complaint, for example, chest x-ray for suspected chest problems, ECG for suspected heart problems. However, this practice seemed to be a rule of thumb rather than a documented protocol. As part of the diagnosis process, doctors ordered particular tests such as specific blood tests, scans and special x-rays. Thus the diagnosis process was emergent based upon successive test results and diagnosis hypothesising. The data from the tests were entered on patient record sheets or the patient's computer record and if on paper, the test result documents were filed by the doctor or other staff in the patient record file. These results were also observed to be used to inform the doctor regarding any immediate treatment to be given to the patient such as re-hydration. Thus the DILO identifies these different actions for different patients: clerking and examination of patient records (Patient A2 at 10.20), examination of patient test results (Patient A5 at 12.25), completion of patient information form (Patient A1 at 10.22), completion of test forms as elements of the diagnosis process (Patient A4 at 16.30) and a decision on treatment taken (to move the patient to Richmond Ward at 11.50).

The diagnosis process including having tests in other departments and having test results returned usually a number of hours to complete, therefore the ongoing part of the diagnosis may be carried out by the first doctor who attended the patient or another doctor. The timing of the diagnosis process may be seen from the intervals between attention to particular patients in the DILO e.g. Patient A6 arrives in the MAU at 17.45, is seen by the Registrar at 18.20, has x-ray forms completed at 19.22, has forms brought by a nurse at 20.10, is taken by a nurse for x-ray at 20.20 and is not recorded as having been referred from the MAU by 21.15. Because of this timing, after initial clerking, subsequent attention by a doctor may be either from one on the same shift or from a subsequent shift where the patient stay had overlapped the shift periods. Therefore patient diagnosis was not dependent on the knowledge gained by one particular doctor but relied on the sharing of patient information between doctors on different shifts achieved through patient notes.

In clerking, the doctors used their own cognitive ability in order to guide questioning and identify possible diagnosis. With respect to this process, the MAU Consultant (10 February 2006) suggested that for a junior doctor to take an hour on clerking was normal, for a senior doctor to take an hour would reflect poor performance. This is to say that the senior doctor should know better the questions to ask to obtain the information needed for diagnosis or decision on next steps. As a result of clerking, the doctors generally made a note of the information gained (See example in Appendix P) then were observed to transfer this information to the patient record sheet e.g DILO at 10.22, see also Appendix M. From the observations carried out, considerable care and time seemed to be taken over this action. This was because the information may be needed by subsequent doctors caring for the patient and rewriting was part of the diagnosis process. The transposing of the record was observed to be being used by the clerking doctor to review the patient condition and identify possible diagnosis which aligns with theories of 'writing as thinking'. Hammarén provided an example of this concept - 'the act of writing provided an opportunity to articulate, structure and remember things to which we had never before given a language' (Hammarén, 2006, p 22). Thus this theory and the observations of the behaviour of the doctors in writing out these notes suggest this was an integral part of the diagnosis process. During diagnosis, the doctor may conclude that further tests are needed in order to supplement any test data already available and the information gained from the patient and any other informant. In order to obtain a test, the doctor used the appropriate test request form which guided the doctor in providing the information needed and indicated to the test department the kind of test required. The form thus mediated between the doctor and the expression of the results required. The test may be of a sample provided with the test form – such as of blood, or directly on the patient such as an x-ray or scan, in which case the patient was moved to the test department, usually by porter. This resulted in the patient being a common object between the interacting activity systems relating to doctor diagnosis, MAU patient care and hospital patient treatment (Engeström, 1996).

The doctor used an implicit embrained and embodied (Blackler, 1995) routine for diagnosis and sometimes referred to another doctor as an aid to the process, explored further in the next section. The actions of reaching a diagnosis were observed to comprise cycles of decisions to order further tests followed by consideration of test results against existing knowledge, a process that correlates with the timescales for diagnosis and the decision on treatment (averaging around 6 hours) recorded in the patient record book. Thus reaching a diagnosis was not a fixed predefined process but one that enfolded in the mind of the individual doctor in the light of their knowledge and experience and the particular conditions of patient, symptoms and signs. As the doctor's understanding of the patient condition developed, the doctor reached a decision about treatment – to discharge or refer to a main ward. This means that in activity theory terms the identification of the next steps 'what to do next' was itself an object that had to be developed and formed. Cognitive artefacts needed for development of this object was firstly an understanding of the routines by which diagnosis may be carried out, that is the testing process, then secondly the process by which a decision may be made on whether the patient malady is sufficiently serious to warrant hospital treatment.

In summary, during diagnosis and treatment decision making, the doctors used a combination of their own cognitive ability mediated through tools and signs comprising the diagnostic and procedural routines and resources such as other staff, test facilities and equipment and results in order to develop a decision on any further testing needed and on treatment. This is analysed further in the following sections.

Use of artefacts (tools and signs) in the MAU

Activity theory defines artefacts as the tools and signs used to mediate between the subject and the object (Leontiev, 1974; Engeström, 1993). In the MAU, there were a number of tools that bridged between the doctor and the objects – the patient, their illness and the treatment decision. For example, the doctors first carried out clerking and used the patient record proforma as a mediating artefact, either as direct or indirect guidance to the process and patient history forms as a way of recording the symptoms and signs of the patients (See DILO 10.20, 10.22, Appendix P). In activity theory, artefacts may be used at different levels relating to the level of the action being examined. In the actions of diagnosis and treatment decision making, there was the use of both visible tools and signs and apparent use of the invisible. For example, the visible included use of the patient record form (Appendix M) that guided action and hospital supplied equipment that provided patient related information to aid the development of the doctor's understanding of the patient condition and appropriate treatment. The invisible such as standard MAU processes were identified through observation of doctor behaviour with follow up discussions by the researcher with the doctor.

The environment of the MAU was a foundation artefact used by the doctors. This included the MAU floor space, beds and support systems, for example catering and refreshments. The hub of the MAU was the doctors' and nurses' workspace. This workspace comprised a small square table with 3 chairs with a trolley alongside. On the table was placed the MAU telephone, the MAU patient record book, the day's duty list of doctors and the current 'jobs to do' sheet. It was at this table that the major part of the actions associated with diagnosis and treatment decision making were observed to take place (other than when the patient was consulted or a doctor or doctors examined computer based test results). It was mainly at this table where the researcher was located during the observation period. At this table, the doctors transcribed and reviewed the notes they had taken during consultation with a patient, reviewed the patient's hospital record forms (See examples Appendices M to S), wrote investigation/test forms and had diagnosis discussions with other doctors (See DILO). Thus the table represented both an informal shared workspace for the doctors during the diagnosis activity and a means of making available necessary reference information such as the 'jobs to do' sheet and list of duty doctors (Appendices U and V).

The trolley alongside the table had two shelves, the upper of which supported a set of seven cardboard open topped filing containers. These containers were used for holding sequentially the patient records for the patients in beds one to seven. These patient records were used repeatedly by the doctors during the diagnosis process e.g. DILO 10.22. Sometimes a container held only the MAU patient record sheets, completed by the MAU nurses and doctors and the sheets completed in A&E, however, if the patient was previously treated at St George's, their main hospital file would be called for and would arrive and be deposited in the appropriate container for the patient, for access by the diagnosing doctor e.g. DILO 20.30. Test results in paper form were also deposited in the patient record container for access by the diagnosing doctor. The lower shelf of the trolley contained a selection of objects and seemed to act as a repository. Normally it contained a copy of the British National Formulary – a drug reference book and the hospital 'Grey Book' (St George's Healthcare NHS Trust, 2005a). This booklet contained a number of medical procedures applying to different medical and surgical subjects but was not observed to have been used by any doctor during the periods of observation. (Note that in the HAN survey described previously, the 'Grey Book' was one of the artefacts used by a doctor, showing it does get referred to at times by doctors)

In reviewing the use of artefacts a number of different items and categories may be identified as being used by the doctors during diagnosis and treatment decision making:

- The basic facilities in the MAU for the comfort of patients – bed, bed clothes etc.
- The shared workspace described above.
- MAU patient records provided a record of patient details, observations and investigations carried out and preliminary diagnosis information (Appendix M).
- Hospital patient records provided a history of the patient if they had previously attended St George's The doctors were observed to use these records as part of the 'problem space' (Simon, 1969) in seeking to identify the diagnosis (ref. DILO 12.25)
- Test facilities and equipment were used by the doctor to provide a window on the patient's condition (ref. DILO 12.25). Thus test equipment was used by the doctor to facilitate the diagnosis by making available information about the patient. This would support the associational and gestalt methods of problem solving (Meyer, 1968).
- Computer systems provided a view of the status of patients and test results (e.g. 22 March when patient record was checked to see if a particular test had been carried out in A&E and 10 March when patient's blood test results were accessed) They were also used as a means of sharing information about patients between doctors either during diagnosis or as part of the Consultant 'ward round' (e.g. group use of computer based

x-ray on 10 February 2006). However the computer terminals were located in the adjoining nurses station rather than in the MAU. Thus use of computer based patient records potentially interrupted the diagnosis process.

- Computer systems provided medical data (e.g. 22 March 2006 when the policy on aspirin use was accessed)
- Personal test equipment (e.g. 15 March 2006, use of stethoscope, 22 March 2006 use of reaction hammer)
- Telephone and bleep were used for communication and coordination (e.g. DILO 12.40 use by Registrar of bleep then telephone for discussing possible admission of a patient with their GP)
- Patient throughput data in the MAU patient record book used for identifying details of a patient (see Appendix L)
- MAU 'jobs to do' sheet used by the doctors on duty to decide which patient was to be seen by which duty doctor (e.g. DILO 17.10 approx.) (see Appendix V)

Thus the doctors used a number of organisational resources as mediating artefacts. These related both to aiding directly in the diagnosis process as part of the doctor diagnosis activity system and to organising the patient treatment activity as part of the MAU patient care activity system. In considering the three objects identified previously, specific use of artefacts in mediating between the doctor and the objects were observed to be as follows:

Between doctor and patient, doctors were observed to use record sheets in order to assist in note taking during history taking discussions with the patient. Doctors used test equipment in order to understand the physical condition of the patient. Additionally, certain test results were used by the doctor in order to explain their condition to the patient.

Between doctor and patient condition, the sign based results of investigations were used along with history data in order to build an information set upon which diagnosis could be carried out (H.A Simon's 'problem space' as quoted in (Mayer, 1992)) The re-writing of clerking derived patient information by the doctor and the lengthy time during which the patient notes of a particular patient were perused by the doctor (often an hour long action) emphasised the role of the patient notes in the diagnosis process (Hammarén, 2006).

Between doctor and decision on treatment, it was apparent that the doctors used the information set and diagnosis notes as a basis for deciding on the treatment of the patient i.e. discharge, referral or holding for further tests. However the precise way in which this occurred, based on the innermost cognitive processes of the doctor, and its relationship with the diagnosis process described above was not open to the research method. However, that there were linkages between the information set, diagnosis and decision on treatment was made visible during the ward round process when doctors used the artefacts in explaining their diagnosis and decision on treatment to the Consultant (e.g. observations 31 January 2006, 15 February 2006)

Thus the study has observed that artefacts were used directly by doctors during the activity of diagnosis and treatment decision making and the roles of the artefacts have been suggested. Additionally, the concept of the object has provided a further perspective on the diagnostic process by identifying the three separate objects that were the attention of the doctor each of which were the focus of action and specific use of artefacts.

Doctors interaction as division of labour during diagnosis in the MAU

The division of labour (Engeström, 1993) involved in diagnosis and treatment decision making comprised various separations of task and certain interactions between the subject doctor and others in the MAU community, for example other doctors, nurses, managers, test departments and the patient. The interaction between the MAU duty doctor and other hospital functions is illustrated by conversational exchanges between the duty doctor and a pharmacist (22 March 2006), the Bed Manager (6 February 2006), HIT team (10 February 2006), Radiologist (17 March 2006) and Cardiac specialist (15 February 2006).

It was observed that on occasions, two or more MAU doctors had a discussion regarding the diagnosis of and treatment for a particular patient e.g. DILO 19.01. (see also observations on 21 January, 25 January, 31 January, 26 January, 1 February, 15 February, 17 March, 22 March in Appendix Y). This was sometimes interspersed with non-patient related chatter between the doctors and at times dialogue drifted between the two modes. Based upon observations and analysis of the patient related dialogues, the situation of these conversations varied and may be described in terms of the dimensions of how clearly a diagnosing doctor understood the patient condition and treatment and the formality of the situation. This is described in the diagram below.

The formality axis refers to the formality of the situation in which the interchange took place. For example, based on observations of doctor behaviour, the Consultant review was taken as a formal occasion but ad-hoc discussions between two doctors was generally taken as an informal occasion. The Certainty axis refers to the apparent certainty or otherwise at the time of a dialogue of the diagnosis regarding the malady of the patient and the treatment decision.

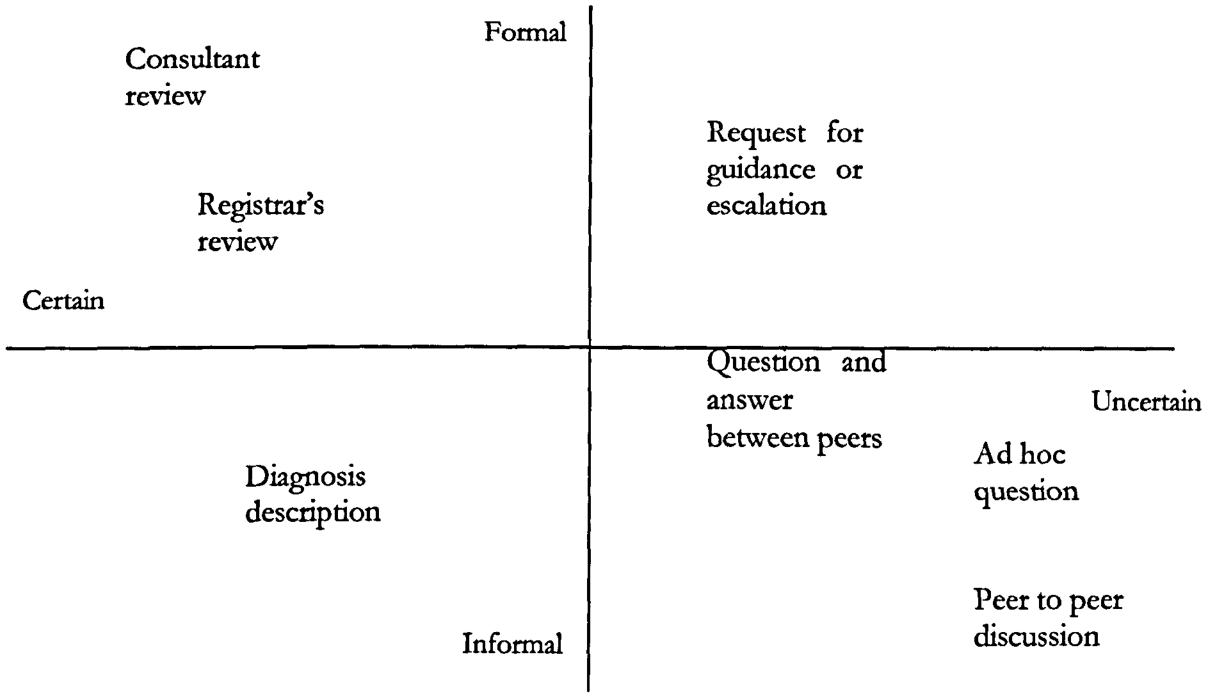


Figure 26 Communications between doctors in the MAU

At one end of the spectrum, a doctor may have been quite confident in their diagnosis but have to report their conclusions as part of the scheduled Consultant review round. (e.g. observations 31 January 2006, 15 February 2006, 6 March 2006) This was a situation where the formal review took place. The purpose of this interchange as described by the doctors was a review of the diagnosis and treatment decision and the approval of conclusions and treatment decision i.e. the Consultant may approve or modify the conclusions of the more junior doctor. This occasion was part of the formal processes by which doctors operated and mirrors (or may be seen as part of) the processes used during general ward rounds (Medical HR Manager). This process was reflected at a lower level of formality by the review of more junior doctors' conclusions of patient diagnosis by the duty SpR (e.g. observations 15 February 2006) and the conclusions of a student by a junior doctor (e.g. observations 1 February 2006).

At the other end of the spectrum were much less formal situations where a variety of dialogue took place. (e.g. observations 21 January 2006, 6 March 2006, 17 March 2006, 22 March 2006) These were observed with the doctors concerned sitting at the MAU table, usually while examining patient records, notes and test results.

A doctor apparently having no clear diagnosis in mind sometimes used another doctor as a source of specific information or knowledge, for example checking the symptoms of a particular malady. Reference the observation on 22 March 2006, a doctor asked another about the effects of use of antibiotics. In this case, the apparent hoped for and expected response was the specific information requested. This appeared to be using the other doctor simply as an information source.

Alternatively, in unclear diagnosis situations, the clerking doctor sometimes used dialogue about the patient condition in an informal way as a way of clarifying their own mind or voicing a tentative diagnosis. Reference observations on 22 March 2006, a doctor uttered 'what would cause a patient to keep falling over?'. This kind of utterance was observed between doctors at the same grade or between different grades. This was also part of knowledge sharing by the doctors and using peer dialogue as a way of expressing ideas about the patient condition and diagnosis. In these cases it appeared from the utterances and following behaviour that the questioning doctor may not have expected a specific response at all. Where a response was given, it may have been in the form of a specific or tentative suggestion or a question. These tentative discussions sometimes died with no specific outcome or sometimes led to a more structured dialogue. Reference observations in DILO 19.07, a doctor voiced 'what can cause a lactose level of 7?' This was not a specifically placed question and the other doctor did not provide a reply to the question nor any other response. The first doctor did not repeat or follow up the question. It may be concluded the first doctor was 'thinking aloud' but giving the second doctor an opportunity to contribute if able.

In a more structured form, sometimes doctors entered a question and answer based discussion (e.g. DILO 19.01). This question and answer activity continued with the diagnosing doctor providing information from their notes or embrained and either voluntarily or in direct response to the questions of the other doctor. This division of labour may also be seen as the diagnosing doctor using the other doctor as a diagnosis tool to assist in moving towards a satisfactory diagnosis.

This dialogue sometimes moved into a discussion where the signs and symptoms were discussed in peer to peer mode in order that the range of diagnosis could be identified either separately or in combination by the two doctors. This was using the two doctors collaboratively as a combined but two component tool for diagnosis.

When a doctor appeared to be quite certain of the diagnosis, they were observed sometimes to take an informal opportunity to run through the patient condition with another doctor of a higher grade or a peer in order to test their conclusions. This led sometimes to another form of dialogue such as described above if the conclusions were not confirmed.

In certain circumstances, where a clerking doctor was uncertain of the patient condition, they were observed to request the advice of a more senior doctor or escalate the situation. This was particularly relevant where the patient condition was giving concern. This represented a standard practice and procedure under which doctors operated, that is, they were expected to consult a more senior doctor in these situations. (ref. interview with MAU Consultant 17 March 2006).

The behaviour of doctors' joint working described above reflects aspects of Engestrom's concept of knotworking, a form of joint working different to a team or network where individuals take part in a 'rapidly pulsating, distributed and partially improvised orchestration of collaborative performance between otherwise loosly connected actors and activity systems' (Engeström, Engeström and Vahaaho, 1999, p 346). This is the coming together of doctors and other roles in an informal but object related work episode either face to face or with spacial or temporal separation and connected by communications systems or artefacts. The observation of such practices as part of the doctors' work suggests it played a part in the diagnosis and decision making process and that the form of discourse and outcome were influenced by the context and participants organisational structure relationship.

Processes and procedures as rules for the doctor

According to activity theory (Eskola, 1999) carrying out activity means working to explicit and implicit rules, therefore doctors working on diagnosis will be conforming to a set of rules that influence their behaviour. In the context of the MAU, these included hospital processes and the inherent rules of behaviour for professionals carrying out professional tasks, for example ways of interacting with patients. There were also the rules of conduct associated with the cultural setting of Southern England and London and those associated with the doctor's own culture. Examples of this were the general lack of formality between SHO and SpR grades, contrasted with the greater apparent formality of the Consultant ward round review. Also the apparent easy acceptance by MAU staff of the researcher being seated at the MAU table seemed to reflect the culture of shift working where an individual may be rostered to work with many different people over time and the organisation of the hospital based upon independent specialties. The cultural rules were also reflected in the uniforms worn, the specific nurses uniforms, the white coats of medical students, wearing of stethoscopes round their shoulders by doctors and the smart suits worn by consultants. Through these uniforms, the identity of the different roles could be identified or guessed and appropriate response identified (Giddens, 1984).

From the observations carried out and discussions with doctors at various times, the activity within the MAU followed a number of common processes, described previously thus representing the rules in use. However, there was no written rule or process apparent in the MAU apart from notices for hand hygiene and posters for the polite addressing of elderly patients. Filed in the lower part of the 'patient record' trolley was a copy of St George's 'Grey Book' which gives procedural guidance for a number of potential situations, however very few of these were apparently pertinent to the MAU operation and there was no observation of any doctor referring to the Grey Book. Thus the doctors were operating to a set of implicit St George's specific and general practice rules common within their community of practice (Orr, 1990; Wenger, 1998). The key processes that were observed associated with doctors' activity of diagnosis and treatment decision making are described below:

• The diagnosis and treatment decision making activity followed the process described previously in this thesis comprising clerking, investigations/tests, decision making and discharge or referral as identified in the DILO. This process was broadly as documented in the medical texts e.g. (Gale and Marsden, 1983; Orient, 2004)

• Change of duty staff was accompanied by a handover process of review of patients and communications between the doctors finishing duty and the doctors commencing duty. (e.g. DILO 17.10). This was asserted to be an important process by a Consultant (ref. statements by Consultant 15 February 2006) The practice of handover in the MAU reflects the observed activity in the St George's HAN study described previously, that is, it may be viewed as not MAU specific.

• Allocation of a doctor to a patient followed the process of review of the 'jobs to do' sheet (e.g. DILO 17.10) (Appendix V) but also influenced by the NHS four hour target (Ref. observations 15 February 2006).

• The Consultant 'ward round' represented both a way of authorising patient referral but also a 'check and balance' on the decisions being made by the doctors on duty (e.g. observation 31 January 2006, 15 February 2006) This process was also reflected in the review discussions carried out between more senior and more junior doctors at a less formal level (e.g. DILO 20.20).

• Manual patient records were systematically updated by doctors and nurses and computer patient records were updated by the doctors, nurses or receptionist (Ref. DILO 10.22 and other numerous examples).

On inspection, a number of these observed processes were directly associated with the process of diagnosis and treatment decision making and others were at a higher level, relating to the overall process of patient treatment by the MAU as a unit.

Whilst these processes at the activity and action levels broadly reflect those in the literature regarding MAU operations and St George's own documented procedures (St George's Healthcare NHS Trust, 2003; St George's Healthcare NHS Trust, 2005a) the doctors on duty were not observed at any point to refer to written procedural guidance. In order to investigate this area further, the researcher asked a doctor new to the MAU how he knew what to do while working in the MAU (10 March 2006). This doctor indicated that he had worked in the MAU previously and that he learnt the procedures from other doctors on duty. Additionally, the processes were similar to those he had encountered in other hospital medical assessment units. The process of learning from more experienced doctors through questioning dialogue was observed on the occasions when more junior or student doctors were working in the MAU (e.g. observations 8 February 2006, 22 March 2006). At the action level, a number of the materials used in the MAU provided implicit guidance to the procedure to be used, for example the layout of blood test forms indicated the information to be written in.

In this section, the individual patient care by doctors in the MAU, relating to diagnosis, has been analysed. The doctors have been identified as using their own capabilities, use each other and artefacts in the form of test equipment and test results to carry out diagnosis. They have also used forms to obtain patient related action such as x-ray tests in other parts of the hospital. In the following section, the operation of the MAU level patient care activity system will be analysed, then the linking between individual and organisational activity systems will be discussed in order to identify how the two levels relate, thus addressing the research questions.

6.4 What are the characteristics of the organisational activity system of the MAU?

In the following section, the observed operations of the MAU are analysed at an organisational level using an activity theory perspective based upon the definitions by Engeström (1993, 1996, 2001). The unit of analysis or activity system under study is the MAU based diagnosis and treatment decision process for the population of patients presenting (from A&E or their GP) with what were thought to be medical problems. Following the diagram below are descriptions of the subject, object, outcome and motive elements of the activity theory framework related to the MAU organisation. This is followed by a discussion of the other elements on the MAU activity system – the role of doctors, artefacts, rules, community and division of labour. This is in order to understand the organisational level activity of which the doctor diagnosis activity was a part and as a precursor to identifying the linking between the individual and organisational levels.

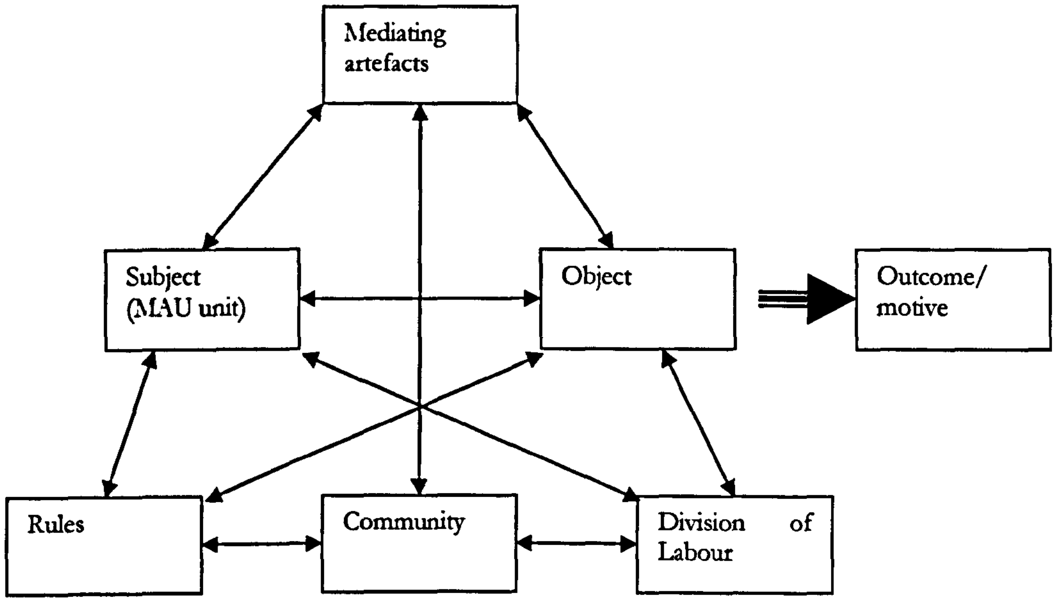


Figure 27 Activity theory framework pertaining to MAU as organisational unit, based upon Engeström (1993)

The MAU as subject

The subject in activity theory terms (Engeström, 1993) is the Medical Assessment Unit as a functional entity within St George's. The MAU as subject was studied by discussion with the MAU Lead Consultant, Acting Matron and Director of Medical Services. The documents describing the role of the MAU and the job description for the MAU Lead Consultant provided written evidence of the objectives of the MAU (St George's Healthcare NHS Trust, 2003; St George's Healthcare NHS Trust, 2006b). From these sources and the observations carried out by the researcher, the MAU was identified as a discrete unit with an organisation structure and a physical space with resources. The MAU was separate from but working with other organisational units – A&E, the Medical firms, test departments and other St George's specialties such as Coronary Care. The MAU activity system relating to medical diagnosis interacted with and was part of a network of interacting activity systems within St George's (Engeström, 1996; Engeström, 2001).

The object in the MAU activity system

The object of the MAU was the cohort of unwell patients who had presented either at St George's A&E or their General Practitioner and for whom a decision had been taken that they were suffering a medical problem that may need them to be admitted to hospital (interview with Acting Matron 25 January 2006). This cohort comprised a variable number of patients each day who arrived in a random-like pattern and included both those resident and those awaiting admission to the MAU (See January 2006 throughput – Appendix W).

Outcome/motive of the MAU activity system

As described by the MAU Lead Consultant and the documentation pertaining to the objectives of the MAU, (St George's Healthcare NHS Trust, 2003) the intended outcome was the diagnosis of the patient condition such that a decision was made about treatment for the population of patients awaiting attention by the MAU. The motive was the provision of medical assessment services as a part of Acute Services to the community as defined by the guidance to hospitals by the Department of Health (Society for Acute Medicine, no date). The motive, based upon the job description for the MAU Lead Consultant and MAU strategy documents, may also be described as the non-referral to wards of patients who did not need further ward based treatment – i.e. those that could be discharged or treated in an out-patients department (St George's Healthcare NHS Trust, 2003; St George's Healthcare NHS Trust, 2005a; St George's Healthcare NHS Trust, 2006b). Thus the motive was a combination of achieving an appropriate decision whilst not referring patients to a ward unless needed.

From the records of patient movement held in the MAU, in January 2006, 329 patients were referred on to Richmond Ward, 50 were discharged, 55 were referred to a main ward and 17 were referred on to other departments such as the Surgical Assessment Unit. Therefore for the greater majority of patients, the MAU was a stepping stone to further attention in the hospital rather than being discharged. The spread of outcomes suggests that the MAU carried out a genuine role of deciding on discharge or admission though the high numbers being referred to Richmond Ward suggests either the decision process was too slow to hit the 12 hour target or that non-availability of a bed in a main ward (which happened on numbers of occasions during the observation period) meant that a patient was moved on to Richmond Ward as a holding action. Thus this reflects a lack of organisational competence in relation to its objective of patient diagnosis and raises the question of what role the doctors and other resources play in the MAU process.

Diagnosis and treatment decision making activity system in the MAU

In this section the MAU patient care activity system will be described from the organisational viewpoint, followed by discussion of the roles of the activity theory framework elements.

As identified in the DILO, on arrival in the MAU, both A&E and GP patients were subject to MAU information gathering activities to supplement information already available upon which diagnosis may be based (See Appendix N, O). The nurses obtained general and social details from the patient which were recorded on the patients MAU record sheets (see Appendix M). The patient was clerked by one of the duty medics. The allocation of this clerking doctor was by the duty Special Registrar (SpR) in the light of the patient waiting and diagnosis situations though it was observed that SHOs on duty did commence clerking where this was needed even if the SpR was not present at the time. For example, this was when a patient arrived and a duty SHO was not busy at that point in time. The clerking doctor obtained a relevant history and started the diagnosis process making notes on the MAU patient history forms about the patient condition (see examples Appendix P).

The clerking doctor ordered appropriate tests in order to make and confirm the diagnosis and decide on the discharge or referral of the patient. Orders for tests that involved another hospital department were completed on an appropriate form and sent via the A&E 'post box' to the test department where the MAU tests were said to get priority treatment (ref. Acting Matron). The test department normally allocated a porter to collect the patient for the test and return them afterwards to the MAU. After a test had been ordered, the clerking doctor checked from time to time whether the test results had been delivered back, either on paper or on the patient's computer record. Tests results such as x-ray and scans were normally delivered via the computer system but ECG tests were returned on paper.

Decisions about discharge or referral were taken by the duty SpR with input from the clerking doctor. These decisions were subject to approval by the duty Consultant either at convenient times of the day or during the evening ward round. If a patient was to be moved to another ward, the duty doctors, nurses and Bed Manager collaborated in deciding on the time of transfer and then on the actual movement of the patient with their notes. This was normally by physical movement of the patient's bed. On discharge of a GP referred patient from the MAU, the duty SpR normally wrote a letter to the GP to inform them of the findings of the MAU visit and any recommended actions. Sometimes, rather than having a specific medical problem, a patient may have had an underlying issue of a social nature, for example excessive drinking, drug taking or in the case of the elderly, a general level of frailty combined with a lack of caring resources. In these cases, it was observed that the SpR on duty contacted the St George's Social (HIT) team to seek to find solutions that would enable the patient to be discharged with appropriate help. In certain cases, the patient was discharged from the MAU but advised to attend an outpatients clinic. This was observed also to be organised by the duty SpR. Thus the SpR took a lead in the practical decision making and action about the patient. The MAU patient care activity system, in addition to the doctor diagnosis system also included other activity systems such as the nurse patient care system, cleaner activity system and food preparation system. The MAU patient care activity system also interacted directly with the A&E patient care system, the GP patient care activity system and the general wards' patient care activity systems with the patient as a common and boundary object between them (Engeström, 1996).

Artefacts

As identified in the DILO, artefacts at the MAU unit level were of two categories, those specifically pertaining to the diagnosis of patients and those of a supporting nature but not directly related to the patient. The artefacts relating directly to patient treatment included the MAU ward space and beds and its patient test equipment, test results delivered from other departments and records keeping systems. Artefacts of a supporting nature that indirectly affected the patient included computer terminals, filing systems, seating arrangements, sink and hand wash facilities and the forms used to instigate action in other hospital departments – such as for patient testing.

At least one of the seven MAU beds needed to be spare before a patient could be admitted. Shortage of a bed (i.e. all beds allocated and patient waiting) was observed to lead to a breakdown in the system associated with the treatment chain. (ref observations, 1 February, 9, 10, 17, 22 March 2006, discussion with Acting Matron 25 January 2006) A shortage of a bed in the MAU meant that patients who should have been admitted could not and had to remain in A&E or be moved to another ward. A similar picture applied to the situation where there were no beds available in wards taking patients from the MAU. Patients had to stay in the MAU bed which meant that another patient could not be allocated to it. Each of these situations was a contradiction (Engeström, 1999), a disruption to normal operation. (Ref. Records in MAU Patient Record Book of doctors seeing patients in A&E rather than in the MAU e.g. 10 January 2006, Patient A6 who arrived at 16.30, Patient A5 who arrived MAU at 16.45, Patient A2 who arrived MAU at 18.30) Thus the MAU diagnosis function could 'spill over' into the physical surroundings of A&E. However, the MAU nurses always remained on duty in the physical location of the MAU. It was observed that there was often a delay of some hours before a GP referred patient presented themselves at the MAU. Because a bed was allocated at the time of acceptance this also potentially impacted the MAU's ability to accept further patients. The duty nurses were observed to keep a running status check on beds that were occupied, those that were empty and those that were currently empty but allocated. The nurses worked collaboratively with A&E and the hospital's Bed Manager in identifying when A&E patients could be moved to the MAU to take their allocated bed. It was observed that there were times when it was not clear to nursing staff if an empty bed was already allocated to a patient (e.g. 14.53 on 31 January 2006). Thus management of the status of beds was also an important capability of the MAU in achieving throughput.

The community of the MAU

The community comprised the social setting within which the MAU doctor operated, for example being part of a team or group and working with others (Engeström, 1987). At the heart of the community were the doctors, nurses, secretaries, porters, cleaners and catering staff who were on rota for duty in the MAU along with the patients and their families. At this level also lay the duty Medical Bed Manager who had a great deal of interaction with the MAU doctors and nurses. At a broader level lay the medical 'firms' from which the MAU duty doctors were allocated and the Richmond Ward nurse team from which the MAU duty nurses were allocated. (See Appendix U) It also included the hierarchy of management within St George's, the GPs who sent their patients to the MAU, the local population and the NHS local and national structure.

Most day to day activity in the MAU was acted out by the patients, nurses, doctors and ancillaries, however the broader community took a greater role in exceptional circumstances. Examples are the involvement of the hospital HIT team in resolving patients social problems, the activity of the hospital crisis team when an outbreak of a vomiting virus broke out in the hospital which affected (and closed for some time) the MAU and the involvement of the Wandsworth Research Ethics Committee in approval of this research project.

Division of labour of the MAU

The division of labour reflected the staffing structure and its inherent split of functions, activities and process responsibilities. An example was the split of functions between the MAU and A&E, Richmond Ward and the main medical wards. This reflected the value add organisational structure suggested by Porter (Porter, 1980). The role of the MAU in division of labour terms may be seen in relation to the A&E function as a way of separating out and giving care to A&E patients with a suspected medical problem. This is reckoned (Society for Acute Medicine, no date; Wood and Rhodes, 2003) to be the most effective way of carrying out the decision making about patients presenting at A&E. The MAU operation also divided the task of initial diagnosis from the ongoing treatment of the patient which was carried out in the main medical wards of the hospital. There was also a division of labour between the MAU and other hospital functions such as the Pharmacy, Radiology and other test departments and the hospital's HIT (social services) team.

The MAU was staffed by teams of appropriate specialists, in the main nurses and doctors. However other specialties played a role in the activities of the MAU. The responsibilities of the various roles were observed and described by incumbents, the Acting Matron and MAU Lead Consultants to be as follows:

> Doctors: accepting patients into the MAU, making a diagnosis and deciding on the further action needed for a patient. The doctors also took blood samples, inserted lines and carried out other minor procedures. Finally a doctor either authorised the discharge of patients or authorised and negotiated their referral to another hospital ward or

department. The doctors also maintained the patient record with patient condition and diagnosis information.

Nurse: general care and wellbeing of the patient, taking social history. Maintaining hygiene of beds. Taking blood samples and where qualified, ECG tests. Monitoring bed availability and arranging movement of patients.

Nurse Practitioners: Taking blood samples, inserting lines, carry out other minor procedures as qualified.

Bed Manager: coordinating bed availability and patient movement between A&E, the MAU, Richmond Ward and general medical wards

MAU Matron: coordinating and managing overall patient throughput in the MAU with the medics and Bed Manager. Management of nursing resources. Ensuring supplies and consumables were available.

MAU Consultant: coordinating and managing the overall operation of the MAU from a medical standpoint. Identification and requisitioning medical test equipment and other capital resources.

MAU Receptionist: Acting as reception to visitors, maintenance of hospital records for MAU patients.

MAU Patients and their families: providing information about the patient condition/symptoms to the doctor

Auxiliaries: maintenance of supplies, managing the preparation and storing of patient food. Serving patient food and drinks.

Porter: Taking patients to and from test departments in coordination with MAU nurses, doctors and the test departments.

Cleaners: Cleaning the environment of the MAU.

As can been seen from the description of roles described above and identified in the DILO, there were clear divisions of labour established within the MAU reflecting a firm organisational structure. In general each of the roles appeared to operate independently with only occasional interactions between them and reflecting the multiple interacting activity systems described earlier eng 96.

The most obvious division of labour was between the duty doctors and duty nurses. The doctors went about their business of diagnosis and nurses went about their business of patient care with little interaction. Examples of the rare conditions under which doctor/nurse interactions were observed to occur included a doctor/nurse dialogue regarding the nurse carrying out observations of a patient (ref. DILO 18.55) and a doctor suggesting that three patients should be sent for x-ray (Ref. DILO 20.05). There was no doctor/nurse discussion observed that related to diagnosis. A fine distinction observed was that almost always when the MAU telephone rang, it would be ignored by any doctors present and answered by a nurse, even if the nurse concerned was at the other end of the MAU unit and busy in a nursing action. The existing sharp separation of activities between roles illustrates the strength of the structure based upon role in the MAU (Giddens, 1984).

The MAU doctors were able to call on other specialties. This represents a division of labour in diagnosis and treatment decision making but also further indicates the MAU community. Specialists included for example a pharmacist when special advice was needed about drug admission (ref. observation 22 March 2006) and a radiologist was consulted when a doctor needed advice on interpretation of an x-ray result (ref. observation 17 March 2006). There was also another role present at times in the MAU that bridged the gap between the roles of doctor and nurse, a Medical Care Practitioner (MCP) was present on occasions (e.g. 26 January 2006) The MCP is a role that represents the capabilities of a nurse but with additional authority to carry out some test procedures normally having to be carried out by a doctor (ref. interview with MCP 26 January 2006). Thus the MCP represents some breaking down of the distinction between nurse and doctor and was seen to communicate more freely with both doctors and nurses than generally between the doctor/nurse combination.

Another specialty that influenced both the incoming of patients to the MAU and their subsequent referral, thus freeing up MAU bed space was the Bed Manager. The responsibility of the Bed Manager was to ensure that beds were made available when possible and used to the best effect (ref. discussion with Bed Manager 27 January 2006). The actions of the Bed Manager were observed to play an important role in enabling the flow of patients through the MAU and thus effective use of doctors' time. This was through the Bed Manager monitoring the status of patients and the beds and coordination of patient movement. (e.g. observations 6, 15 February, 6, 22 March 2006)

A number of other subsidiary roles managed other aspects of the MAU operation. For example secretaries and cleaners managed their own aspects of ward management and food orderlies managed aspects of patient comfort. Therefore, the MAU operation may be seen as a network of interacting activity systems (Engeström, 1996) based upon an interlocking set of independent professional role activities or communities of practice (Wenger, 1998). Particular mention may be made here about the ward cleaner who was observed by the researcher to be systematically, diligently and professionally carrying out an ongoing process of cleaning the MAU surrounds on each occasion that the researcher was observing and as reflected in the DILO (A contrast to 'filthy ward' stories (Hope, 2007)). Thus, each specialty was observed to be carrying out its role largely independently of others, the operation of the MAU being dependent on each specialty carrying out their role effectively.

Rules governing the MAU

From observations and discussions, no general medical treatments were given whilst patients were in the MAU. Minor treatments were given that were needed by the patient either for medical reasons (such as hydration) or as an aid to diagnosis. The MAU operated against the background of the NHS four hour target for Accident and Emergency attention. These targets stipulated that a patient presenting at A&E must be assessed and directed for treatment within four hours e.g. in the MAU and admitted if necessary within 12 hours i.e. assessment completed and the decision to admit taken.

'It is unacceptable for patients to have to wait for more than 12 hours from the decision to admit them to hospital. The NHS Plan envisages no patient having to spend more than four hours in A&E in total from arrival to admission, discharge or transfer.'

(Great Britain. Department of Health, 2000)

It was observed that MAU staff took specific actions to speed the admission of patients when they approached or exceeded being in A&E for four hours. An example that illustrates the effects of this rule was when the MAU was full but an A&E located patient was approaching the four hour wait. The Acting Matron reviewed each of the patients located in the MAU. He sought to identify blocks that could be removed to enable the patient to be moved on, thus enabling the admission of the waiting patient (Ref. observations 10 March 2006). Rules also related to the legal environment e.g. working hours legislation (the reason for the HAN study) and those of an ethical nature applying to health provision. An example of this was when a relative of a patient requested a doctor to look at his sore wrist. The doctor refused on the basis that he could not do so without giving the person a full examination in a formal way as a registered patient.

At a broader level, from observation and discussion with doctors, the operation in the MAU reflected the rules and processes of the normal hierarchical operation of medical firms in the hospital. An example is use of the normal morning and evening 'ward round' Consultant led process of review. (Observations and interviews with the Medical HR Manager and doctors). At a further broad level, the overall operation of the MAU conformed to both rules of action for NHS professional staff (e.g. distinctions between the activities of doctors and nurses) and the outlines for MAU organisation and operation set out in NHS, Medical Authority and St George's own guidance (Society for Acute Medicine, no date; St George's Healthcare NHS Trust, 2003; Alberti, 2003).

In contrast, the 'Grey Book' (St Georges Healthcare NHS Trust, 2006) located in the MAU contained guidance for doctors at the immediate patient level, for example in treating cardiac arrest, but not at the MAU activity level – i.e. what to do about the queue of patients waiting for attention by MAU or delays in obtaining test results. The MAU Operational Policy (Appendix I) only gives very general guidance.

In this section, the observed operations of the MAU were analysed at an organisational level informed by the activity theory perspective (Engeström, 1993) (Engeström, 1996). The unit of analysis or activity system under study is the MAU based diagnosis and treatment decision process for the population of patients presenting (from A&E or their GP) with what were thought to be medical problems. This has been in order to understand the organisational level activity of which the doctor diagnosis activity was a part and as a precursor to identifying the linking between the individual and organisational levels. It was identified that the MAU comprised an environmental structure within which multiple interacting activity systems operated either using the patient as a common object or the MAU workplace as a common object. The doctor diagnosis activity system was one that directly related to the MAU objective of providing the service of deciding whether patients who presented should be admitted to the hospital for treatment or discharged.

6.5 In the MAU situation, how do the individual and organisational activity systems relate?

This question relates to the roles of artefacts, rules, community and division of labour in linking between subjects and objects in achieving desired outcomes in and between the individual doctor diagnosis and MAU patient care activity systems. This relates to these elements as conceptualization of the mechanisms that link between the individual capability of doctors and the capability of the MAU organisation. This section will carry out an analysis of doctor and MAU level activity systems and their linking by examining the relationship between elements in the two levels. The two levels of activity system operating may be described as in the diagram below but were two of a network of multiple interacting activity systems operating around patient care in St George's (Engeström, 1996).

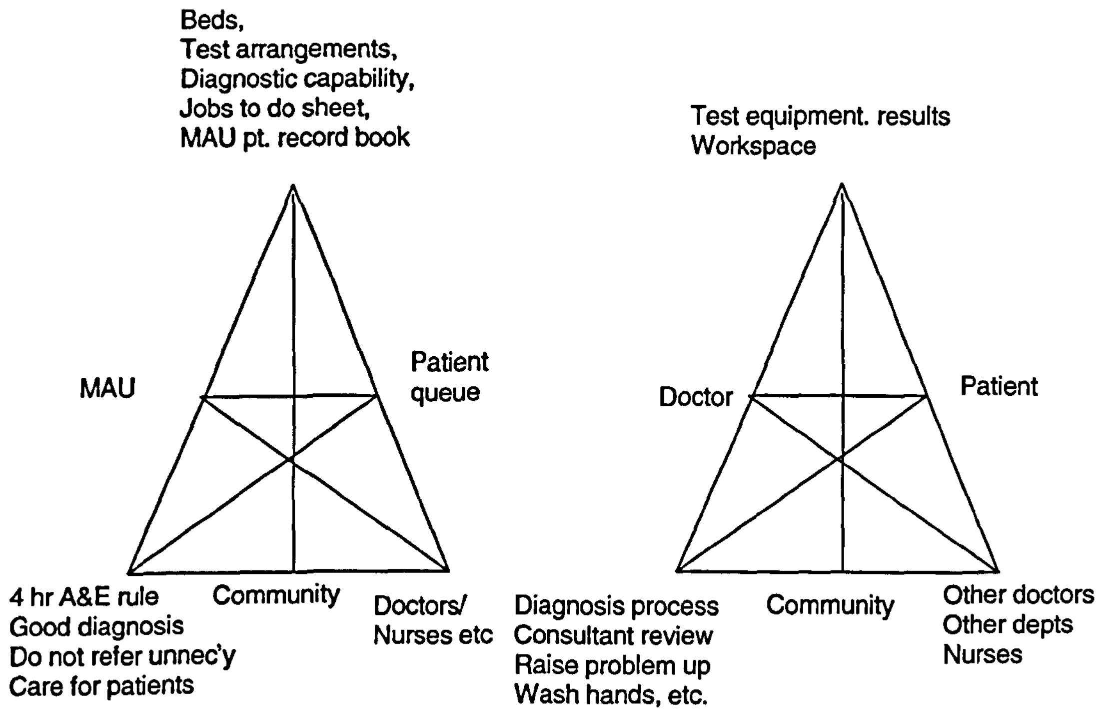


Figure 28 Organisational and individual activity systems in the MAU (Source author based upon Engeström 1993, 1996)

On the left may be seen the activity system relating to the MAU patient care and on the right, the activity system relating to doctor diagnosis.

In the MAU organisational patient care activity system, the object was the resident population of patients and those allocated to it but awaiting a bed. The intended outcome was the clearing of the patient queue or at least diagnosing patients at such a rate that MAU allocated patients in A&E did not have to wait more than four hours to be admitted.

The community of the MAU comprised the patients, nurses, duty doctors, ancillaries, cleaner, Acting Lead Consultant, Bed Manager and laboratory or test personnel and less directly other stakeholders in the hospital and within the general public. The relationship between MAU activity system and doctor action was that the doctor was part of a purposive structure and one of a number of separate supporting roles, along with for example, nurses with their general care of the patients, orderlies serving patients their food and the cleaner maintaining the cleanliness of the environment. The doctors' task of diagnosis and deciding on discharge or admittance was a critical element of MAU competence – the treatment of the queue of patients. Thus a MAU critical capability was its diagnostic and decision making ability, embodied in the form of the doctors.

The MAU organisation structure represented a hierarchy and spread of knowledge and skills reflected by the different grades of doctor – SHO, SpR and Consultant levels, and specialist doctors and other MAU roles. Division of labour was clearly differentiated by role and most roles carried out their tasks independently with little interaction representing interrelating activity systems with the patient or MAU environment as common object. The grade structure also influenced the more formal interactions illustrating a power difference between the grades but which was part of the 'check and balance' control system of the MAU.

The MAU patient care activity system used its artefacts to support patient diagnosis and their more general care. The seven beds and its other facilities such as wash basins formed a foundation. The MAU's own test facilities enabled rapid carrying out of tests. For tests carried out in other specialist departments, the arrangements by which MAU patients could have tests formed an important artefact, reflected in the Consultant objective referring to working with the hospital's Professional and Scientific Directorate on achieving rapid turnaround of investigations (see Appendix H). It also used the Jobs to do sheet and duty rota as a way of organising doctor work and thus ensuring the diagnostic capability was used effectively (See Appendix V and U).

The MAU worked to the set of culturally embedded rules suggested in the Lead Consultant's objectives of carrying out diagnosis, not referring patients to a main ward if they could be discharged and general care of the patients. The MAU operation was also influenced by the A&E four hour rule. For the MAU level patient care system, the rules reflected unwritten processes relating to admittance, patient data recording, diagnosis, referral and job allocation using the Jobs to do sheet. These processes were the way in which patient throughput was both achieved and controlled.

Within the overall MAU system of patient care the intended outcome of the doctor diagnosis activity system was the decision whether patients should be discharged or admitted.

In the doctor diagnosis activity system, the subject was the individual MAU duty doctor and three objects were identified - the sentient patient to whom the doctor was paying attention, the doctor's understanding of the patient condition and the formation of the decision on what to do next. The identification of multiple objects builds on existing theories that focus only on the first two objects – diagnosis and the patient as sentient being. Descriptions in the medical literature focus on the diagnosis object without taking the broader situation and the patient into account e.g. (Meyer, 1968; Gale and Marsden, 1983).

The intended outcome of the activity was the progression and completion if possible of an agreed decision on discharge or admittance of the patient. The doctor diagnosis activity system comprised actions of clerking, instigating tests, diagnosis and taking a decision on treatment. The doctors had to use their own capability to decide on and take appropriate actions in order to carry out diagnosis and reach a discharge or admittance decision. As part of this, they had to use inter-personal skills in information gathering from patients and balance the need to strengthen their diagnosis against the need to reach a decision on treatment such that the patient bed could be made available to another patient. This was an emergent process based upon the doctor's capability to identify appropriately 'what to do next'. This comprised decisions on the series of investigations that would provide the required level of certainty over the patient problem and thus the appropriate action. It used the doctor's cognitive ability mediated by tools and signs made available through patient records and tests. The tools and signs were derived from either the MAU test systems or test facilities located in other parts of the hospital.

Collaborative interaction in support of diagnosis was observed between MAU duty doctors and also with other medical specialties but rarely between doctors and nurses and other non medical roles. MAU doctors used each other and called on doctors of other specialties to support them in the diagnostic task. The nature of the doctor to doctor interaction was illustrated through the identification of a range of situations in which they occurred. These were related to the apparent certainty of diagnosis and formality of the occasion and showed different ways in which the doctors supported each other.

The hospital activity systems interacted with the doctor diagnosis activity system (Engeström, 1996) and provided a systematic way in which the MAU doctors could interact with test department facilities, mediated by the test request forms and the test result return artefacts. The facilities of the hospital such as test departments effectively became an agent of the MAU and the doctor in supporting the patient diagnosis process. This was illustrated by the problem caused to the process on the occasions when a porter was unavailable to take a patient to a test department which caused the diagnosis process to be halted. Thus the doctor diagnosis activity system interacted with the MAU patient care and other hospital activity systems such as those associated with tests (Engeström, 1996; Tobach, 1999; Engeström, 2001).

Artefacts were used relating directly to the three objects identified. These included the forms used to assist the clerking process and the equipment and the artefacts providing information about the patient condition and their history. Some equipment was within the MAU and under its direct control but tests located in a remote department had to have action instigated by the doctor and mediated via forms. Sign based artefacts describing the patient condition from patient records and test results were used as the problem space (Simon, 1969) that the doctor manipulated in order to decide on next actions, either in the diagnosis process or as a decision about whether the patient should be discharged or admitted (See Appendices N to S).

The artefacts used by the doctors were based upon technologies from the simple to the complex. Paper based forms, patient information sheets and MAU patient file were very simple but apparently effective. Test systems and computer based information systems were clearly of a more complex nature, the latter illustrated by the cost of the NHS patient record system and the problems being experienced in its implementation (Toussaint and Berg, 2001). Artefacts supporting diagnosis also included the work-space where the doctor carried out the activity and the 'discussion space' that enabled the patient related discussions between doctors. Computer based information in the form of patient records, notes and test results was used for individual diagnosis and group discussion both during diagnosis and during the Consultant ward round. The effect of the use of the technical systems was to make the diagnosis process time, space and individual doctor independent.

The telephone supported MAU operation and the doctors. It was used to communicate with the MAU duty doctors, for example by General Practitioners wishing to refer a patient and by A&E to arrange patient admission. The telephone was also used by the duty doctors to interrogate other parts of the hospital in order to progress diagnosis or make arrangements about the moving on of the patient thus enabling the MAU bed to be made available to another patient. The researcher noted during one reflective period that the MAU appeared to operate as a communications hub (Ref. 31 January 2006). The MAU telephone number sheets – (Appendix Y) copied from the inside cover of the MAU Patient Record book provides a view of the potential communications links needed.

The artefacts used by doctors played an important role in the linking between the interacting activity systems relating to the MAU and patients (Engeström, 1996; Engeström, 2001). These included the doctor diagnosis, MAU patient care system and the hospital patient care systems that supported the MAU diagnosis process. The artefacts included the patient record, the communications tools such as the telephone and forms used for instigating action in other parts of the hospital such as for blood tests and x-ray. The patient record systems in the MAU and at a hospital level enabled the MAU to continue the diagnosis of particular patients irrespective of which doctors were in attendance at any one time. Artefacts were used by doctors for identifying the state of the patient through testing, for recording of patient information, for guidance and communications across the hospital. At times the MAU operated as a central point in a communications network regarding possible patients coming into the MAU and arrangements by which the patients could leave the MAU. There were also foundation level artefacts in the MAU such as beds and fittings. The bed was a key facility as the throughput of the MAU was dependent on beds being available for incoming patients. The patient record not only acted as an information source but writing out of patient notes were observed to be part of the manipulation of the problem space (Simon, 1969) of the diagnosis.

It was observed that the doctors in the MAU worked to culturally embedded rules or processes that were mostly unwritten. These related to how to carry out diagnosis, the reporting of diagnosis decisions to the Consultant during ward round and raising problems to higher levels where appropriate. Completion of test forms and discharge notes identified the hospital processes that could be instigated by the doctor for their patient. The rules governing these processes came from within the broader hospital, for example test form completion and the wider world such as from general NHS practice and medical school.

The hospital operated other important activity systems that interacted with the MAU activity system (Engeström, 1996; Tobach, 1999; Engeström, 2001). One such activity system related to patient movement, coordinated by the Bed Manager. This system operated between A&E, the MAU nurses and the responsible nurse in other wards and responsible medic for these locations. This activity made the patients available to the doctor to be seen in the MAU and removed the patient once a decision has been made about treatment enabling another patient to be admitted. Maintaining a flow of patients out of a MAU once a decision has been made is crucial to a MAU's success (Alberti, 2003). Thus the activity of patient monitoring and movement linked to the effectiveness of the doctor diagnosis activity and hence the MAU level activity system. The activity system making materials available for the doctor for diagnosis and treatment decision making, for example blood test kits and patient record forms was also important to the doctor and MAU effectiveness. Alberti (2003, p 5) describes these as 'supporting systems and inputs' and included bed bureau, bed management, diagnostics, medical records, escalation policy, IT and access to care pathways. Each of these was apparent in the MAU study.

From discussions with the Acting Matron (25 January 2006), the activity system relating to purchase of additional resources was governed by the resource planning and budgetary processes operating in the hospital but there was little control felt by MAU staff of the process. (During the preliminary study in the MAU, a number of doctors complained that the MAU table was too small for the number of doctors and nurses who wished to use it. The researcher offered to purchase a larger table in appreciation of the help received but the Acting Matron declined the offer stating the reason for refusal was the amount of effort that would be needed to gain the approvals for this change to be implemented.) In conclusion, the intermediate activity systems operating in the MAU were observed to act as linking between the competent operation of the doctor diagnosis activity and the MAU level patient treatment activity.

The doctors, the MAU as a unit and the hospital had inter-linking activity systems. Doctors' diagnosis of individual patients relating to the MAU throughput system that linked for example into the hospital systems for bed management and investigations. The effectiveness of the doctors in the MAU was also influenced by other hospital level systems or structures, such as the agreements with test departments for carrying out of tests on MAU patients, the A&E four hour target that influenced priority of action, the Firm structure that called doctors away from the MAU when emergencies occurred with their other patients and Consultant ward round that affected when patients would be released from the MAU. A structure that became visible during the study was the operation of the hospital crisis team, who took action to cause closure of the MAU during an outbreak of a virus, then decided when appropriate that the MAU should be re-opened.

In this section we have identified the multiple linkages that tie together the diagnostic activity of the doctors to the overall patient care activity system of the MAU – relating to the decision on whether to admit or discharge the patients who have presented. The doctor diagnosis activity system has been demonstrated as being an integral element of the MAU activity system, however the doctor has made use of MAU artefacts including the MAU environment, test equipment and other staff. In the following section these findings will be related to the aims of the research and the theoretical framework identified in the literature review.

6.6 Conclusions - MAU as activity system in relation to the theoretical framework

The purpose of this study was to build on the data derived in the HAN study to identify in the specific organisational context of the St George's Medical Assessment Unit (MAU), the way that the actions and interactions of doctors and their use of artefacts related to the organisational capability of the MAU. The operation of the MAU has been analysed using the perspective of activity theory. There has been focus on two levels of the multiple inter-relating activity systems (Engeström, 1996) operating in and around the MAU, relating to the MAU as a unit and within the MAU activity system, the doctor diagnosis activity system. The linkages between these two levels (Tobach, 1999) have also been analysed. The conclusions from this analysis as follows.

The patient related activity system and thus the capability of the MAU was dependent on the doctor diagnosis activity. The success of diagnosis was dependent on the individual capabilities of the doctors, their use of interaction with others, use of artefacts in the MAU. In carrying out the diagnosis activity, the doctors followed MAU and hospital level processes and were influenced by MAU and hospital role and departmental structures. Thus there was a symbiotic relationship between the doctor and the MAU and broader hospital as a set of resources.

The doctors in the MAU were part of a specific structure of roles and hierarchy relating both to MAU and hospital as a whole, that included doctors and other specialties. Each role played its own part in the doctor being able to carry out diagnosis and the MAU its function of deciding whether patients should be admitted or discharged.

The doctors used their own capabilities and followed the practice of information gathering and hypothesis formation relating to the theory of diagnosis (Orient, 2004) as the way to achieve the intended outcome. This was identified as an emergent process where the doctor was constantly re-inventing the diagnosis process in the light of information being made available from tests.

In carrying out their diagnosis role, the doctors followed culturally embedded processes, enacting the rules of the MAU and hospital. One such process was how services were obtained from other hospital departments, guided by specific rules based on form designs to enable the communications between the MAU doctors and the other hospital functions.

The doctors used interaction with other doctors and specialties during the diagnosis activity. It was identified that different forms of interaction was carried out depending on the situation and it was hypothesised that two measures of the situation were the formality and state of certainty of the doctor.

Doctors made use of a range of technical systems both as an aid to diagnosis and for organising patient care.

Each of the areas discussed above identify how the doctors took action to carry out diagnosis mediated by their colleagues and artefacts in order to arrive at patient treatment decision. This activity contributed to the enactment of the organisational competence of the MAU, the Acute function and the hospital.

In the next section, the MAU as a queuing system will be examined.

6.7 The MAU patient pathway – how the MAU operated as a queuing system

This section examines the role of the linking factors between the MAU doctors and the capability of the MAU by using the perspective of queuing theory (Wilkes, 1989; Littlechild, 1991; Bose, 2005). A queuing system is where people (or objects) wait in queues for attention by some kind of server – either human or inanimate and 'whether or not a physical queue is observed' (Littlechild, 1991, p 153). The MAU represents a queuing system as the study observed that patients queued to get into the MAU, for attention by a doctor and for tests. If not discharged, patients would queue for a bed in Richmond ward or a main ward. The relevance of queuing theory is that it can be used to describe the operation of systems where throughput is important. This is the case with the MAU where a specific patient related objective was to 'reduce the overall length of stay' within the broader objective of reaching an appropriate diagnosis and decision on treatment (St George's Healthcare NHS Trust, 2006b). A full analysis of the operation of the MAU as a queuing system is beyond the scope of this enquiry. Rather queuing theory helps to highlight that an important part of the MAU's capability was in managing its queues and the doctor was an important influencer of how this was achieved.

MAU operations as queuing system

The patient related operations of the MAU were observed to be around the stages of acceptance, information gathering (clerking) , diagnosis and discharge or referral of the patient.

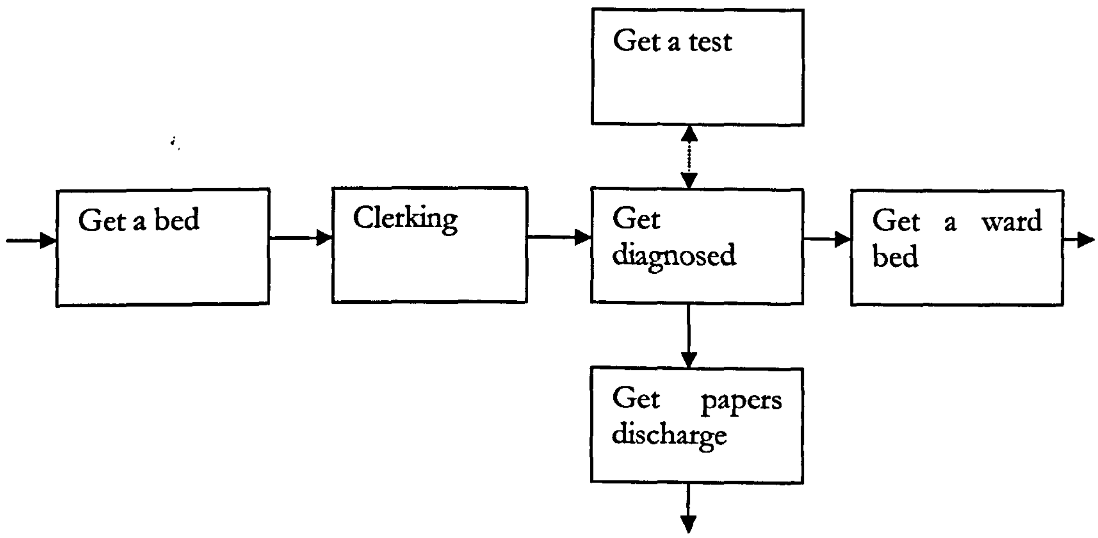


Figure 29 The MAU diagnosis and treatment decision process - MAU as a queuing system

In queuing theory, there are a number of conceptual elements (Wilkes, 1989; Littlechild, 1991; Bose, 2005) The object or person to receive attention is called the 'customer' and customers have a pattern of arrival. Thus for the MAU operation, the customer is the patient and the arrival pattern, the way in which patients present to the MAU as recorded in the MAU patient record book. The element providing the service is known as the server mechanism (Littlechild, 1991, p 155). In the MAU each of the service elements in the diagram represents a server function.

The dependence on allocation of a bed meant that the seven beds available in the MAU represented seven fixed server positions. Any patient to be treated in the MAU had to be allocated a bed – there were neither 'trolley' nor seating based facilities.

The doctors acted as a server, firstly to carry out clerking of the patient then during diagnosis and treatment decision making. The staffing structure of the MAU defined the number of doctor servers available to customers, thus typically there were three servers available (reference the MAU doctor staffing sheet - Appendix U) during the daytime period, though emergencies in other parts of the hospital were observed to cause the doctors to leave the MAU, thus reducing the numbers of servers. (e.g. at 13.43 on 17 March 2006) In queuing theory terms, this means that the customer (patient) had to queue in a variable number of doctor queues depending on the actual diagnosis process. The variability was dependent on whether the doctor was able immediately to decide on treatment or had to attend the patient and their records a number of times before a decision on treatment was made.

The test facilities also represented server positions with a variable demand – not every patient was subject to every test and patients may have had individual tests repeated such as blood tests. The wait for tests provided by a nurse or doctor were observed to be subject to the availability of the nurse or doctor and the test equipment. The wait for test department tests such as x-ray or scans were subject to availability of the equipment itself and the wait for a porter to take the patient to the test facility. The MAU patients were in competition or queuing with patients from other departments who were also awaiting the same test equipment, thus representing a queue of indefinite length. Once a test had been completed, there was a wait for test results to be made available – very short in the case of MAU based tests such as ECG but longer in the case of tests carried out in other departments of the hospital. The results of such tests were either delivered physically into the MAU or entered by the test department in the patient's computer record. In either case the doctor had to interrogate the computer system or patient record box in order to check if the result was available thus representing the patient waiting in another queue for the doctor to carry out this action.

Once diagnosed, if the patient was to be discharged, they entered a queue for completed discharge papers completed by the SpR on duty. The discharge papers had a number of elements that caused the patient to have to continue to queue in the MAU. It was also dependent on agreement by the responsible Consultant, either during a ward round or during the day should the Consultant be available. From observation, discharge may also have been dependent on the resolution of social issues such as arrangement of home visits. Thus the patient may be queuing for attention by this social processing procedure. Referral to another ward was dependent on a bed being available as it was not possible to accept a patient into a ward unless there was an empty bed. Thus patients in the MAU awaiting a ward bed represented a further queue.

The wait in any queue for any individual also depends on the way in which customers are served. In general the MAU queue discipline for initial clerking was observed to be first come, first served however from observation this was not always the case. For example, doctors on duty were observed to scan the MAU 'jobs to do' sheet and attend a patient who fitted their own particular skills or interests or had particularly urgent needs.

The queuing system in the MAU comprised a maximum of 7 people observably in the queue – the patients in a MAU bed who were waiting the attentions of doctors, or tests etc. However, when the seven beds were all filled, queuing theory suggests that there would be occasions when there were additional patients awaiting the allocation of a bed who were not visible to the observer. That is, they were waiting in A&E or their GP's surgery. This was verified by the occasions when it has been observed from the MAU patient record book that the MAU doctors have commenced clerking the patient whilst the patient was still in A&E and has not yet been able to have a MAU bed allocated (e.g. 10 January 2006) and when responses were given by nurses to enquiries that no beds were available (example 31 January at 14.53 hours) It is also implied by the times that all MAU beds were occupied e.g. 6 March 2006 at 10.15 hours.

In the terms described by Littlechild (1991) the MAU process was a complex queuing system which would need to be analysed using a technique such as simulation in order to build a full picture of its operation (reference the MAU study carried out by Oddoye (Oddoye, 2006)) However, a number of the general principles of queuing theory can assist in explaining how the actions of doctors, and their use of organisational artefacts related to the capability of the MAU in the situation of patients needing timely and accurate diagnosis and a decision on their treatment.

From first principles (Littlechild, 1991), the performance of a queue is dependent on the rate and pattern of arrival of customers and the rate at which customers are served. If the rate of arrival begins to approach the rate of service, then a queue forms and the length of wait in the queue will depend on the relationship between arrival and serving rates (Littlechild, 1991). This is illustrated in the diagram below.

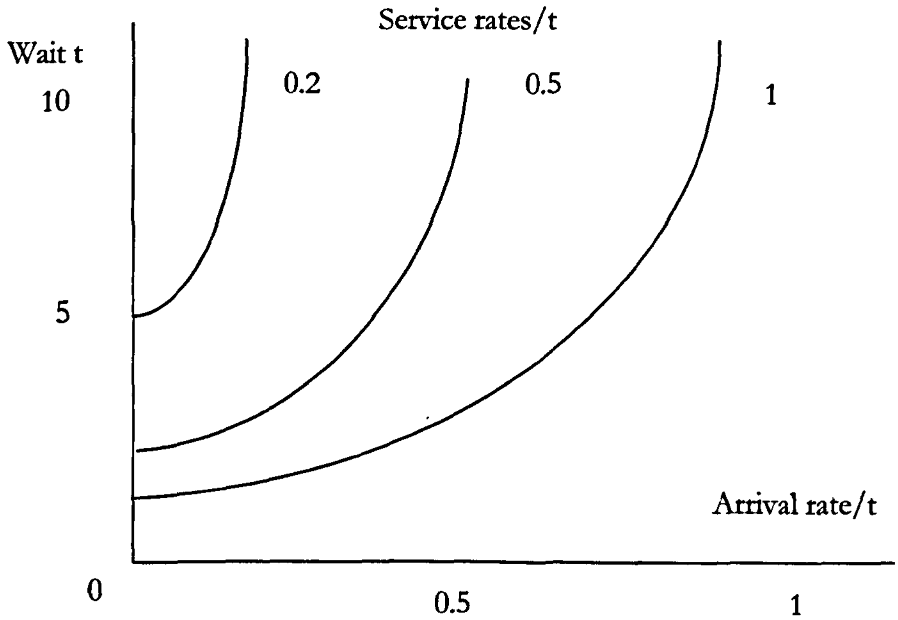


Figure 30 Relation between arrival rate and service rate and average wait in the system, sketch based upon Littlechild (1991)

In the diagram above, the wait in a queue may be seen in relation to the arrival and service rates. Service rates are expressed as customers per time period, arrival rate is expressed as customer arrivals in the same time period and wait is expressed also in the same time unit. This assumes that customer and server rates vary in a random-like pattern conforming to a normal distribution (Littlechild, 1991). The diagram shows that wait time increases considerably as arrival rate approaches service rate. Conversely, service rate must be very much quicker than arrival rate for a small wait to be experienced. In picturing the situation in the MAU, the relationship described above applies to each of the elements of the MAU operation. Thus how long it takes for clerking by a doctor, having tests, diagnosis by a doctor and allocation of another ward bed or completion of discharge notes impacts on attainment of the MAU objective to minimise patient stay (St George's Healthcare NHS Trust, 2006b). The implication of this may be viewed from two main perspectives for the MAU, with regard to doctors and test facilities. In each case the ability to 'service' the patient at a rate greater than their arrival rate is important to reducing queue size and hence wait. For the doctors, this would mean being able to complete their diagnosis and decision on treatment more quickly than the arrival of new patients. For the test facilities, this means service rate is greater that its arrival rate such that that results are returned quickly enough to support the patient diagnosis objective described above. This implies that patients need to be tested as soon as possible, preferably in the MAU because of delays in portering and waiting in test departments. For test departments, queue discipline needs to be related to the urgency of the

MAU process, i.e. MAU patients have priority over main ward patients who are not subject to short term stay imperative. There should also be minimum delay between the results being produced and the doctor attending to them.

Customer arrival pattern is important to the operation of a queuing system (Littlechild, 1991) therefore it is necessary to understand the pattern of arrivals of patients to the MAU. Patient arrivals and throughput from the MAU patient record book for January 2006 have been used for this analysis as the February and March periods were disrupted by sickness attacks that altered the normal operation.

The records of throughput for this period may be found in Appendix W but are summarised below. The first chart shows the patient arrivals each day in January 2006.

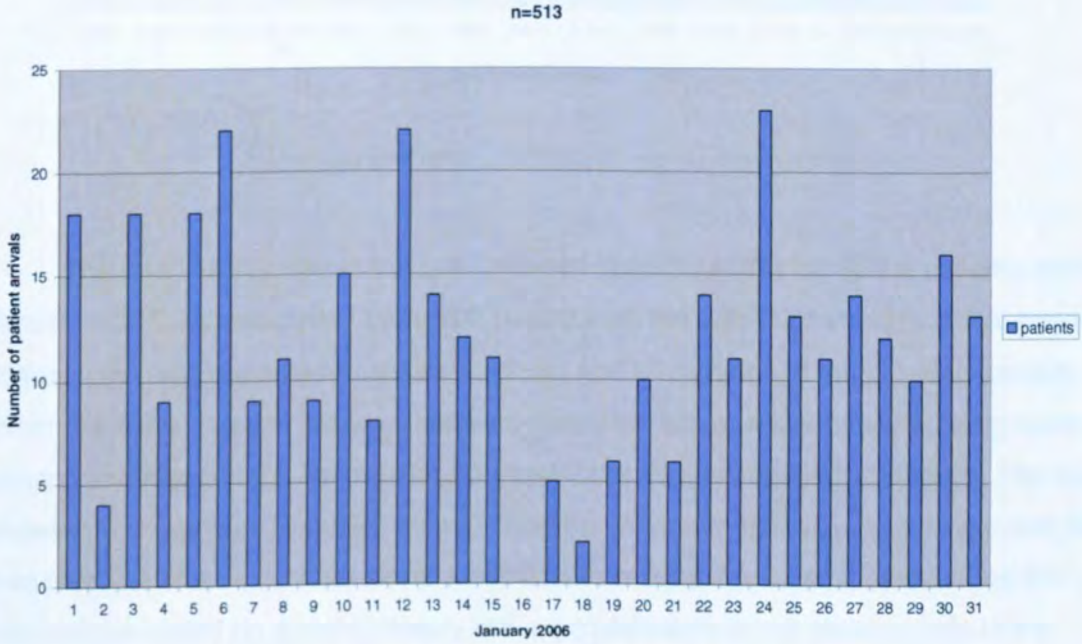


Figure 31 MAU study patient arrivals by day in January 2006

The mean arrival rate for patients during January 2006 was 11.8 patients per day with a standard deviation of 5.6 patients per day. This deviation is a relatively high figure which means that the number of patients seeking MAU attention varied considerably each day.

A further element of the pattern of arrivals of patients important to the operation of the MAU as a queuing system is the gap between arrivals - whether arrivals are evenly spaced. These data are described in the chart below.

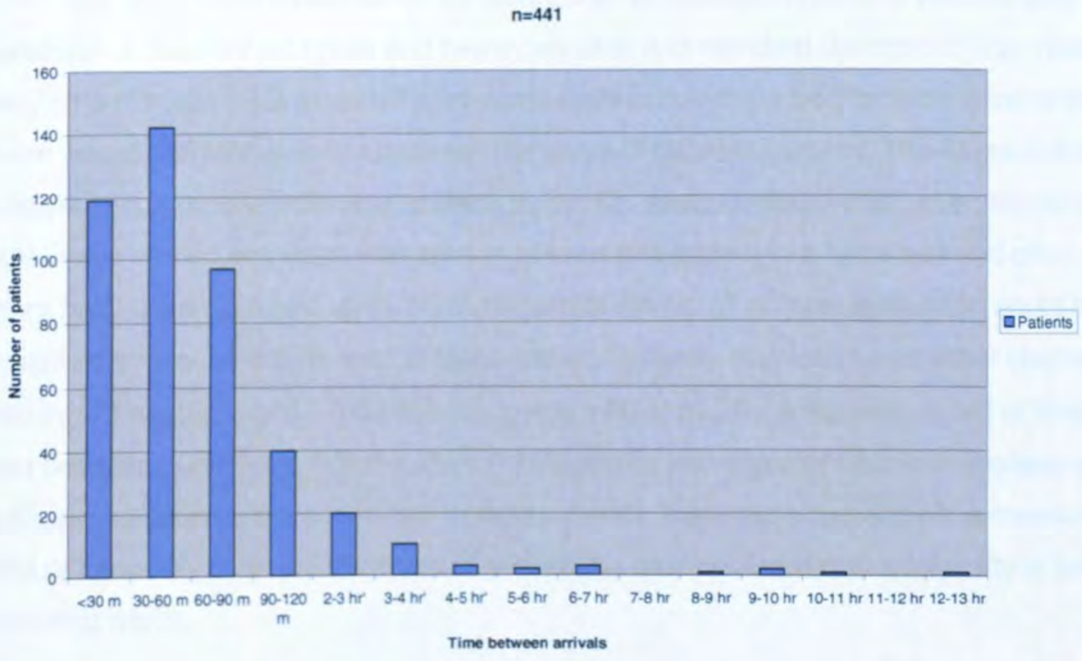


Figure 32 Interval between MAU patient arrivals in January 2006

The chart above shows the gap between patient arrivals for all the patients presenting in January 2006. For example nearly 120 patients arrived within 30 minutes of the previous patient, over 140 patients arrived between 30 and 60 minutes of the previous patient. The minimum arrival interval between patients was 0 i.e. two or more patients being recorded as arriving simultaneously. The maximum arrival interval recorded was 15 hours. The mean gap between arrivals was 1 hour 27 minutes and the standard deviation was 1 hour and 53 minutes. The chart exhibits a slewed distribution around the mean that indicates the calculations based on queuing theory are approximations since the accuracy of the calculations is based upon the gap between arrivals being a normal distribution (Littlechild, 1991).

The pattern of arrivals per day and through the day impacted on the MAU's ability to provide timely diagnosis and a decision on treatment. This is because related to an 'average' time for diagnosis and treatment decision making i.e. service rate, arrival rate on certain days and at certain times were considerably higher and thus queue lengths longer (Littlechild, 1991). In effect this implies that at times doctors will have a number of patients awaiting their attentions and at others may have no patients awaiting attention. An element of doctor capability is the ability to manage these fluctuating workloads so that patient can be discharged or referred as soon as possible. Both high and low states of demand for doctor attention were observed in the MAU at different times.

The MAU patient records for January 2006 (Appendix W) show a variable stay for patients – a mean of six hours and twenty minutes and standard deviation of four hours and forty nine minutes. This means that patients were occupying a bed for this period of time and there was significant variation between the stays of different patients. The degree of bed occupancy physically represents patient delay. On every occasion that observations in the MAU were carried out, there was always at least one patient in a MAU bed and often many more beds were occupied up to the maximum of seven. (A no-queue situation could be imagined where patients enter the MAU and are instantly diagnosed and either discharged or referred to another ward – thus not occupying a MAU bed for a discrete period of time). The bed occupancy confirms that the speed of diagnosis and treatment decision making was not sufficient to address the arrival rate of new patients. Thus bed occupancy is a measure of the MAU's capability in timely diagnosis of presenting patients, subject to availability of beds in following wards.

Performance of the MAU as a queue system

Queuing theory has been interpreted in mathematical terms (Wilkes, 1989; Littlechild, 1991; Bose, 2005) that makes it possible to make calculations about the performance of queues. This is only generally possible for simple queue systems and complex systems are reckoned to need simulation in order to model their behaviour. The basis for calculating the queue behaviour is the traffic intensity which is the average arrival rate divided by the average service rate. This is represented as $\rho = \lambda / \mu$ where ρ is traffic intensity, λ is arrival rate and μ is service rate. Where λ is greater than μ in any one period, the queue increases in length whilst if μ is greater than λ then the queue decreases in length over time. Thus the differing occupancy of the MAU beds represents variations in the arrival rate combined with variations in the service rate.

Thus queue length is directly related to average arrival and average service rates λ and μ. We have seen previously from the figure showing the relationship between arrival rate, service rate and average time in the system (figure 30) that the time in the system is very dependent on the closer that the traffic intensity λ / μ gets towards 1.

For the MAU in January, the average arrival rate was 0.5 patients per hour and the mean time in the MAU was 6 hours, 20 minutes.

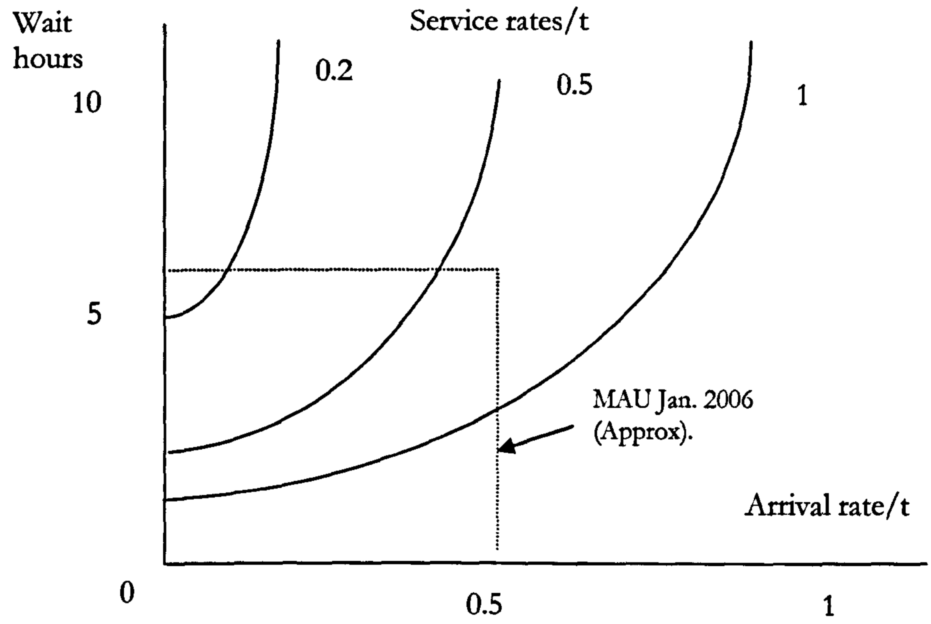


Figure 33 Arrival and service rate MAU January 2006, sketch based upon Littlechild (1991)

From the original of the diagram above, this represents a service rate on average around 0.7 patients per hour. The higher rate of service than arrival explains why the demand in the MAU does not continue to increase with ever longer queues for beds. However, increasing service rate μ would decrease patient time in the MAU, for example increasing service rate to 1 patient per hour (or twice arrival rate) would decrease the average time in the MAU from 6 hours to approximately 2.5 hours.

If all the MAU beds were occupied, a patient who should have been moved to the MAU could not and would remain in A&E thus potentially impacting the A&E four hour target. This would imply a lack of competence in the MAU handling its patient arrivals. Queuing theory provides a way in which this may be quantified in relation to the arrival pattern using calculations of probability of a queue of n

The probability of different queue lengths n is given by the formula

$P_n = (1 - \lambda / \mu)(\lambda / \mu)^n = (1 - \rho)\ \rho^n$ for n=1, 2.....

(Littlechild, 1991, p 160)

Based on an average arrival rate of 0.5 patients per hour (approximated from 11.8 patients per twenty four hours) and service rate of approximately 0.7 patients per hour, the probability of seven beds being occupied in any hour is 2.7% i.e. around 40 minutes per day and the probability of 8 beds (i.e. someone waiting for a bed) is 1.94% or around 28 minutes per day. However we have seen from the records of the MAU (e.g. Appendix W) that arrival and service rates varied widely therefore there would be more occasions where all beds were occupied thus arrival of new patients was capped by the lack of available bed.

Therefore the number of beds was an element of the capability of the MAU to handle patients wishing attention and the lack of spare beds would have limited the doctors' abilities to service the patients awaiting diagnosis. Reflecting on how this relates to the linking between doctor and MAU, since it was the doctor who through a decision on treatment, releases a bed then the doctor plays a direct role in enabling the MAU throughput by preventing the 'all beds full' condition.

Note that the calculations described are dependent on a random pattern of arrivals following a normal distribution, figure 32 demonstrates that a skewed but broadly normal distribution pattern of arrivals is experienced.

The first wait for a patient within the MAU was for clerking by a doctor. The chart below, based on the MAU patient record book entries, shows a scattergram in ascending order of the length of time that the patients waited for clerking during January 2006 e.g. most patients were seen within two hours but one patient waited nearly fourteen hours. (Note that not all patients had the time of clerking recorded)

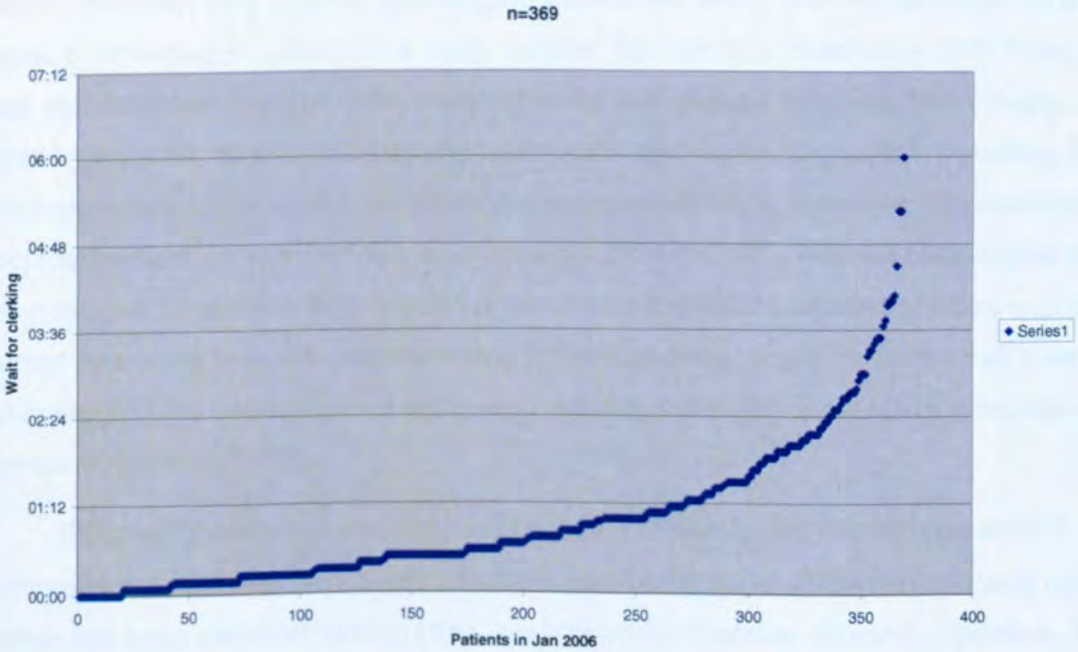


Figure 34 Scattergram - patient wait for clerking in the MAU in January 2006

The mean time for patients to wait for clerking was 1 hour and the standard deviation was 1 hour and 17 minutes. Again this shows a considerable variation in waiting times. As the first element of the MAU process, the wait for this first clerking by a doctor directly affects the competent operation of the MAU in terms of patient throughput. There were no specific records held of waiting times for tests, however from the observations in the MAU, there were often considerable delays between patients being clerked by a doctor and the patient being taken for a test and the results being available e.g. 27 January, a patient who arrived in the MAU at 0.35 hours was clerked at 3.00 hours and taken for an ultrasound scan at 11.47 hours, a time period of over 11 hours.

Conclusions from analysis of MAU operations from a queuing theory perspective

In the section above, the operation of the MAU has been analysed using the queuing theory perspective. Using the theory, (Wilkes, 1989; Littlechild, 1991; Bose, 2005) it may be concluded that the MAU operated as a complex queuing system with nominally a maximum queue length of seven (though the actual queue length was greater at times due to the constraint on seven beds being overcome by the doctors commencing clerking whilst the patient was still in A&E). During the observations, there was always at least one bed occupied, that is a queue existed. Competent operation of the MAU was that all patients should be treated as soon as possible with appropriate diagnosis and decision on treatment (White, 1959; St George's Healthcare NHS Trust, 2003; St George's Healthcare NHS Trust, 2005a). Mean length of stay in the MAU was around 6 hours but with a standard deviation of nearly 5 hours, meaning many patients had lengthy stays in the MAU. The performance of the MAU, in terms of attending to patients in a timely manner (St George's Healthcare NHS Trust, 2003), was dependent on the time delays relating to the sub queues within the MAU, that is, being seen by a doctor, waiting for tests and test results, waiting for diagnosis and waiting for discharge authority or waiting for a bed in a subsequent ward. Based on observations and the recorded patient arrivals and service in January 2006 the MAU was not always able to service the potential demand causing queues of patients in the MAU beds and at times was unable to accept new patients due to all beds being full (calculated at approximately a half hour per day on average). The uneven arrival of patients reduces the ability of the MAU to provide quick service (Littlechild, 1991).

Effective operation of the MAU depends on minimising the internal queues, but commensurate with the best diagnostic performance. The role of the test artefacts used by the doctor has been demonstrated to have two potentially opposing effects in relation to the capability of the MAU. Their use served to enable the doctor to establish an improved diagnosis and thus decision on treatment, however their use also increased the patient wait that counters the MAU throughput objective. Using the principles of queuing theory and the results of inspection and observation described above, the way in which doctors attend to patients and tests are carried out have been demonstrated to directly influence exponentially how long patients are in the MAU.

The doctor has multiple influences on MAU competence. Primarily, a doctor needs to identify an accurate diagnosis and decision on treatment. Additionally, the doctor needs to attend to patients as soon as possible in order to minimise the patient stay. However, the doctor also directly influences the test elements of the patients stay. For a patient to have a minimum length of stay in the MAU, a minimum wait during testing should be experienced. The need for multiple tests implies greater waiting thus the number of tests should be minimised. However, it is clear from the guidance given to doctors on the diagnosis process (e.g. (Fields, Isaacs and Stroobant, 2005)) and the observations and discussions with doctors that different tests are used in order to hypothesise and substantiate diagnosis. Therefore, it may be derived that the most effective doctors in the situation of the MAU's defined objectives will be those that arrive at the appropriate diagnosis with the minimum delay from awaiting test results. This correlates with the statement by the MAU Consultant (10 February 2006) that the qualities of the good MAU doctor were being able to make the correct diagnosis in as short a time as possible.

Looking more broadly at the capability of the MAU, Littlechild (1991) describes that optimisation of queuing systems is dependent upon balancing the cost of additional servers against the benefit of speedier service. In the case of the MAU, this involves the number of beds in the MAU and how quickly the patients in the beds were served, influenced by the capability and numbers of doctors, how fast it was possible to obtain test results, main ward beds or discharge papers. Speeding each element of the MAU process by appropriate investment could improve MAU throughput and thus increase its capability. The direct MAU and investigation related items here reflect those identified by Wood and Rhodes (Wood and Rhodes, 2003). However, the dependence on other wards for beds such that MAU beds may be made available is an area not discussed by Wood and Rhodes but is mentioned by Alberti (Alberti, 2003).

How operations in the MAU reflect organisational and individual competence

From the descriptions of MAU operations (St George's Healthcare NHS Trust, 2003; St George's Healthcare NHS Trust, 2004) and objectives and discussions with the MAU Lead Consultant, the competent performance of the MAU role was in the appropriate (and as speedy as possible) treatment of the patients being referred to it. Patients are referred to another ward or discharged as appropriate in as short a time as possible. Thus the competent operation of the MAU was related to this aim of speedy decision making. From the observations carried out, it does this through the effective working of doctors and nurses in efficiently bringing patients into the MAU, carrying out the procedures relating to diagnosis and taking an appropriate decision on treatment. At a broader level, a competence of the MAU operation was the general care of patients – ensuring that they understand and take part in the decision processes regarding their care, ensuring they were kept safe and comfortable. The actions taken when an outbreak of a vomiting virus – freezing entry to the MAU and eventual closure for disinfection, the continual process of cleaning and the laying on of food and beverages all reflect this aspect of care. Thus the competence of the MAU operation comprises both the areas relating to the diagnosis process and general patient care – that the patient was not only appropriately diagnosed but also does not exit the MAU was a worse condition than when they arrived. At a wider level, and reflecting both the observations of the doctors and guidance regarding the role of the MAU in the St George's MAU Operational Policy (Appendix I) and external guidance (Alberti, 2003) (see Appendix J, Appendix K) the competent operation of the MAU relates also to the whole care pathway, that is overall treatment of the patient, by appropriate upstream coordination with A&E or the patients GP and downstream with subsequent care operations, for example main wards, the patients GP or other care services such as the local authority social services department. From the observations, these elements of competence were enacted by inter-working and sometimes inter-locking activities or sub systems, each activity being carried out by the individuals in the defined roles. It was only by the effective working and inter-working of each of these activity systems that the MAU operated in a competent manner.

In the MAU, the role of the doctor was three-fold, to carry out the diagnosis of the patient and decide on whether they should be admitted or discharged and to identify the emergent process by which diagnosis could be achieved to the standard that would be defendable in the consultant round. They did this through their medical knowledge, knowledge and use of St George's test facilities and processes and through interaction with other doctors and other specialties as needed. Their role was also to ensure that their conclusions were documented in order that other doctors would know their reasoning and actions.

In the following chapter, conclusions will be drawn together from the empirical research – the HAN and MAU studies. These will reflect the research aim of understanding the way in which the competence of the individual doctors is linked to that of the hospital as a whole entity.

Chapter 7 Conclusions

In this chapter, the aims of the research will be reviewed and conclusions drawn from the analysis of the findings of the case study based upon the secondary sources and two primary empirical studies. After this, in Chapter 8, the implications with regard to theory and practice of the findings will be proposed and the limitations and strengths of the research project discussed. There will also be recommendations made for further research.

7.1 Purpose of the research study

The purpose of this thesis and its associated research has been to investigate the nature of the linking factors between organisational competence and the actions of individuals within it. The literature has described research and theorising on particular aspects of individual and organisational capability but there has been little focus on the linking between individual and organisation. Use of language has been diverse around the subjects of competence and capability and no agreed definitions of these concepts have been applied either to individuals or to organisations (Dosi, Nelson and Winter, 2000). The multitude of views on the meanings correlate with Attewell's view that the definition of skill is dependent on the perspective of the observer (Attewell, 1990). The variation in views also reflects Handy's (1985) assertion that the complexity of organisational capability has prompted researchers to use simplified views.

Relevant to the study is the need to identify appropriate proxies for the concept of organisational capability (Dosi, Nelson and Winter, 2000). In this research project, the organisational objective has been taken as such an proxy as being what the organisation has been seeking to achieve and thus what the actions of the employee may be related to.

The conceptual foundation was laid by Smith, Ricardo and Marx (Smith, 1776; Ricardo, 1911; Marx, 1930) who identified the concepts of the productive power of enterprises and labour power as the expression of their capabilities by individuals. They also identified productive power of enterprises to be based upon division of labour, coordinated labour action and particular use of machines (Smith, 1776; Ricardo, 1911). Marx (1930) looked further at the production of use-value and the way work and workers were organised in terms of process, layout and social structure. These concepts were developed further as part of the resource based view of the firm (Penrose, 1959; Wernerfelt, 1984; Barney, 1991) who identified that organisational aims are pursued through services provided by the knowledge mediated deployment of human and other resources. Analysis of these theories and related research projects in the literature review suggested that factors that represent the link between individual and organisational capability include the people and their interactions in combination with the technical systems used, organisational processes followed and influencing organisational structures. Therefore, the empirical study aimed to identify whether and if so, how these factors were influential in the pursuit of organisational aims in the setting of doctors providing patient care in a hospital.

7.2 Outline of the research approach

The research study investigated individual and organisational capability and competence in the literature, in secondary sources and empirically in the practical situation of doctors carrying out patient care in St George's Hospital, London. Whilst individual actions can be observed and recorded, in order to understand the meaning of the actions taken, it is also necessary to understand the situation in which the individual activity is taking place (Cassirer, 1953; Leontiev, 1981; Suchman, 1987). This is particularly important in looking at the activity of individuals within an organisational setting. The approach taken has been to examine the patient care activities of doctors whilst also relating their actions to the setting and context in which they were working and with a view of the objectives or drivers for their organisation.

Two studies were carried out that provided complementary perspectives on doctor activity within their organisational setting. In the HAN study the organisation was the hospital as a whole with the broadly stated objective of 'supplying the care expected from an NHS hospital' (St George's Healthcare NHS Trust, no date). This was taken to mean that patients accepted into the hospital would be looked after, kept safe and the best attempt made to treat their ailment. The individuals being studied were the doctors on duty at the time of the observations – between 9.00pm and 8.00am. The unit of analysis was the 'patient call' which was the sequence of actions taken by the doctor, mainly as a result of a call to the duty doctor to attend a particular patient problem. The sequence commenced when a doctor first paid attention to the patient and ended when the doctor moved attention away from the actions immediately required by the patient e.g. when the doctor commenced attention to something else. In the MAU study, the organisation was the Medical Assessment Unit that had the objective of deciding whether patients allocated to the unit should be discharged or admitted to a main ward. The subject individuals were the doctors on duty in the MAU at the times of observation. The unit of analysis was the actions taken by the doctors as part of the process of diagnosis and treatment decision making. In the HAN study, by the nature of patient problem resolution, typically one to four specific actions were recorded per patient. In the MAU it was not so well defined. The doctors on duty were observed to switch attention between patients depending on events, such as the arrival of a patient, arrival of test results or completion of previous actions where the doctor would decide where next to pay attention. Thus the unit of analysis comprised actions taken for a particular patient during one period of time. Later actions for the same patient may have been taken by the same doctor or another, for example from the next duty shift. Therefore, the role of the doctor in the HAN study was to resolve particular patient problems that had arisen and in the MAU study to take forward the process of diagnosis and treatment decision making.

In conceptualising this research, three levels were identified that provided frameworks by which empirical research to address the research aims could be carried out. It was identified that the resource based theory of the firm based upon the conceptual foundations laid by Smith, Ricardo and Marx (Smith, 1776; Ricardo, 1911; Marx, 1930), provided underpinning theories. These theories identified the conceptual elements of the productive power of the enterprise based upon the expression of individual and coordinated labour power to produce use value or services, using machines through purposive processes and within purposive spacial and social structures. Penrose (1959) identified the concept of the administrative organisation that deployed the human and other resources(Wernerfelt, 1984; Barney, 1991). From the literature, it was identified that these could be interpreted as the enactment of individual capability by people, how they interact with others and with technical systems, follow organisational processes and are influenced by organisational structures (Porter, 1980; Hall, 1980; Campbell and Goold, 1997; Corbridge and Pilbeam, 1998; Drejer, 2000). Second and third generation conceptualisations of activity theory (Engeström, 1993; Engeström, 1996) and queue theory (Littlechild, 1991) were identified as frameworks by which these elements could be investigated within a case study of people at work within an organisational setting, an approach that was capable of providing the necessary level of explanation (Yin, 2009).

Below will be found a summary of conclusions from considering the combination of the HAN and MAU case studies. This is followed by a discussion of the conclusions in relation to the perspective provided by activity theory. The way in which the identified linking factors operated in relation to the individual doctors and organisational capability will then be discussed in further detail. Following this, the overall conclusions of the research and their relationship with theory will be discussed.

7.3 Conclusions from the two cases

In looking across and comparing the results of the two cases (Yin, 2009), it is necessary to identify if and how the factors of individual capability, interaction, use of technical systems, organisational processes and influencing structures played a role in achievement of organisational aims. In both HAN and MAU cases, human and other resources were identified as being deployed in pursuit of the organisational aim by what was concluded to be different elements of an administrative organisation. The HAN study (Chapter 5) has provided evidence in the setting of the general hospital at night <u>that</u> these factors played a role in linking the capabilities of the individual doctor to the competence of the hospital. The MAU study (Chapter 6) has provided evidence in the setting of the MAU <u>how</u> these factors played a role and through the queuing system analysis (Section 6.7), why the interaction between the individual doctors and other factors have been important in pursuit of organisational competence. This is described in fuller detail below for each factor.

Individual Capability

In the cases of the both HAN and MAU studies, evidence has been provided that the doctors used labour power or their own capabilities in the emergent process of taking decisions on and carrying out action in pursuit of the organisational aims, that relates to the individual contribution or human resource aspect of organisational resources (Penrose, 1959). In the HAN study, described in Chapter 5, doctors were observed to take different courses of action depending on situation, for example, ordering investigations, carrying out medical treatments or writing out prescriptions. It was concluded (Section 5.4) that this was a process of 'deciding what to do next' in order to resolve the immediate problem condition of the patient in pursuit of the hospitals aim at patient care. In the MAU study, described in Chapter 6, doctors were observed in taking actions in order to achieve diagnosis including finding out information from the patient through clerking, pondering on possible causes, ordering tests and building a conclusion on treatment. It was concluded (Section 6.5) that this comprised the activities of diagnosis, seeking to arrive at a decision on discharge or admission and the creation of a plan by which these two activities could be completed, thus relating to the MAU objectives. Thus, each study shows how the actions by individuals relate to the organisational aim – resolving the patient problem and a decision on discharge or admittance respectively for HAN and MAU settings.

Interactions between individuals

Both cases also provided evidence of interaction between doctors, quantitatively in the case of the HAN study but in richer detail in the MAU study. The HAN study showed that in carrying out patient care, doctors worked and conversed both with their own grade and with others (Figures 9, 10, 11, 12). Specialty team members worked together but also called on other specialties and specialists. However the pattern of joint working was not uniform across grades, specialty and patient illustrating that interaction was situational (Winograd, 1987). It was concluded that the doctor acted as part of the hospital doctor network but was also able to call on this network (Section 5.3). The MAU study illustrated how in the context of the MAU, the doctors used each other during the diagnosis and treatment decision process, as information sources, for joint problem solving and also as the formal check and balance process of the consultant round. The identification of different patterns of dialogue, based on formality and certainty (Figure 26) illustrates that MAU doctors' talk was also situational depending on the needs of the doctor at the time (Winograd, 1987) but also related to the hospital processes of check and balance. The doctors were also part of the hospital doctor knowledge and skills network and also were able to call upon it. From the context of the interactions from both studies, it is concluded that interaction between doctors and others supported the competent operation of the hospital.

Technical Systems

Technical systems of different kinds, represented by physical artefacts were observed to be used in each study setting and acted both as providing direct services and as carriers of the 'administrative organisation'. They included elements of Wernerfelt's (1984) and Barney's (1991) categories of plant, equipment and machinery but also more basic paper based systems. In the HAN study, artefact use was noted in around a quarter of calls (Appendix G) and it was concluded that their use provided a number of services in support of organisational competence (Penrose, 1959) (Sections 5.1, 5.2). Documents were used as a way of embedding processes for guidance of the individual in what was expected of them and for instigating actions in other departments or functions of the hospital. For example the blood test form was both the carrier of information and the instruction to the blood test department (Prior, 2004). The hospital communications systems – telephones and bleeps were also observed in both studies to link the individual to others in the hospital and others to the individual thus making the skills pool a cohesive whole and enabling the doctor to call for help or advice when needed. Test systems were used in both HAN and MAU studies to identify the condition of the patient, such as blood condition (Appendices Q, R, S) and other equipment was used to treat the patient such as intubation.

It was identified that artefacts played two levels of role – mediating directly between the doctor and the patient but also between the patient and the broader patient care system of the hospital (Figure 22). Thus the purposeful action of the individual was linked to and instigated the systems and actions of others within the overall hospital system. In this case, it was the doctor who instigated this mediation through for example, the writing of a blood test form or prescription.

The patient record and its associated system of storage and retrieval was also identified in the studies as a mediator between patient and the hospitals patient care system and was key to its competence (Appendix G, Section 6.3). Continuity of care was provided through the record rather than the personal knowledge of individual doctors.

In comparing artefact use in the two studies, there were similarities recorded in those used, for patient treatments, tests, information and communication. The MAU study (Sections 6.4 and 6.6) explained how artefact use impacted on and was important to achievement of the organisational objective. The diagnosis and treatment decision was based upon the doctors own capability and their use of signs indicating patient condition, provided by organisational artefacts in the form of test tools and systems. However, the study also identified a contradiction relating to the two organisational objectives of accurate diagnosis and speedy decision in that use of additional tests may improve diagnosis but slow patient throughput.

Organisational Processes

The following of routines or processes were observed in each study and represent Penrose's (1959) 'administrative organisation' or the way that resources are deployed. In the HAN study as well as an emergent process of diagnosis and decision on treatment, the processes of calling a doctor, provision of drugs, admittance of patients and handover to the next shift were also observed (Figure 9). These processes were all concluded to be important to the care of the patients by the hospital through resolving their problems, ensuring responsibilities are clear and that the patient condition is understood by different shifts of doctors. Processes included diagnosis, handover, the performance of the Consultant ward round, the referral process of accepting and referring patients, the upwards referral where the doctor had doubts about the patient condition, doctors talking to or consulting other doctors during patient care and the interaction with the hospital HIT team and external social services practitioners regarding patient social problems. The processes were either apparently known by the doctors or regulated through artefacts such as the prescription form. In the MAU the overall process of diagnosis and treatment decision making was at the core of the operation of deciding on discharge or admission (Figure 29). The role of the doctor was in both following and dynamically creating this process for each patient being attended to at that time by that doctor. This re-creation of processes was similar to that relating to engineers, described by Orr (1990) and Narduzzo, Rocco and Warglein (2000). Also apparent in the MAU were the processes for obtaining patient tests, obtaining and maintaining patient information, admittance and referral each of which were followed and used by the doctor as part of patient care (Sections 4.5, 4.6). Thus the processes of the doctor linked with and were mutually dependent on other departmental and hospital level processes.

Influential Structures

Influential structures (Giddens, 1984) representing Penrose's (1959) administrative organisation were also evidenced in both studies. Each setting comprised a purposeful physical, knowledge related and hierarchical hospital setting. The HAN study illustrated that the structures of ward and doctor specialty and of doctor grade were reflected by differential patterns of activity (Figure 8, 11, 12). The analysis of skills use showed that the structure was close to but not exactly that required by the patient care activity on the days of the study (Table 6). The MAU as a unit had a specific structural purpose - the decision on admission or discharge of suspected medical cases. This was related to the care of new patients presenting to the accident and emergency function and was instrumental to the way that the hospital met or did not meet the A&E 4 hour target (Figure 23, 29). It was also structurally related to operations in the main wards with the task of not admitting patients who did not need to be admitted but also dependent on availability of beds in main wards for its ability to move patients on. The doctor played an important role in acting out these structural purposes – that of deciding in a timely fashion whether a patient should be discharged or admitted (Figure 29). The MAU operation and activity of its doctors were also influenced by the 4 hour A&E treatment target, thus targets may be categorised as influential structures (Giddens, 1984).

Summary of the research findings

The linking between the competence of the hospital and the action of the doctors who worked in it was founded upon the doctor emergently enacting their individual capabilities but making use of artefacts representing enabling organisational factors. These factors included interaction between doctors and others, using technical systems, following organisational processes and influence by organisational structures. Doctors needed not only medical knowledge but also an understanding of 'how to work the organisation', that is how to get the organisation to do what the doctor needed for the patient.

Both studies have illustrated that in their particular settings, the individual and through interaction, joint capability of doctors has been applied to patient care in pursuit of the organisational aim. The studies have shown how technical systems or artefacts have played roles either directly in the treatment of the patient or indirectly by mediating the instigation of action in other departments of the hospital. The studies have illustrated the doctors following organisational processes or routines, held mainly embrained (Blackler, 1995) by the doctor but in some cases written directly as a protocol or embedded (Blackler, 1995) in forms. The doctors in carrying out patient care have been influenced by structures within the hospital, the two identified as most significant being the structure of representation of doctor grade and specialism and the structure of the hospital physical organisation, but also in the MAU, the A&E 4 hour treatment target.

7.4 How did the linkages operate between individual doctor and organisational patient care in the setting of St George's?

In this section, the way in which the factors identified acted to link between the individual and organisational capability will be discussed in more detail.

Role of the doctor in competent patient care

Based upon the UK NHS medical school training, the doctors were educated to have appropriate knowledge of the working of the body and of disease, to be proficient in basic clinical skills, have appropriate behaviours and communication skills, to have demonstrated intellectual curiosity and capacity for critical understanding and the potential for further development (St George's Hospital Medical School, 2004). This was supplemented by the 'readiness to perform pre-registration house officer jobs competently' (St George's Hospital Medical School, 2004, p 9). They were also en-cultured in NHS processes and trained to carry out diagnosis as part of their particular role (Gale and Marsden, 1983; St George's Hospital Medical School, 2004). The MAU study showed that doctors learnt the processes in use both from medical school practice and from the build up of experience 'learning by doing' (Teece and Pisano, 1994) and interaction with other doctors. During early training doctors would follow a scheme of building experience and understanding of the specialties by carrying out six month tours of duty in different specialties (Medical HR Manager). Higher grades of doctor reflected the build up of operational skills and knowledge linked to continuing professional development (Royal College of Physicians, no date).

The study has been of how a doctor as one of the people in the organisation relates to other elements of organisational capability. The doctor operated within the organisational level patient care system playing a role that contributed directly to competent operation of the organisation whilst in parallel with others such as nurses who also played their part. As well as applying medical knowledge, the doctor also needed to know how to use the available resources in order to fulfil the organisational objectives.

In diagnosis and treatment decision making, the doctor carried out a process of information gathering from the patient and other sources such as patient records, instigated investigations, discussed the patient condition with peers and recorded information in patient related notes. Behind these specific actions was the overall process by which the doctor used factual and procedural knowledge along with information about the patient condition obtained from test investigations. This use of knowledge was to arrive at and test hypotheses on the patient disease and arrive at a treatment decision.

Effective operation of the MAU depended on minimising the internal queues, but commensurate with the best diagnostic performance. For a patient to have a minimum length of stay in the MAU, a minimum wait during testing should be experienced. Using the principles of queuing theory and the results of inspection and observation described above, the way in which doctors attended to patients and tests were carried out have been demonstrated to directly influence how long patients were in the MAU (Section 6.7). The need for multiple tests implied greater waiting thus the number of tests should be minimised. The doctor had multiple influences on MAU competence. Primarily, a doctor needed to identify an accurate diagnosis and decision on treatment. Additionally, the doctor needed to attend to patients as soon as possible in order to minimise the patient stay. However, the doctor also directly influenced the test elements of the patients stay. From the guidance given to doctors on the diagnosis process e.g. (Fields, Isaacs and Stroobant, 2005) and the observations and discussions with doctors, different tests are used in order to hypothesise and substantiate diagnosis. Therefore, it may be derived that the most effective MAU doctors are those that arrive at the appropriate diagnosis with the minimum delay from awaiting test results thus implying an optimal use of testing.

The actual process of diagnosis and treatment decision making for a particular patient was emergent although it followed a broad structure as described in the literature e.g. (Orient, 2004). It was necessary for the doctor to identify for themselves the particular actions they should take in the particular situation of the patient. At a broader level the doctors had to identify for themselves the way in which they would be effective, their own behaviour was part of the problem space (Meyer, 1968; Simon, 1969). Therefore an element of a doctor's capability is the way in which they can use the choices open to them and the materials available to come to valid diagnosis and treatment conclusions.

In the HAN study, other areas of competence were suggested, for example the provision of minor medical treatments would suggest that a doctor should be able to do these satisfactorily. In the MAU study, there were also identified or observed more subtle capabilities of the competent doctor. These included the need for the doctor to be able to take the patient's broader social situation into account when making decisions about treatment. This required not only an understanding of the life of (mainly) elderly patients but also of the support available to patients by the hospital and other social services.

The doctors had to be able to justify the diagnosis and treatment conclusions to more senior doctors and also have a willingness to refer upwards in cases of uncertainty, which reflects a beneficial safety or non risk-taking orientation. A particular point mentioned by the MAU lead Consultant was the doctor's ability to write clearly which reflected the importance of the patient record in linking between doctors. At the level of the broader aspects of patient care, doctors' understanding of hygiene and conformance to appropriate practices and use of antiseptics were important elements of competence that are nationally recognised in the fight against hospital acquired infections (Great Britain. Department of Health, 2008).

In considering the capabilities of the doctor in diagnosis and treatment decision making, there is resonance with Hall's (1980) descriptions of competent performance as requiring ingenuity and inventiveness, the ability to see short cuts and solve problems, deal productively with other people and respond appropriately to circumstances. Reflecting Woodall and Winstanley's (1998) definition of capability as requiring skills, knowledge and understanding, the research has identified that this includes both the medical and procedural areas as the medical decision making is placed within a broader situation of the patient care plan or patient pathway. A doctor needs to understand the options and have knowledge of the facilities of the hospital that may be brought to bear in progressing the diagnosis and treatment decision process. This situational nature of decision making is a subject not covered generally in the works describing the diagnosis process.

In the HAN study, in addition to the practical activities such as medical procedures, writing prescriptions etc, a significant number of actions were within the reviewing and discussions categories. In discussing this pattern with the Medical HR Manager, it was concluded that these actions were associated with the decisions about what action the doctor should take next, essentially diagnosis and treatment decision making. This is clearly a significant activity in that its correct operation will be representative of the competence of the hospital e.g. (St George's Healthcare NHS Trust, no date).

In the study, competent performance of the doctor was reflected in speedy and accurate performance of the actions appropriate to the patient condition. For the HAN study, this implied being able to take an appropriate decision in the light of the patient's overall care plan and immediate condition. For the MAU study, the capabilities of a competent doctor implied being able to balance the outcomes related to the three objects identified against the objectives of the MAU. The objects were the patient as a thinking human, the diagnosis of the disease and the decision on treatment – whether to discharge, admit or hold for further investigations. This suggests that knowledge required of the doctors was what state of malady warranted hospital treatment. This correlates with the statement by the MAU Consultant (10 February 2006) that the qualities of the good MAU doctor were being able to make the correct diagnosis in the shortest possible time. The correctness of a doctor's decision on diagnosis and treatment is also clearly of importance but its judgement is outside the scope of this thesis.

Thus the patient care activity of doctors included a range of actions depending on the particular patient condition and situation. In carrying out patient care, doctors used each other and test and treatment resources, the need for which was emergent as part of the patient care process. The use of rules was apparent though these were largely unwritten except in particular cases. The actions were carried out within a structured and role related community and organisational environment that the doctor needed to understand and be able to use.

Structures

The actions of doctors were placed within structures that were important for achievement of organisational aims – the hierarch and division of skills and the way in which physical artefacts were arranged. Key structures influencing the provision of care by doctors in St George's are described below.

Organisation structure

The doctors were part of the firmly structured UK NHS medical establishment. This was based upon hierarchical grades and medical specialties, but also influenced by the Medical Colleges, the professional associations one of which each doctor belongs according to their specialty. The grades in ascending order at the time of the study were Pre-Registration House Officer (PRHO), Senior House Officer (SHO), Special Registrar (SpR) and Consultant (Cst).

The role structure of doctors and nurses, although invisible, were marked by differences in uniform and provided clear separation of actions (Giddens, 1984). The MAU used a number of specific roles with each playing a particular part in carrying out or supporting the MAU's competence, for example, doctors in diagnosis, nurses in general patient care and the cleaners in maintaining a healthy environment. The role structure also provided a range of capabilities that were seen to be used, for example in doctor to doctor dialogue. However the doctors also carried responsibilities outside of the MAU operation – associated with their 'firm'. These were not always in line with the MAU objectives and were sometimes counter to them, such as when doctors had to leave the MAU to attend a heart arrest patient in another ward. This raises the question whether this split responsibility provides optimal performance for the MAU and general wards.

The hospital organisation structure had a spread of knowledge and skills reflected by the different grades and specialisms of doctor and other roles. The grade and specialty based roles were reflected in different patterns of action with different skills and artefacts being used thus suggesting a relationship between these structures and the carrying out of patient care. Doctors were treated as a generic resource and no ongoing relationship between doctor and patient existed other than through the firm structure. This reflects the importance of artefacts as carriers of patient information discussed in a following section.

The hospital patient care structure was based around patients being the responsibility of a particular Consultant specialising in the category of illness being suffered. Each doctor followed a particular specialty area and was a member of a Consultant firm of that specialty and thus had responsibilities for patients under that Consultant. The HAN study showed there was continual demand overnight for doctors but intensity varied by time of night and specialty, thus reflecting varying demand on the duty doctors relating to organisational structure (Figure 8). Thus the structure resulted in un-equal work loads for different specialisms of doctor.

In the HAN study, the combination of doctor specialty and grade for actions carried out were recorded as closely matching the skills needed by the patient care, however it was not perfect reflecting either a waste of skills or that skills may be slightly but potentially dangerously insufficient which suggests a potential lack of organisational competence (Table 6). The grade structure also influenced the more formal interactions illustrating a power difference between the grades but which was part of the 'check and balance' control system of the MAU (Figure 26).

Physical arrangement as a structure

The hospital was arranged physically in a purposeful structure. For example, the physical placement of the MAU near to A&E aided movement of patients and despatch of test samples (which were despatched from A&E to the test departments). The structure of the technology influenced both the MAU and individual doctor effectiveness, for example the length of time that was taken for test results to be returned from other departments influenced how quickly the doctor could access this information as part of diagnosis and thus meeting the MAU throughput objective. Thus physical structure influenced the competent action of the doctor and the hospital.

Processes

The doctors in both HAN and MAU studies were observed to take actions that related to the process of diagnosis described in the medical literature, collecting information through clerking or history taking, using patient test results and hypothesising the complaint. This was concluded to be an emergent process. The sequence of doctor actions developed as a result of the information gained. In the MAU study, that many patients were transferred on to Richmond Ward (Appendix W) for further diagnosis illustrates that the MAU process of diagnosis often did not reach a conclusion within the MAU target time constraint.

The MAU was also ruled strongly by the A&E four hour rule. Specific processes were employed to make a bed available in the MAU for patients in A&E who were approaching a four hour wait. For the MAU level patient care system, processes were followed relating to admittance, patient data recording, diagnosis, referral and job allocation using the Jobs to do sheet. These processes were the way in which patient throughput was both achieved and controlled and either influenced or were influenced by the individual doctors.

Concerns over hospital derived infections were reflected by hygiene processes such as hand washing and use of anti-bacterial gel. They were also reflected by the ward cleaning regime where a cleaner was continually circulating around the MAU and surrounding areas and disinfecting the surfaces.

The doctor activity was also part of a wider process of the patient pathway or care plan which includes the 'check and balance' actions of reference of the patient condition and proposed action to higher authorities of doctor that was carried out either informally with other doctors or the formal Consultant 'ward round' process. The process of patient review appeared to follow that used in main wards (i.e. morning and evening Consultant Round) which potentially delayed patient discharge or movement to a main ward thus impacting the MAU 'throughput' objective.

The overall MAU process and Consultant ward round are examples of the managerial techno-structure (Corbridge and Pilbeam, 1998) which in the MAU was oriented towards a 'check and balance' on decision making rather than leadership.

Whilst the main focus of the study was the diagnosis and treatment decision making of doctors, other important processes were observed relating to individual and organisational competence. Other secondary but important processes observed in the MAU were the replenishment of MAU consumables and patient meal supply. Doctors were also dependent on broader level hospital processes, the procurement of supplies, availability of support staff and processes associated with the patient record system and consumables procurement.

The enactment of individual and organisational competence were also dependent on other, inter-linking processes at different levels. This was evidenced by the hospital level processes which came into operation when an outbreak of a vomiting infection occurred. A workgroup was formed to treat the outbreak comprising MAU staff and others from St George's Infection Control department. The MAU was shut down during the period of the sickness virus in February 2006 then later re-opened once deep cleaning had taken place.

In the light of path dependency theory (Dosi, Nelson and Winter, 2000), the ability of the hospital to provide competent care based on the availability of appropriate resources also depended on the hospital's ability to identify and procure the resources required and the way in which such resources were originally selected for use. It was identified in discussions regarding the supply of a bigger table for staff in the MAU that staff felt that this process was sometimes unwieldy. An examination of the procurement process was not within the scope of this study but would be worthy of further investigation as the availability of appropriate resources has been shown to support individual and organisational capability.

In summary it is suggested that the use of organisational routines and processes influenced patient care and thus the enactment of organisational competence.

Technical systems

In this section the different kinds of technical system and their impact on patient care will be discussed.

The technical systems and artefacts employed played a role both as part of and in support of the diagnosis and treatment decision making task. The technology provided a window on the patient condition on which the doctor could make diagnosis and treatment decisions. The simple technology of the table and chairs enabled the doctors to carry out the collaborative aspects of diagnosis and formed a central information point between the roles needing access to patient related information. The bed related filing system provided a way in which the layout of the beds in the MAU were represented thus simplifying the linking of information to patient. The patient record system held representations both of the patient condition and of previous doctor activity. It mediated between a doctor and the diagnosis and treatment decision objects and also between different doctors on different shifts. The patient record information display facilities mediated between doctors carrying out collaborative working during the diagnosis and ward round processes.

Communications technology

The telephone and 'bleep' played a part in enabling communications across the hospital and thus supported its cohesive operation. In the MAU, the telephone was used by the duty doctors to interrogate other parts of the hospital in order to progress diagnosis or make arrangements about the moving on or discharge of the patient thus enabling the MAU bed to be made available to another patient. The telephone was used to gain information and advice, to instigate action and for negotiation. It was used to communicate with the MAU duty doctors by others, for example by General Practitioners wishing to refer a patient and by A&E to arrange patient admission

From the doctor perspective the telephone and bleep provided a link to the other roles with whom they needed contact. It is concluded that the doctor needed to know the roles available to them which implied having an understanding of the broader hospital organisation structure. Each bleep was allocated to a particular role such as 'General Medicine SpR' rather than a person. Using the bleep, the General Medicine SpR could contact for example the Renal SpR for particular renal advice. The doctor also needed to understand the effect of using the person representing the role on their intended outcome in the same way as the investigation tools described above. Communications systems assisted individual doctors in their care of patients and enabled the hospital to operate as a network of skills and roles such that ongoing patient care was broadly individual doctor and time independent.

Physical environment

The patient was located within the purposeful structure of the hospital, medical specialty ward and bed. At an organisational level, the MAU activity system used its artefacts to support patient diagnosis and their more general care. The seven beds and its other facilities such as wash basins formed a foundation for its care of patients. For the MAU, with its throughput objective, the bed was a critical resource needed for patient acceptance and thus needed to be cleared as soon as possible. This also applied to the follow on wards – Richmond Ward or a main ward. Non-availability of a bed in a follow on ward prevented a patient being moved on when able which slowed the MAU process on a number of occasions.

The design of the work-place is also recognised to impact on performance and competent action, (Clements-Croome, 2006a; Clements-Croome, 2006b). Specific examples noted in the MAU were that the table in the MAU was not regarded as big enough for its purpose as a central work station and the need for doctors to use computers in the adjacent Nurses Station meant they had to leave the MAU and thus lose contact with patient movements and test result arrivals.

The investigation and patient record systems are examples of the hospital's technical system and both have been identified as important elements in achieving organisational capability. The dependence on use of investigation resources has highlighted the importance of these to competent operation of the MAU.

Interaction as contributor to individual and organisational competence

The doctors taking action related to patient care were not independent of others. In both HAN and MAU studies, joint working with other doctors was observed and the organisation of the hospital also implied specific forms of interaction.

There was direct interaction during the diagnosis and treatment decision making process between doctors on duty, with a patient or with other specialist doctors and other functions and occasionally with the nurses. This was reflected in the data relating to calls to doctors by other doctors and by observations of dialogue and joint working on patient care actions. The way in which people in these departments coordinate their activities with each other is an important element of organisational capability. Examples of such good inter-working observed were the hand-over process between A&E and the MAU nurses and the role of the Bed Manager in overseeing the best bed deployment.

In the HAN study, it was noted that nurses often attended the doctor during the call, however in the MAU, the researcher observed very little direct interaction and collaborative working between doctors and nurses. The doctors and nurses appeared to work to well defined roles, on separate planes with only occasional interactions. This may be because the organisation of medical resources for the MAU is based on use of doctors from the medical rota rather than a dedicated team, thus doctors may be less familiar to the nurses, resulting in a 'distance' between the roles.

In the HAN study, it was noted that doctors were called by other doctors in their firm and by other specialties. They were also observed to work with others on a range of actions. The study also noted that if a medical action was carried out as part of diagnosis there was less likelihood of two doctors being involved, whereas for direct treatment of the patient two doctors working was more likely. Thus the ways that doctors worked together were situational (Suchman, 1987). The situational nature of interaction is shown through the observations from the MAU study described below.

From the MAU study, multi-voiced collaborative interaction was observed between MAU duty doctors with the dialogue between doctors apparently conformed to patterns dependent on the certainty of the diagnosis but in settings ranging from the informal to the formal as described in the diagram below.

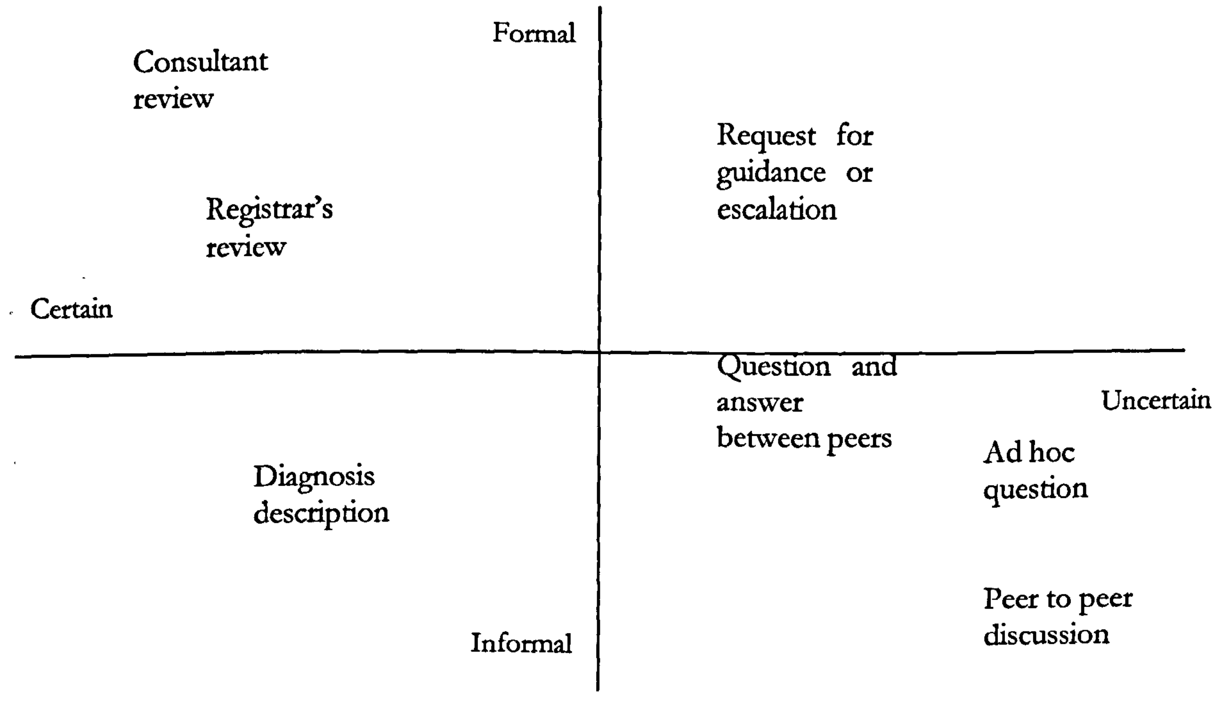


Figure 35 Communications between doctors in the MAU

There was interaction between the doctor and Consultant as part of the ward round which related to the check and balance of the doctor decision. This situation was also reflected in other hierarchical based communications between levels of doctor that appeared to be based more on a hierarchy of knowledge than just status. These observations showed the doctors supported each other by acting as an information source, sounding board, inquisitor or partner in addition to the more formal review by a senior. The way in which the doctors used others appeared to be related to their respective grades and the situation of the action. The informal way in which doctors were observed to work together followed Engeström's (1999) descriptions of knot-working, the coming together of individuals for collaborative working in the context of a particular situation. The ward round process and the lead taken by the Special Registrar on duty in job allocations were the only visible manifestations of the management function.

There was also secondary level interaction between doctors and functions or other doctors separated by space or time such as between a doctor and a remote test department or between a doctor and another doctor on a later shift. These were mediated by the artefacts described previously such as patient records and prescription and investigation forms

In summary, the doctors used others to support their patient care and thus supported both individual and organisational competent action. Doctor discussion and advice giving was also a way in which the hospital shared the knowledge of the doctor community.

7.5 Reflections on the research findings

The individual competence of the doctor was part of the competence of the organisation. For example, the actions carried out by doctors across the hospital overnight were addressed against patient needs and showed discretionary behaviour so suggests they were important to the hospital's patient care. The diagnosis and treatment decision making by the doctors was central to the MAU's role of deciding on the admittance or discharge of the cohort of patients awaiting that decision. From the organisational viewpoint, the availability of the doctor overnight in the hospital and the allocation of doctors to the MAU were ways by which the hospital cared for its patients.

However, the studies showed that the doctors actions were not solely representative of the hospital capability. Hospital structures and resources including other roles and artefacts in the form of facilities, tools, and information also played their part. The artefacts used by doctors played one or both of two roles; in the linking between doctor and patient and between the doctor, patient and the hospital's broader patient care system.

In the case of both the MAU and HAN study, the role and importance of diagnosis and treatment decision making was highlighted. This was found to be a process of multiple dimensions where the doctor needed not only factually based medical knowledge but also procedural knowledge. Part of the capability of the doctor was how to make effective use of the organisational resources in an emergent situation of the patient condition and desired outcomes.

A feature of the writings e.g. (Sutermeister, 1976; Hall, 1980) has been the emphasis on the role of managers in setting the environment in which employees operate. The researcher noticed during the detailed observations in the MAU the functional role of the management structure. Essentially, the only management action observed amongst the doctor community was that of the check and balance on diagnosis and treatment decision making – either as part of the MAU process or in development of students and the allocation by SpR of patients for clerking by the duty SHO level doctors. The MAU Lead Consultant was not seen to be present in the MAU at any time during the periods of observation. Another management responsibility which might be expected would be the scheduling of staff for duty but this is another standard process operated centrally by the hospital's Medical HR department (source Medical HR Manager). Thus it may be argued that doctors do not need managing however this would be at odds with the emphasis on the role of management by the writers. In Hall's model participation is defined to relate to whether the employee will participate in the work activity which is related to the ethos and credibility of their management and the socio-technical structure in which the employee sits. Little specific evidence of ethos and credibility of management was identified in the study which is an indicator of the hands-off role of management.

Another area discussed in the review of the literature has been the ability of an organisation to learn or adapt to new situations. From the observations carried out in the MAU and discussions with doctors and nurses, doctors were seen to be part of a centrally designed and structured medical training programme but it was apparent that there were limited processes in place locally for organisational learning (Fiol and Lyles, 1985). The learning that was observed was that carried out by doctors and nurses at a personal level, either on ward or as observed during informal discussions held over coffee in the hospital coffee bar. The one piece of evidence related to local organisational learning was a survey form found in the MAU questioning doctors on discharge procedures that indicated the existence of a corresponding research project. No other indication of this project was identified.

The lack of formal organisational learning process reflects Wood and Rhodes (2003) observation of the lack of research into and general understanding of the MAU operations and the lack of written processes in the MAU. It also calls into question the way in which contradictions may act as a source of change and development within the processes and structures of the NHS.

For the HAN study, the research setting was the care of resident patients. It was identified that the outcome sought by the hospital was the short term resolution of a particular problem being experienced by a patient at that time and for which the doctor had been called. This was within the broader care plan for treatment for which the patient had been admitted which is not directly within the scope of the study. During the study, equivalent to two nights of activity, doctors handled 660 patient calls and took 1230 actions in resolving the patient problems that had arisen.

In the case of the MAU, the outcome sought was the diagnosis and decision on treatment for the population of patients resident in the MAU and those referred to the MAU but awaiting entry. The essence of the MAU objective was that patients would be diagnosed as soon as possible and accurately in terms of whether they should be admitted to a main ward or discharged. This definition correlates directly to that proposed by Wood and Rhodes (2003), that patients in a MAU should undergo rapid and rigorous assessment, investigation and initial treatment with the purpose of establishing their need for admission or discharge..

During the study period of January to March 2006, around a 1000 patients were treated by the MAU and during January, the overall process of diagnosis and treatment decision making took an average of around 6 hours per patient for the average of around 12 patients per day being admitted to the MAU. This process time included the patient waiting for the doctor, the investigations appropriate to their particular condition and either being allocated a bed in a main or Richmond ward or getting discharge papers. From the observations, patients certainly underwent assessment, investigation and initial treatments and decisions were taken about their admission or discharge, however the value judgement on whether the mean of 6 hours to do so was rapid and process rigorous are outside the scope of the thesis. However, the fact that in January 2006, 329 out of 451 patients were passed on to Richmond Ward for further diagnosis and that the MAU was sometimes full so could not accept further patients could be contributory to the 2.32% of A&E patients who were not treated within four hours (Great Britain. Healthcare Commission, no date) It was identified that the doctor had the key role in achieving the desired outcome of a treatment decision in order to enable the throughput of patients, one of the aims of the MAU.

Chapter 8 Contribution of the Research to Theory and Practice

8.1 Contribution of the research to theory

In this chapter, the contribution of the study to theory and practice will be reflected upon. The research was founded on the concepts of the resource based view of the firm (Penrose, 1959; Wernerfelt, 1984; Barney, 1991). RBV sees that organisations achieve their aims by the knowledge mediated deployment of human and other resources through an administrative organisation. In the literature review, it was identified that these concepts could be represented as the people and their interaction with others and with technical systems through organisational processes and influenced by organisational structures. It has been demonstrated that these factors each applied in the case of doctors carrying out patient care in pursuit of the organisational aims, as described in the previous chapter. These elements did each and in appropriate combination, contribute to effective performance of the doctors in support of the hospital's patient care objectives. It is proposed that these findings add further clarification to the previous theories of organisational capability as described in Chapter 2 and that the conceptual models developed in this thesis contribute to the theory of organisational effectiveness and add a layer of detail and context to existing resource based theory. That the research was based on a hospital and examined organisational capability is particularly relevant at this time because of issues relating to the performance of NHS hospitals in the UK (Alberti, 2009; Great Britain Healthcare Commission, 2009).

In looking at diagnosis and treatment decision making, the research study examined the way the doctors use artefacts relating to knowledge and interaction with others in their tasks. This study increases our knowledge of the actual way in which one particular community of practice operated regarding personal use of knowledge and interaction with others in problem solving thus adding to existing theory (Meyer, 1968; Frederiksen, 1986; Fredrikson, 1992; Wenger, 1998).

The research was based upon activity theory, which has thus far been used mostly in education and social areas (Engeström, 1999). There is much discussion in the activity theory practitioner community about the structure of activity and its relationship with the activity theory framework e.g. (Engeström and Miettinen, 1999; Kaptelinin and Miettinen, 2005). For this research project, the framework has been used in a pragmatic way. It was identified that the doctors' activities observed represented an object oriented, artefact mediated activity system (Engeström and Miettenen, 1999) related to patient care that enacted the competence of the hospital. The framework has been found to provide a useful perspective on activity within the research setting and the concepts of artefact and object have been most useful in both HAN and MAU studies for analysing the interaction of doctors with their patients and the resources of the hospital. Its use in researching diagnosis and treatment decision making in St George's increases the understanding of its application to a knowledge based service setting and for multiple integrated activity systems. Activity theory was complemented by the use of queuing theory as a theoretical framework for analysis which was also found to be a useful perspective in the context of the MAU operation, that illustrated the importance of the availability of doctors and investigation facilities in the hospital patient care process. The use of activity theory and queuing theory provides a novel perspective on work activity research.

A conceptual model

The theoretical framework that represents the focus of the research is based on a simplification of the model developed by Sutermeister (Sutermeister, 1976). In this section, the findings of the study will be applied to a theoretical model developed from the literature and findings. The following diagram describes the model and is annotated with the key findings from the study.

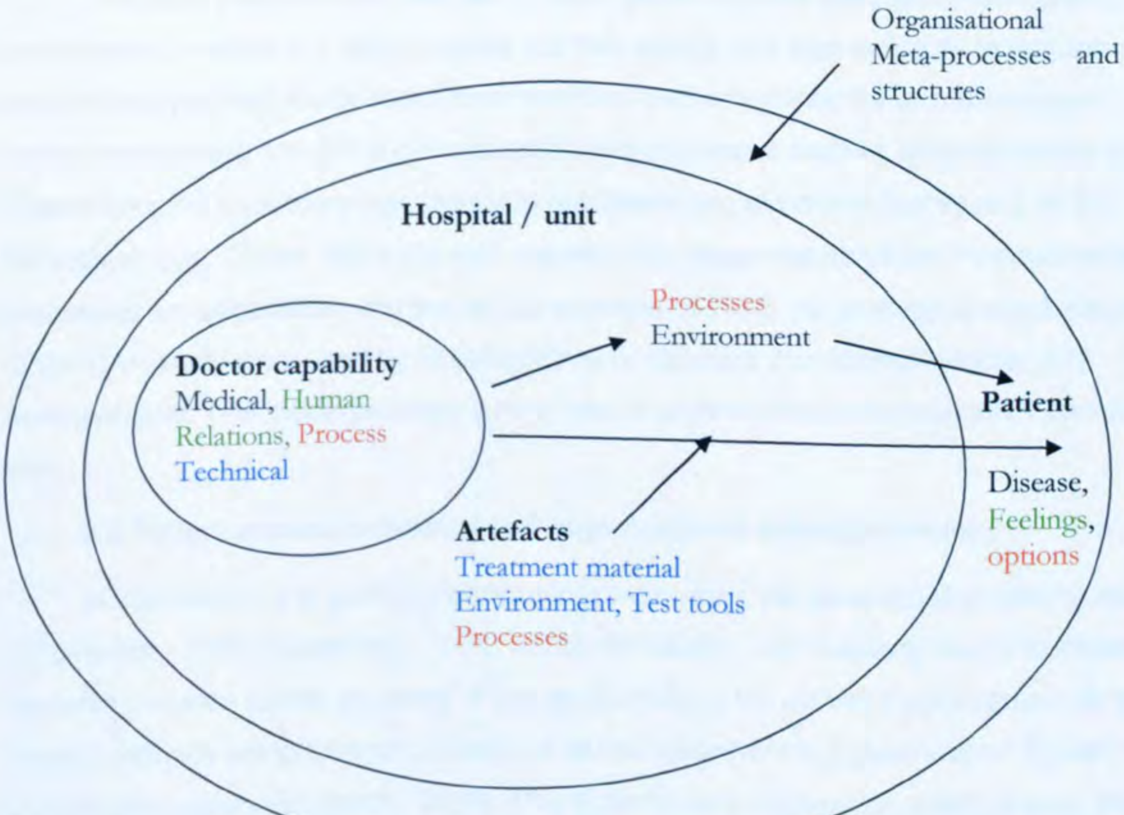


Figure 36 Doctor capability enacted through the hospital organisation with study findings

A doctor has a set of capabilities for performing patient care actions. The basic model suggests that the enactment of the capability of the doctor is influenced by organisational artefacts. Performance and organisational competence is dependent on a combination of the doctor's capabilities and the artefacts made available and used.

The study identified four important dimensions of capability which are colour coded in the diagram. The first dimension is medical skills and knowledge, needed for understanding patient condition and a diagnosis of disease. The second dimension is the understanding of the patient as a thinking and feeling person so that the doctor can treat them humanly. The third dimension is the general medical and specific hospital or unit related processes that relate to doctors' treatment of patients in order that these processes are appropriately followed. The fourth dimension is an understanding of the organisational and technical structure in which the doctor acts and how deployment of this structure impacts on the achievement of personal and organisational objectives. The study has identified how the doctor uses these dimensions of capability in combination with each other and with artefacts when performing patient care actions. Thus the organisation affects the activity of the doctor through the direct patient related artefacts – availability of treatment materials, environment, test tools and associated processes.

The study has also identified two broader levels at which the organisation affects the environment in which the doctor carries out their activity and thus indirectly to the doctor but which directly impact the patient. The immediate level comprises the overall physical environment of the hospital and the hospital level processes such as infection control routines. The enveloping level comprises the meta-processes and structures that impact on the immediate level. These reflect the path dependency processes by which the environment and processes are established and evolve. An example of this is the process by which the results of the HAN study were used by St George's to re-structure the overnight doctor duty arrangements. This model provides a new view of organisation to complement those already in use.

8.2 Patient care as individual and organisational activity systems.

In this section, the particular conclusions from using the perspective of activity theory (Engeström, 1996; Engeström, 2000) will be discussed. Use of activity theory to inform the research provides further evidence of the applicability of the activity theory framework to work based scenarios complementing reports of its use elsewhere e.g (International Society for Cultural and Activity Research, 2005). This is particularly relevant as activity theory, though based on original theorising by Marx as demonstrated in Chapter 2 is still developing as an analytical framework (Engeström, 1996; Engeström, 2001; Daniels and Warmington, 2007).

The studies identify that the operation of the doctors within the hospital may be conceptualised as a hierarchy of interlocking activity systems and processes in line with Engeström's 3rd generation conceptualisation and Tobachs concept of integrative levels (Engeström, 1996; Tobach, 1999). The doctor activity of diagnosis in the MAU is within the

MAU activity system of attending to the queue of patients awaiting medical diagnosis. The MAU activity system is itself within the overall St George's activity system of attending to the medical needs of the population of South West London. Other activity systems exist within the hospital such as the system that deals with the queue of patients awaiting MRI scans or blood tests. Thus it has been concluded that the competence of the hospital was dependent on a series of interrelating and interlocking activity systems, from the doctor carrying out direct actions for a patient through operation of departmental support systems to the overall hospital level patient care systems. Contradictions (Engeström, 1999) or non-competence occurred when there was breakdown within or between the systems such as when the MAU staff were unable to locate a porter to take a patient for tests (Section 6.4).

Relationship between doctor and hospital activity systems

In carrying out patient care, the doctor operated as an individual with their own particular characteristics and capabilities, however at the same time they were working as an agent of the hospital and their responsibilities were related to the objectives of the organisation. The observations of doctor activity reported in this thesis suggest that the doctors' actions in the hospital represented an object oriented, artefact mediated activity system (Engeström and Miettenen, 1999) related to patient care that enacted the competence of the hospital. The development of a diagnosis of a particular patient problem may be seen as expansive learning in the particular within the broader development of the capability of the doctor. For example this is reflected in the expectation of the MAU Acting Lead Consultant that a more senior doctor should be able to carry out clerking more quickly than a less senior doctor as they should know the questions to ask to achieve diagnosis.

In activity theory terms, the actions of doctors is represented as part of the organisational activity system as shown in the left hand activity system diagram below. Within the hospital level activity system, the doctor was also the subject of an activity system related to their individual patient care as shown in the right hand activity system diagram.

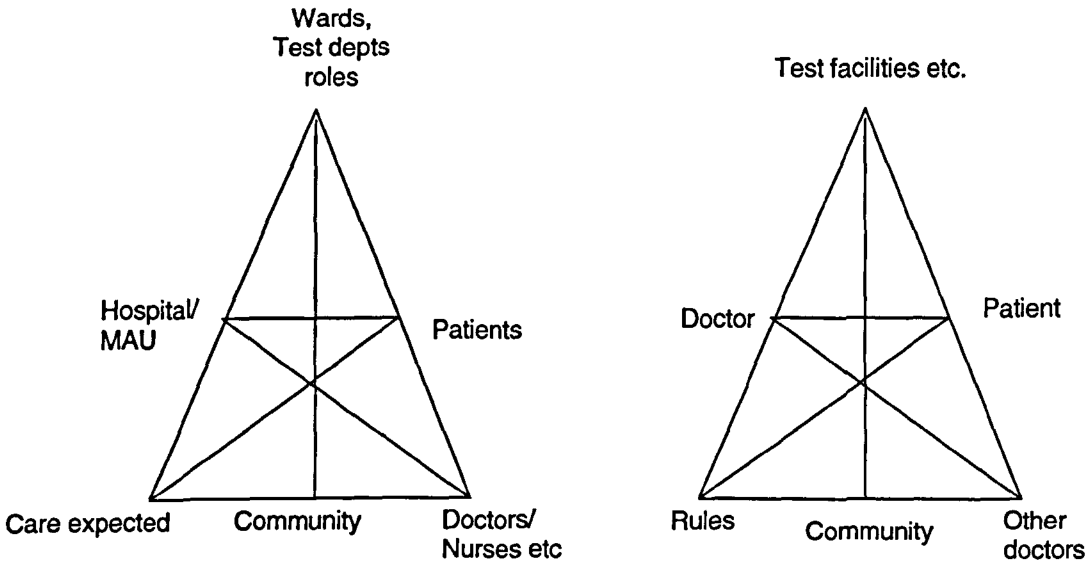


Figure 37 Organisational and individual doctor patient care activity systems

In the (left hand) organisational level system, the subject is the hospital (HAN study) or the MAU (MAU study) and the object is the population of patients being cared for. The activity system comprised the different elements organised to care for patients within the broad remit of providing the 'care expected' (St George's Healthcare NHS Trust, no date). People and artefacts were deployed in an appropriate way by which the hospital addressed the particular and emergent needs of its patients. The hospital level activity system used the ward space and facilities, test departments, test equipment and particular human roles as artefacts supporting patient care. Along with nurses and other roles, the doctors were part of the community and through division of labour were tasked with and were called on to carry out appropriate patient care actions. It is assumed that should the doctors not have carried out the activities relating to their role, the patient would have suffered and thus the competence of the hospital be decreased.

In the (right hand) individual level system, the subject is the doctor and the object the particular patient for whom the doctor has been given responsibility. The doctors took direct action in relation to the patient as part of the division of labour of the hospital, however, the relationship between doctor and hospital also effectively reversed. The facilities of the hospital such as test equipment and test departments effectively become a tool of the doctor in order to support the care of the particular patient. The hospital also had non physical artefacts (Miettinen, 2005) such as institutional routines such as the hand-over process as part of its patient care system by which the doctor operated and through which action was instigated.

In activity theory, the object is defined as the raw material or problem space (Marx, 1930; Simon, 1969) at which activity is directed and which is moulded or transformed into outcomes. The object is by definition of the situation of the HAN study the focus of attention of the doctor in their care of the patient and reflected in their activities and actions. The way in which the desired outcome of the resolution of the patient problem might be achieved was indicated in a number of cases such as the action of 'prescription completion' (and presumably the subsequent provision of medication). In the MAU, the study identified that a doctor's actions was based around three separate but related objects of attention – the patient as sentient being, the doctors understanding of the patient condition and the decision on what to do next – the course of action. This may have been to discharge or admit or a decision on additional investigations needed. In the MAU study, the patient was identified as a common object between multiple interrelating activity system. For example in the boundary crossing between A&E and MAU activity systems and as a common object in doctor and nurse patient care activity systems. This consideration of the role of patient as object extends current thinking about the nature of the object (Kaptelinin and Miettinen, 2005).

The role of artefacts has been emphasised by Activity Theory (Engeström and Middleton, 1998) and it has been identified that physical and cognitively held artefacts have played an important role in patient care. At the organisational level the hospital environment and physical resources have been important, for example the availability of beds both in the MAU and in general wards was identified. The artefacts of the skills structure represented by the hierarchy and specialisation of doctors and the roles of nurses and other staff and the duty roster were identified as ways in which the hospital applied appropriate skills to the job in hand – though in the HAN study it was shown that the match was close but not perfect. Artefacts representing rule based processes such as the MAU ward round where decisions were reviewed and approved and the hand over process between shifts or firms were ways in which the hospital carried out its responsibility for patient care.

There are artefacts that directly link between the doctor and higher level activity systems such as the patient record system. This system acts as a critical way in which communication occurs between the levels of activity systems. For example it communicates patient details across changes of shift, between test departments and attending doctors. At the individual doctor level, the artefacts of test facilities, communications and information systems, medical supplies and peer support were identified as important to their patient care capability.

The studies have provided evidence that individual doctors used individual artefacts in carrying out actions as part of the patient care activity (Appendix G). Some of these were used directly with the patient such as for example the ECG equipment, but others were indirect for example the investigation request form. In doing this the doctors have not been taking direct action with the patient but directed towards the hospital level of activity system – supply of medications and test department operation respectively. In these, the position of the doctors are similar to the actions of the beaters in Leontiev's famous hunting example, where the beaters are chasing animals away from themselves (Leontiev, 1981). These are actions that can only be understood in the context of the activity system (Kaptelinin, 2005), the hunt for food and hospital patient care system respectively. In the hunt, the hunters will kill the animal being chased towards them by the beaters for subsequent sharing with the beaters and in the case of the hospital the doctors will instigate actions that will be taken by other departments – the pharmacy and test department respectively.

Thus, whilst many actions of the doctor may be understood directly in relation to using their capabilities to provide direct care to their patients, others may only be properly understood in relation to the patient care systems of the whole hospital.

The activity systems being studied involved a community structured in a particular way in order to apply specific skills and resources to circumstances. The community comprised the patients, nurses, duty doctors, ancillaries, cleaners, Lead Consultant, Bed Manager and laboratory or test personnel and less directly other stakeholders in the hospital and within the general public. Along with nurses and other roles, the doctor was part of the community and through the role structure was tasked with and was called on to carry out the patient care required. The doctor duty schedule of the hospital at night and of the MAU showed that the structure of the organisation was purposeful with regard to expected demand.

Rules representing routines and processes

The activity theory concept of rules refers to that which guides actions (Engeström, 1990). In relation to this research project, rules are interpreted as not only specific rules but also the more subtle effects of habitual or institutional routines and processes that relate to the organisational setting.

It was observed that doctors followed a number of unwritten but standard rules, routines or processes, for example acceptance of patients from General Practitioners, leaving work at the end of a shift for the doctors of the next shift. It was also identified that many rules, routines and processes that were observed in the study were carried by artefacts that inherently guided the action of their users such as investigation forms. Investigation or test request forms and discharge notes were used by the doctor for instigating hospital processes for their patients and gave the doctor guidance in the information required and the options available (See Appendix M).

The doctors in the MAU were subject specifically to the rules included in the Lead Consultant's objectives of carrying out diagnosis, not referring patients to a main ward if they could be discharged and general care of the patients. Written rules in the MAU comprised only posters, one prompting the following of hygiene practices and another prompting the use of appropriate language with elderly patients.

Artefacts as mediator in activity

In conceptualising this research project, the resource based view (Penrose, 1959) based upon theorising by Smith, Ricardo and Marx (Smith, 1776; Ricardo, 1911; Marx, 1930) was identified as an explanation of how organisations achieved productive power through the deployment of labour power and other resources through an administrative organisation. It has been concluded that the activity theory concept of artefact has explanatory power in identifying both non-human kinds of resource and how the administrative organisation is carried or reified. In considering the factors identified in the organisational capability models and research, different levels of artefact (Wartofsky, 1979) represent both technical systems and the mechanism by which processes and structures are embedded. Therefore, this section reflects on the important role of artefacts mediating between subject and object e.g. (Engeström, 1993).

In both HAN and MAU studies, the doctors were observed to use not only their own knowledge but also a range of supporting physical artefacts (Appendix G, Sections 6.5, 6.6). In addition to using artefacts directly with the patient, the doctor also took actions using artefacts that related to the patient but aimed at the hospital patient care system. Activity theory provides a way in which such artefacts may be considered as mediating between subject and object in seeking a desired outcome. The artefact may be a physical tool, a sign or a cognitively held construction (Wartofsky, 1979) and it is concluded that their use supported the competent action of both individual doctors and the hospital as a whole.

The artefacts used by the doctors may be classified into a foundation level related to the ward environment and those that related directly to the patient as object. These include those used to provide information to support diagnosis, to instigate action in other parts of the hospital, test technology, as guidance by the hospital and communication technology. Artefacts supporting diagnosis also included the work-space where the doctor carried out the activity. There were also invisible artefacts, for example the access agreements to test resources and facilities in other parts of the hospital and the 'discussion space' that enabled the patient related discussions between doctors. These are described further in the following sections.

Artefacts as carriers of patient information used in patient care

Artefacts contained patient information relating to their history and bodily condition (See Appendices M to S) and were used in support of or input to the process of diagnosis and deciding on treatment (Orient, 2004). The artefacts related either directly to the actions of the doctor with the patient such as derived through clerking or carried information gained from other doctors or departments of the hospital. The artefacts were sign based, describing the patient condition such as blood lactose level (Appendix S) and were used as part of the problem space that the doctor manipulated in order to decide on diagnosis or next actions (Meyer, 1968; Simon, 1969; Orient, 2004).

Considering the relationship between subject and mediating artefact, for artefacts such as patient history and blood test results, it was concluded that the doctor must know the meaning of the information in the situation of the patient condition, possible hypotheses regarding disease and the contribution to the decision on treatment. At a broader level, since the doctor was also contributor to this information, they needed to understand the relevance of the action of information provision on the hospital wide patient care process – that others may need the information. Thus the relationship was multi-layered.

The hospital computer system was used as a carrier of patient records, notes and test results such as x-ray (Appendix G) and was used by individual doctors and for group discussion as a mediator both achieving understanding both during diagnosis and during the Consultant ward round e.g. (Section 6.1).

Artefacts as carriers of information to other departments

Whilst carrying out patient care, doctors also used artefacts that acted as carriers of patient related information to others in the hospital. The prescription, blood test and x-ray request forms acted as a means by which action was instigated in and requirements were communicated to other parts of the hospital such as pharmacy and tests departments (Prior, 2004). The success of this action was based upon the hospital test department routine using the test forms as both carrier of information and signifier of action needed.

Doctors were observed writing onto the patient record the information gained from the diagnosis process (Appendices M and P). This may be seen as part of the individual's diagnosis process but also part of the organisational activity system – a way of communicating from the subject doctor to themselves for later, other doctors or other departments.

Use of these artefacts for communication of patient information supported the division of labour between specialist departments and doctors on different shifts.

Test tools and facilities

Some artefacts used by the doctors were tools that enabled them to investigate the patient condition or state, the results of which were used in the diagnosis process. These included the patient history/clerking sheet, the use of local test facilities such as the portable

ECG machine and stethoscope and the instigation of testing in other departments. It was concluded that the doctor must have an understanding of a number of different dimensions relating to these tools. Firstly, the doctor must know what investigation systems are available in relation to a particular patient condition and the current diagnosis situation. Secondly, they must know and be skilled in how the tool should be used. Thirdly, the doctor needed an understanding of the possible impacts of the results of tool use on the patient care activity, contingent on the particular conditions at that time and the possible outcomes for the patient in relation to the objectives of the hospital. This may be restated by the question for the doctor – should they make use of a particular tool in the current situation and what would be the impacts of the tool use on the outcome sought for the patient. The MAU queuing theory analysis showed that where the time for additional tests made patient service rate (i.e. achieving diagnosis and a decision on treatment) approach new patient arrival rate, the effect on queuing time was exponential and time in the MAU for patients increased considerably. (see figure 31) Thus the doctor had to play off confidence in the diagnosis against patient delay and MAU throughput. This decision making required the layers of tacit knowledge described by Polanyi (1969).

Patient treatment artefacts

Patient treatment and care resources such as blood, saline etc were observed being used by the doctors in the HAN study. For these resources, it was concluded that the doctor needed to know how they should be used to benefit the care of the patient and appropriately skilled in their use.

Artefacts as carriers of rules, processes and other information

It was observed that a number of standard rules or processes followed by doctors were encapsulated in activity theory terms in cognitive and physical artefacts. The physical included protocols, that give direct guidance and more general point of reference material such as the 'Grey Book' (St Georges Healthcare NHS Trust, 2006), medical websites, handbooks and the British National Formulary (Appendix G). The MAU study illustrated the rules embedded in forms design, for example the blood test form guided the doctor in the information needed (Section 6.1).

Artefacts were observed being used that related to the MAU organisational level activity system (Engeström, 1996) thus having a secondary effect on patient care. The use of the Jobs to do sheet (Appendix V) and duty rota (Appendix U) were tools for organising doctor work and thus ensuring the diagnostic capability was used effectively.

In a similar way, the patient record was for the doctor an aid to diagnosis whilst for the MAU and hospital as a whole it was a way of enabling communications between doctors thus representing an element of the MAU and hospital patient care activity systems (Engeström, 1996; Tobach, 1999).

In the MAU, the rules or routines held as cognitive artefacts included the need to diagnose and decide on treatment for the patients, upkeep of the patient record, the routine for selection of the next patient to attend to and the inter-doctor dialogues that occurred.

It is suggested that use of such rule and process based artefacts impacted on the way that patient care was carried out and thus the enactment of organisational competence.

Observations and conclusions regarding use of artefacts

The artefacts used by the doctors were based upon technologies from the very simple to the complex. Paper based forms, patient information sheets and MAU patient file were very simple but apparently effective. Test technologies and computer based information systems were clearly of a more complex and disputed nature, the latter illustrated by the cost of the NHS patient record system and the problems being experienced in its implementation (Toussaint and Berg, 2001; Anderson et al. 2008).

For tests carried out in other specialist departments, the arrangements by which MAU patients could have tests formed an important artefact, reflected in the Lead Consultant objective referring to working with the hospital's Professional and Scientific Directorate on achieving rapid turnaround of investigations (see Appendix H).

Thus the studies have identified in the research setting the multi-faceted nature and roles of the artefacts used within the field of study.

Patient record – writing as thinking

It was noted that doctors took much time in transcribing their rough notes to the hospital record. Appendix P provides examples of the extent of doctors' notes. Rather than being simply a clerical task, the writing of the patient record from information gained from the doctors' notes appeared to be part of the diagnosis process, helping the doctor to arrive at a hypothesis. This support of problem solving by writing concurs with Dunleavy's and separately Hammarén's theories of 'writing as thinking' (Dunleavy, 2003; Hammarén, 2006).

Activity theory emphasises that mediating artefacts (such as computer or paper systems) operate in a two way interaction with a human subject – the nature of the artefact shapes the user e.g. (Kaptelinin and Nardi, 2006). In their discussion on the role of patient records Toussaint and Berg (2001) describe that understanding the role of the patient record in different situations as an organisational artefact is an important consideration in the computerisation of these records. Because of the different ways in which data is en-scribed and read on a computer keyboard and screen and on paper, the question is raised of how the use of a computer based patient record will affect the diagnosis and treatment decision making process (Kaptelinin and Nardi, 2006). This is a subject worthy of further investigation in the light of the impending computerisation of patient records.

The activity theory framework include the elements of subject, object, artefacts, rules, community and division of labour (Engeström, 2000). In comparing this structure with the dimensions of the people, their interaction, technical systems, processes and structures in the situation of doctor's patient care the following conclusions are drawn.

The people component was equated primarily to the doctor as subject in the activity of patient care. The interaction between people and others was informed by the activity theory community and division of labour constructs but it was recognised that the opportunity for interaction was a second order artefact (Wartofsky, 1979). Technology was linked clearly with the concept of artefact and was observed in the form of test equipment, information systems and paper based systems such as the investigation request forms. Process was equated with the rules concept and a range of processes important to patient care were identified. Structure was identified in the arrangement of physical artefacts, and in the doctor division of labour – the medical hierarchical and knowledge based structure.

Thus each of the individual, interaction between individuals, processes, technical systems and structures have been shown to relate in the context of the patient care by doctors to Engeström's (1993) activity theory framework. It has also been identified that the relationship has been multi-dimensional. An example of this is process that equates to the activity theory rules concept but may also represent a cognitive artefact or be defined in a physical artefact. The study thus develops further the understanding of the way in which activity theory can be used for work research and its relationship with individual and organisational capability.

8.3 Contribution of the research to business practice

This research study contributes to business practice in two ways, directly in the context of hospital organisation but also more broadly in terms of the models that have been developed and demonstrated that are potentially of value for the analysis and development of other kinds of organisation. The research contributes by providing a fresh perspective on organisational capability and competence and the links between individual and organisation

At a hospital patient care level, the findings from this research project contributes evidence about how doctors actually use the resources of the hospital in their work. The results of the HAN study have already been used by St George's hospital for a review and restructuring of their overnight patient care staffing. The activity theory and queuing theory based analyses of the MAU operation contributes to an understanding of the medical assessment function, an under-researched area of operation (Wood and Rhodes, 2003). This is particularly important because of the impact of effective MAU operations on achieving rapid throughput of A&E and of the population of the hospital in general. Therefore the results of the research show how such resources are being used and provide indications of the benefit they bring to the diagnosis and treatment decision making activity.

It also provides information upon which decisions may be made about MAU team working. This is through the identification of the roles and the importance of organisational artefacts against the background of individual capability. The comparison between doctors diagnosis and engineering fault finding provides further insight into the problem solving process.

In a direct way, the hospital unit involved in the research and other hospitals will gain benefit from the research through gaining a better understanding of the processes at work. A particular issue is the question of how the use of computer based patient records will impact on the diagnosis and treatment decision making process of the doctor. This is a critical issue in view of the current programme for implementation of standard computer based records across the UK NHS (Connecting for Health, 2007) and the concerns raised (Eason, 2007; Anderson et al. 2008).

The research also contributes a framework that may be applicable to both the hospital setting and other organisations (see below). The framework may be used for analysis and design of an work environment that would support competent action at individual level that would contribute towards organisational competence. The framework has already been used by the researcher in teaching masters level students and by the students for analysis of their own organisational settings and were found to be useful by the students for that purpose. It is suggested that this model provides a further tool for organisational audit and development.

The reporting of the use of activity theory and queuing theory advances knowledge of the way that these techniques may be used separately and together in a business situation, thus adding to the tools available to organisational development practitioners.

8.4 Implications and recommendations

Hamel and Heene (1994) state that theories should guide day to day management decisions and actions, therefore in this section the implications of the findings will be discussed and recommendations made.

It is proposed by this thesis that the linking between individual action, the tools at hand and the objectives of the organisation need to be considered separately and as a whole. The investigation has demonstrated that a wide range of both physical and cognitive artefacts are used by doctors in their patient care activities as described in the theoretical model. In the case of the MAU, the analysis using queuing theory has illustrated that the timely availability of doctors and investigation facilities is crucial to meeting the objectives of the MAU and hospital overall, that is of speedy and accurate diagnosis and treatment decision making. Littlechild (1991) suggests that the investment in systems to support speedy treatment of customers in a queuing system needs to be balanced against the benefits of such speed of treatment. The evaluation of the potential benefit of further investment in local investigation or revised access to hospital investigation facilities is outside the scope of this enquiry but is one that should be carried out. It is not clear that current investment and processes are optimal in the light of the high numbers of MAU patients who are not diagnosed within the target time of twelve hours.

The importance of the processes being used in the MAU has been emphasised. For speedy diagnosis and a decision on treatment to occur, the process of review also needs to be speedy. This was often observed not to be the case as the Consultant ward round procedure in the early morning and late afternoon usual in non-MAU wards was used in the MAU for the agreement of treatment decisions. Having a resident doctor with appropriate authority for agreement of treatment decisions would speed the diagnosis and treatment decision making process thus reducing patient wait and bed occupancy.

It was observed that the doctors in the MAU often spent a considerable time in rewriting notes into the patient record. This appeared to be more than just a writing exercise as it was identified that the rewriting and review of the material was part of the diagnosis process and relates to Hammarén's and Dunleavy's theories of 'writing as thinking' (Dunleavy, 2003; Hammarén, 2006) This raises the question of how implementation of computer based patient record systems will influence this diagnostic process. Evidence should be drawn from hospitals who have implemented such computerised records in order to gauge this effect.

A model for investigation and design of human activity within an organisational setting.

Based upon the research and analysis carried out in this research project, it is possible to form an analysis framework that would assist organisations in conceptualising, analysing and developing the environment that would support competent action. This is similar to a model directed specifically at understanding the role of technology in organisations (Scott-Morton, 1991). In keeping with the theme of this thesis, practitioners using the framework should come from both of, or bridge the gap between, human resources and organisational strategy functions. Without a view of both dimensions, there is a danger that one or other element is overlooked.

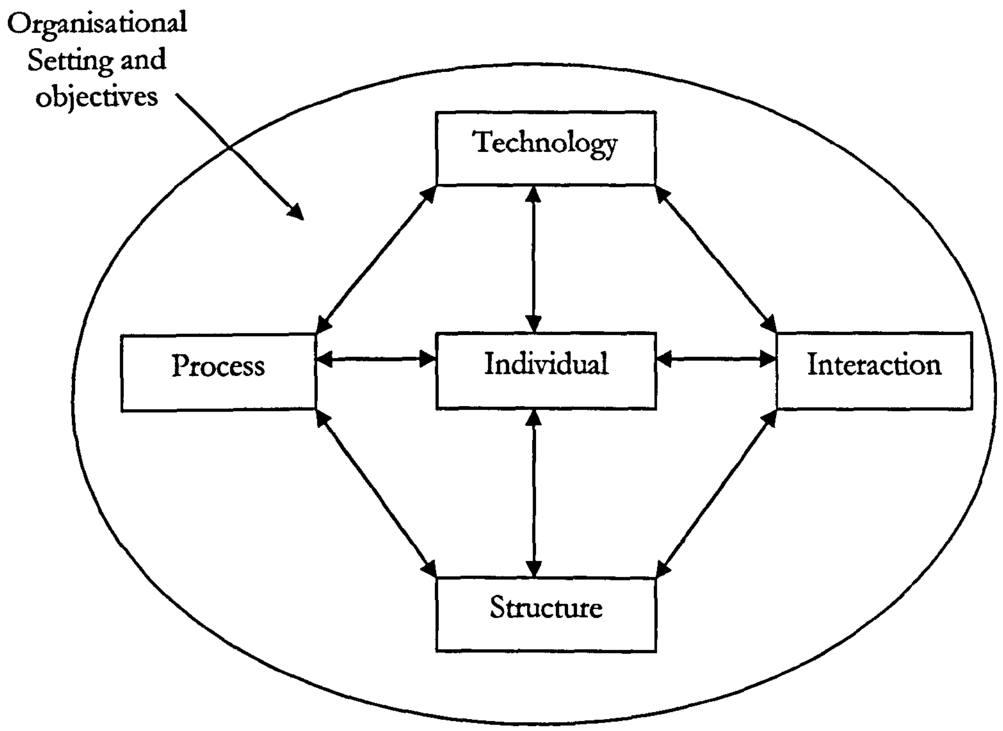


Figure 38 Individual capability within an organisational setting

The diagram represents how each of the factors identified – technology, process, structures and human interaction relate with each other and with the individual in pursuit of competence in an organisational setting. This model provides a conceptual view which is restructured into a draft form shown below that will enable the analysis of an individual within the organisational setting, using the observations of the doctors in the MAU as a short example.

Organisational Factor	**Inter-relationships/requirements** **Contradictions marked with ***
Organisational Objectives In the MAU, key objectives are: • Diagnosis and deciding whether patients should be admitted or discharged • Minimising number of patients awaiting MAU entry • Support A&E four hour target • Do not admit patients unless necessary • Move patient to Richmond if time exceeds 12 hours	

Role of the individual Doctor responsible for diagnosing and deciding on treatment. May take actions to progress the above. Must present to and get agreement to decision by duty Consultant. Must update patient records.	Doctor has to decide on the actual process to use in order to satisfy MAU objectives. This includes selection of tests that will provide sufficient diagnosis data upon which to make a treatment decision. *Diagnosis may take too long. *Consultant only available during morning and evening ward round causing delay to treatment action – discharge or admittance.
Role of interaction Doctors operate as a small team in the MAU.	Doctors may use each other to support their diagnosis activity. Senior doctors to support and check progress of juniors.
Role of technology ECG equipment is available for use in the MAU. Other tests carried out by investigation departments. Computer equipment is available at the neighbouring Nurse Station for doctors to use. A central table is available in the MAU for doctors to use. This hold the MAU patient record book, jobs to do sheet and duty rota. Patient files kept in file boxes 1-7 by MAU table. Telephone and bleep available to support doctor contact with others.	Use of MAU based equipment is subject only to whether it is already being used for another patient. Computer may be used for accessing patient info. Including records, x-ray pictures and other test results. Also can access intranet and internet for internal St George's/external reference info. *Computer may be unavailable because it is being used by a nurse. *Table has 4 chairs but not sufficiently large for required use by doctors and nurses.
Influencing structures Doctor have hierarchical grading structure and MAU duty uses mix of SHO and SpR plus oversight by duty Consultant. MAU part of Acute department and sits between A&E and main wards. MAU separate from investigations departments.	Doctors use grade structure for defining responsibilities and as indication of knowledge/experience. Doctors fear presentation to Consultant. *MAU operation impacted by meeting A&E four hour target that means patients may be moved on to Richmond before necessary. *Non-availability of beds in main wards means patients sometimes cannot be moved on. *Awaiting test results from investigation departments causes delay to diagnosis.
Applicable processes Doctor uses standard diagnosis process but route is subject to findings of investigations. MAU part of bed management process. Doctor scheduling as part of General Medical Specialty rota. Supplies part of hospital supply system.	*Process means that length of stay in MAU is un-predictable. *Lack of bed availability disrupts MAU operation but actions of Bed Manager assists in effective bed utilisation. *Doctors only spend time in MAU subject to rota, possibly means a lack of team-work with

External tests subject to investigations dept. scheduling process. Discharge subject to hospital discharge process. Medications subject to hospital medications supply process. Patient selection is from the jobs to do sheet. Patient movement to tests subject to obtaining the services of a porter.	MAU nurses. Diagnosis time is subject to doctor commencing clerking. *External tests subject to both investigation dept delays and delays to obtain services of a porter. *MAU sometimes has no bed available for waiting patient due to greater number of patients arriving than having treatment decided.

Table 8 Individual/organisational capability diagnostic

As shown in the example, this diagnostic may be used for identifying the operation of and contradictions (Engeström, 1999) within an activity system. The diagnostic provides a way in which the different elements of organisational capability and their interactions may be considered. As a result of the analysis, the contradictions may be addressed thus improving the achievement of organisational competence.

8.5 Reliability and validity of the research

The observational methods used for the research were informed by the descriptions of previous research practice reflected in the writings on work based situations including those using activity theory. The theories underlying the research questions and the researcher's growing understanding of cases and context during the studies are what Flick describes as 'sensitising concepts' to enable the study of effects in social settings (Flick, 1998) and this is appropriate to the study of individual doctor actions within the hospital setting. An issue here is one of complexity. Much of quantitative research is based around simplification of circumstances by holding variables as a constant thus enabling precise identification of cause and effect (Flick, 1998). However if the wish is to study a complex situation such as organisational behaviour, Flick (1998) suggests that research methods are needed that are so open that they do justice to the complexity of the object under study. A case study approach of multiple cases using flexible methods and mixed mode data collection as represented by the HAN and MAU studies and their combination match this requirement (Yin, 2009).

The perspective of the researcher

The perspective of the researcher is crucial to which data are collected and their interpretation (Seale, 1999). It is recognised by the researcher that this research project involved considerable interpretation of observations both at the time and subsequently as part of writing this thesis. However, at a deeper level, the research design - the way the research was carried out, what was important to investigate or observe - was building in the researcher's own desires and prejudices. The aim was to minimise the effects of these and at least make them apparent as part of the thesis.

Reliability

A general question regarding any research is that of reliability, that is independence from accidental circumstances and whether people would get the same results if they repeated the research in the same way (Peräkylä, 2004).There is a diversity of methods available and some argument amongst researchers about the superiority of one over another (Silverman, 2004). The methods used for the research as documented in this thesis were selected with reference to the literature and previous practice. Reliability was sought through the production of a research protocol based on multiple observations and interviews and use of multiple cases and assuring the quality of the field notes and their public accessibility.

In case studies, sampling is not a critical issue in the way it is of vital importance to quantitative research, where external validity is dependent on the sample taken (Saunders, Lewis and Thornhill, 2003; Yin, 2009). The hospital department, doctors and patient events used were convenience samples used to provide multiple sources of evidence. Data were used from a systematically taken set of observations and this is said to be an appropriate strategy in case study research (Yin, 2003; Yin, 2009).

The MAU study took place during the early part of the year – January to March, therefore the specific patient complaints may be different to other times of the year. However the Acting Matron stated that in the MAU the general approach to the patients will be similar irrespective of type of complaint. Thus the validity and reliability of the research is not thought to be critically affected by the time of the year in which it was carried out. In a similar way for the HAN study, it is not expected that the kind of actions needed of doctors by patients overnight and the artefacts used would change significantly at different times.

Validity of the research approach

There are numbers of threats to validity, that is whether the findings are what they purport to be (Saunders, Lewis and Thornhill, 2003; Yin, 2009).

The main dangers in observational research are that the behaviours being observed are distorted by the presence of the researcher and by using misinterpretations of the observations (Richardson, 1996; Seale, 1999). It was impossible for the research activity to be completely independent of the activities taking place. Therefore it is possible that carrying out the study directly affected the subjects by setting different thought patterns. For example questioning doctors about their activities, which happened during the progress of the doctor/patient interaction, may influence the future progress of diagnosis and treatment decision making. It was planned that this research project would have as little impact as possible on the subjects of the research. The activity pattern of multiple subjects were observed and materials from the normal working environment were examined and copied or retained. Any effects are recognised where possible in the study. It was not possible to observe a hospital doctor during every waking moment so the observations were designed so that a sufficient activities were observed and recorded in order to answer the research questions. It is also implicitly assumed that the doctors in taking action were seeking to pursue the objectives of the organisation of which they were a part. No evidence was found that would undermine this assumption.

The doctors who were observed in the HAN study were those who were scheduled for duty in the appropriate role at the times selected for observation. No purposeful selection was made except that the Medical HR Manager scheduled the observations to cover (mainly) each specialty twice. For the MAU study, the doctors observed were those on duty during the researcher's observation periods. Diagnosis and treatment decision events were also selected on a random convenience basis – i.e. all events that took place whilst the researcher was resident in the MAU. These events were deemed to be typical in the eyes of the Acting Matron. Thus the research sought a realistic approach that tells it 'as it is' (in this particular hospital department and situation). For the observations in the MAU, the researcher's use of a diary of events and photocopies of real documents and recordings was designed to support validity through the ability to carry out accurate reporting of events and materials and their analysis. These recordings and evidence have been maintained by the researcher in case of the need for future reference and a transcription may be found in Appendix Y.

Another important source of data for the study was documentary evidence in the form of St George's Medical School and St George's NHS Trust materials. Denscombe (2007, p 232) suggests that the validity of such documentary sources should be assessed with regard to their authenticity, credibility, representativeness and meaning. In each case, because of the situation in which these documents were published, they have been taken to be valid for the purpose described.

On the basis of the preceding discussion, the body of evidence gained through the HAN and MAU studies provides valid and reliable information within the constraints described in this thesis with which to answer the research questions, that is to identify the ways in which individual doctors used other organisational resources in carrying out patient care and a view of the organisational context in which their actions occurred.

Generalisability of the research conclusions

An issue said to exist with research based on case studies is that given sufficient depth of study, there is significant validity but there are limits to the generalisability of results. Qualitative researchers argue that such research gives generalisability of concept or 'analytic generalisation' rather than a numeric score (Seale, 1999; Yin, 2003; Silverman, 2004; Yin, 2009). Case study research is not seen as a sample from a wider population but as a detailed description of phenomena in a particular setting that may lead to explanatory theory generation (Bryman and Bell, 2003; Yin, 2009). This means that a clear link has been demonstrated between observations and the theory generated and that this theory may help in understanding other cases or situations (Robson, 2002). The key questions are whether findings are grounded in empirical material and whether the methods have been appropriately selected and applied (Flick, 1998). These are documented in this thesis.

The case study of doctors' patient care was in two parts – the HAN and the MAU study. Commonalities have been identified between them in the actions doctors were observed to carry out and the artefacts they used, however, no assumption is made of the generalisability of the observations between the studies and other hospitals or times. However, the identification of the theoretical framework shown to represent the linking between individual action and the organisational aim is proposed as one that may have explanatory power in other organisational situations (Yin, 2009).

8.6 Limitations of the research

In reviewing the research study carried out against the guidance in the research literature, e.g. (Yin, 2003; Bryman and Bell, 2003; Saunders, Lewis and Thornhill, 2003) the following limitations have been identified.

A range of literature has been used to provide a theoretical baseline for the study however it is possible that other literature may provide further insights into the area of study.

The study took place over a limited time and as such may be categorised as small scale. Potentially, studies taken place in different contexts, over a longer time period or at different times of the year may provide richer results.

The methodology used has been based upon a case study using in a pragmatic way, the frameworks of activity theory and queue theory as perspectives for examining the actions of doctors in their organisational setting. This has led to valid conclusions in respect to the research aim and questions being asked. However, both frameworks would be capable of supporting more comprehensive analysis should this be desired to gain a fuller picture of the patient care in a hospital, for example by exploring the cultural and historical influences on doctor action at the individual doctor level.

In order to build closer to a perfect understanding of the activities under study, it would be necessary to read the minds of the doctors and to record and analyse their every utterance and see their every action. It is recognised that limited access to the processes being used is available to the researcher, both because of the situation of busy doctors wishing to concentrate on their patient care activities and the research design whereby it was intended that the doctors' normal processes of activity were uninterrupted or affected. Therefore the approach taken falls short of this perfect situation. A detailed diary of specific patients and their care journey was not feasible. Such data collection would potentially provide further information about the impact on the diagnosis and treatment process by doctors and their use of artefacts.

The research was focussed on St George's hospital. The findings therefore reflect only the events that occurred within St George's during the study periods. Other hospitals may provide different findings or St George's may provide different findings if the study was repeated at a later date. Therefore the findings and conclusions from the studies are presented only as representative of St George's during the study periods but may apply to other times and locations. This is an appropriate conclusion for case study research (Stake, 1995; Robson, 2002; Yin, 2003; Bryman and Bell, 2003).

For both the HAN and MAU studies there was a limitation to the amount of data collected. Further data collection could provide further insights to those documented in this thesis. Direct recording of doctor conversation using a recording device was attempted in the MAU study. However because of the impact on doctors of observing the recorder – becoming reticent, and the ambient noise in the MAU making interpretation of recordings difficult, use of direct recording was abandoned. Therefore the conclusions are based upon the form of dialogues noted rather than specific content. Having full recording of dialogue between doctors and others would enable further understanding of the role of dialogue in the hospital. Medical terms were recorded in the MAU study 'as heard' so may not be accurate, however since the focus of the research is on the form of dialogue rather than specific content, this is assumed not to impact the validity of the conclusions.

In the study, there was limited access to both doctors and management. Further access to both players could provide further depth to the analysis of the data and the conclusions made. In particular, the hospital management was difficult to access so there has been limited feedback on the results of the studies. Since the empirical research was carried out, the hospital management have made significant changes to both overnight staffing by doctors and the physical organisation of the MAU. Due to change of management roles, it has not been possible to ascertain to what extent this has been based upon the research findings.

The UK National Health System carries out operational research and makes changes to its operations in different locations in a highly structured way which limited the opportunity to carry out developmental research. It is planned that the results of this research project can be used as a basis for entering into the process by which developmental research can be approved and carried out.

No direct observations were made or statistics collected on use of the investigation facilities that featured in both the HAN and MAU studies. Incorporating such information would add further depth to understanding the impact of these artefacts on the achievement of patient care in relation to the decision making by doctors and thus the enactment of organisational competence.

Under the research protocol, no direct doctor/patient diagnosis episodes were observed by the researcher, therefore no direct 'hands-on' diagnosis action or conversation was recorded. Therefore the specific area of the physical skill of doctors in diagnosing through touch and questioning is not part of the research finding.

8.7 Strengths of the research

This research project has set out to investigate an area of organisational operation that has been overlooked by other researchers. This is the linking between individual and organisational capability. It was identified that in addition to the importance of individual capability, the other factors that influence organisational competence is the way people can interact, use technical systems, follow processes and are influenced by physical and social structures. The examination of the combination of these dimensions is unique and provides a new approach to understanding organisational capability.

The research in examining concurrently the individual and organisational levels comprised a case study of doctor patient care informed by activity theory and queue theory. Each of these frameworks has provided specific perspectives on the relationship between the actions of the individual doctors, the aims of the organisation and the role of mediating artefacts. This has been a novel approach to organisational research.

In carrying out the HAN and MAU studies, a body of evidence has been collected about the actions of doctors in the two specific contexts. The HAN data has already been used specifically for the restructuring of doctor staffing during the overnight period and both data sets have been used for activity analysis in a University setting. Additionally the availability of the data make further historical analysis of activity within an organisational setting possible. This is particularly relevant in the present context of restructuring and change within the NHS, for example removal of the 4 hour rule for treatment in A&E.

The identification of the theoretical framework and its contextualisation in relation to patient care provides a tool for examining and potentially improving healthcare operations. This is particularly relevant to the UK situation of seeking cost effectiveness improvement through adoption of information technology and organisational change.

8.8 Recommendations for further research

This research project has generated a model of the linking factors between the individual and organisation, therefore it is appropriate that this model is tested against other settings and situations. An appropriate setting would be the investigation of recent or current healthcare problems. The framework of developmental research through intervention suggested by Engeström (1996) provides a potential method by which this could be carried out.

The research study described in this thesis has been of one particular hospital at a particular point in time. Since the study was carried out, time has moved on and St George's has developed, for example in reorganisation of the MAU. The findings of this study may be developed in a number of dimensions.

By the nature of the study, the use of artefacts has been observed and described, however, the scope of the study did not include for value judgements to be expressed about how the use of artefacts affected the effectiveness of doctors. It would now be useful to investigate further the use of artefacts and resources – are the artefacts used effectively? Would it be more cost effective to make artefacts more available, for example a study of the availability of investigation systems from a MAU viewpoint could improve the service from these facilities and thus improve both the patient experience and MAU effectiveness.

A further study of the MAU operation would provide comparative information – is the MAU now serving the public to worse or better effect? The effect of the number of MAU beds and numbers of doctors and their impact on MAU competence is a suitable area of study. This is particularly relevant in view of the observations that many patient were moved into Richmond ward for further diagnosis.

It has been described that the doctors on duty in the MAU were scheduled from the general medical community. Appropriate research may be carried out into ways of resourcing the MAU that would increase the level of knowledge of the duty doctors, for example by having a discrete team of MAU doctors. It was described that little research has been carried out around MAU operations (Wood and Rhodes, 2003). A review of practice across different MAU operations would answer a number of these questions.

A question raised at the Ethics Committee review of this research project was whether it would examine the accuracy of diagnosis made by doctors in the MAU. This was not within the project scope but a study of accuracy of diagnosis against the throughput objective would be of benefit to MAU organisation. For example has the delay in getting test results from remote test departments meant that doctors have admitted patients unnecessarily and would the situation be improved by more local test facilities.

The computer systems for modelling the MAU operations were assessed by Oddoye (Oddoye, 2006) and the use of queuing theory for analysis of MAU operations has been described in this thesis. Operations of the MAU may be improved through application of these computer based activity modelling techniques in relation to the cost effectiveness of the application of human and other resources (Littlechild, 1991).

The use of the patient record during the process of diagnosis and treatment decision making has been discussed. There is a potential issue that the computerisation of these records will impact how diagnosis is carried out. Therefore, an important area of research needed in the near future is to assess the impact of patient records being computer based on the diagnosis and treatment decision making process. This can be through the examination of the early adopters of these systems.

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Appendix A St George's Corporate Objectives 2006/7

Agenda Item: 12.1
Paper No: TB(06)27

St George's Healthcare NHS
NHS Trust

Name and date of meeting: **Trust Board: 14 March 2006**
Document Title: **Corporate Objectives: 2006/07**
Action for the Board: To consider the proposed Corporate Objectives and agree the Trust objectives for 2006/07.
Summary: The Corporate objectives agreed by the Trust Board in March 2005 have been reviewed. The updated objectives continue to be based on the Standards for Better Health domains. Sub objectives have been added and the research objective has been included, as a sub-objective, under the Governance domain. The report will be presented by Peter Homa, Chief Executive
Author and Date: Lesley Stuart Head of Governance — 2 March 2006
Contact details: Tel: 020 8725 1638 — E-mail: Lesley.stuart@stgeorges.nhs.uk

St George's Healthcare NHS Trust
Corporate Objectives – 2006/07

Domain: Safety
Corporate Objective: To enhance patient safety, by minimising all risks to patients.

Sub objective: To continuously and systematically review all activities that directly affect patient safety and apply best practice in assessing and managing risks, particularly when patients move from the care of one organisation to another.

Domain: Clinical and Cost Effectiveness
Corporate Objective: To improve clinical effectiveness and outcomes of care.

Sub objective: to provide a seamless service which, conforms to national guidance and best practice, takes account of individual requirements and is founded upon evidence-based practice.

Domain: Governance
Corporate Objective:
1)To achieve effective organisational governance.
2) To ensure that our functions, policies and organisational practices are non-discriminatory, promote equality of opportunity for all and good relations between people from diverse backgrounds.

Sub Objectives:
1. To achieve financial balance.
2. To achieve NHS performance targets.
3. To ensure a diverse workforce at all levels within the organisation, that is well - supported, fit for purpose, continuously improving services through better ways of working and adopts best practice in human resources management.
4. To further develop the research and teaching function of St George's Healthcare in collaboration with our academic partners.
5. To ensure integrated governance and clinical governance best practice is in place across the organisation and associated clinical networks.

Domain: Patient Focus
Corporate Objective: To ensure that positive patient and carer experiences are a focus of our services.

Sub Objectives:
1. To ensure patients receive timely and appropriate information on treatment, care, services and health promotion and are supported to make choices about their own health care.
2. To help patients, particularly patients with long-term conditions, contribute to planning their care and develop competence in self-care.

Domain: Accessible and Responsive Care.
Corporate Objective: To ensure that services are accessible, responsive, and meet the needs of our patient populations.

Sub Objective: To ensure the Trust plans and delivers care which recognises the diversity of our patient population, their views and needs, maximises patient choice, ensures equality of access, promotes dignity and respect and uses local policies which accord with best practice and national expectations.

Domain: Care Environment and Amenities
Corporate Objective: To improve the care environment and amenities.

Sub Objective: To ensure care is provided in environments that are safe, promote patient and staff well-being and effectively control health care associated infections.

Domain: Public Health
Corporate Objective: To formulate a clinical strategy which identifies the role of St George's NHS Trust in improving the health of the local community in the medium and long term and take into account emerging policies and knowledge on public health issues.

Sub Objective: To collaborate in effective programmes to improve health, reduce health inequalities and protect our population from both identified current and new hazards to health.

Appendix B HAN Activity Codes Diagram

Activity codes diagram

DIGIT 1		DIGIT 2		DIGIT 3		
1	Patient care	1	Clerking	1	First Dr to see pt? Yes	
				2	First Dr to see pt? No	
		2	Review of patient	1	First Dr to see pt? Yes	
				2	First Dr to see pt? No	
		3	Practical procedure	1	Operative/ Anaesthetic	e.g. in theatre, ITU, Resus, Intubation/RSI
				2	Medical	See list below*
				3	Minor	e.g. Venepuncture I.V. Cannulation Injections/Drug administration, ECG recording, Obs recording, Blood gases, Urinary catheter, NG tube insert
2	Interactions with other staff	1	Making or accepting a referral	0		
		2	Arranging admission	0		e.g. ordering a bed, speaking to nursing staff, etc
		3	Requesting investigations	0		e.g. talking to lab /radiology, etc
		4	Advice or help	1	Seeking it	includes receiving teaching
				2	Giving it	includes teaching and talking to relatives
		5	Handover	0		
		6	Bleeped	0		i.e. Bleep requiring No action at that time
3	Finding stuff and paperwork	1	Searching or chasing up	1	X-rays, finding or delivering	
				2	Lab results	
				3	Notes or letters	
				4	Portering	e.g. collecting drugs or pumps
		2	Writing stuff	1	Prescription	
				2	Renewing prescription chart	
				3	Discharge letter	
				4	Other	

e.g. Central line and arterial line insertion, Pacing, Joint aspiration

Chest drain, Pleural tap, Lumbar puncture

Cardiac arrest (Not anaes) Sigmoidoscopy (not theatres) Suturing (outside theatres)

Appendix C HAN Data Collection Code sheet

St George's Hospital at Night Project Data Collection Codes

CODE	Patient Care
111	Clerking - first dr to see pt
112	Clerking - not first dr to see pt
121	Review of pt - first dr to see pt
122	Review of pt - not first dr to see pt
131	Operative/Anaesthetic, e.g in theatre, ITU, resus, intubation/RSI
132	Medical procedure e.g. (see Medical list below)
133	Minor procedure (see Minor procedure list below)

CODE	Interactions with other people/staff
210	Making or accepting a referral
220	Arranging admission
230	Requesting investigations
241	Seeking advice or help incl receiving teaching
242	Giving advice or help incl giving teaching/relatives
250	Handover to other
260	Bleeped (but no action needed immediately)

CODE	Finding stuff
311	Searching or chasing up x-rays
312	Searching or chasing up lab results
313	Searching or chasing up notes or letters
314	Searching or chasing up portering e.g collecting drugs or pumps

CODE	Paperwork
321	Writing prescription
322	Renewing prescription chart
323	Discharge letter
324	Other paperwork

Medical list - examples

e.g. Central line and arterial line insertion, pacing, joint aspiration
chest drain, pleural tap, lumbar puncture,
cardiac arrest (not anaes) sigmoidoscopy (not theatres) sutering (outside theatres)

Minor Procedures list - examples

e.g. Venepuncture IV, cannulation, injections, drug administration
ECG recording, obs recording, blood gases, urinary catheter,
NG tube insertion

Appendix D HAN Date Sheet Coding

CODING

St George's Hospital at Night Project Data Collection Form

Data collector name		Doctor name			Date
		Call	Call	Call	Call
	Time of call (24hr)	xx.xx			
	Time of intervention	xx.xx			
Who called	Own team	1			
	Other staff	2			
	Nursing staff	3			
	someone else	4			
	Ward round	5			
	Who else attended				
Urgency	Left from previous shift	1			
	At once	2			
	Within the hour	3			
	During the shift	4			
Skill needed	More than subject	1			
	Appropriate for subject	2			
	Less than subject	3			
	Non-medical	4			
Patient condition	Life/limb threatening	1			
	Physiologically unwell	2			
	Physiologically normal	3			
Stability	Improving	1			
	Same	2			
	Worse	3			
Where needed	Phone only	1			
	Ward	2			
	Theatre/ITU other	3			
	A&E/Admissions	4			
	NICU/SCBU	5			
	Labour ward	6			
	Description code (see code sheet) also other comments				
Physical Resources used	e.g. test results, patient records system, test equipment, procedures, protocols, bleep, reference books etc.				

Appendix E HAN Data Collection Advice Notes for Observers

St George's Hospital at Night Project
Data Collection Notes

Hello,

Thank you for helping us collect data about activity during the overnight period. This note is to answer queries that may arise during data collection. The data collection form is designed to be largely self explanatory – but unfortunately, activity in the hospital overnight may not be so self explanatory – hence this note.

The note is arranged in sections and will be updated as the survey goes on as queries arise. The reason for this is that it is essential for the project that consistent recording of activity takes place.

Data collector name/Doctor name/Date Please write in your name on each sheet and the date. You only need to write in the doctor's name if it is not the doctor you have been allocated to shadow.

Individual call information
Time of call/duration Please write in the time using 24hr notation. Remember to write in the call duration when an activity is finished.

Who called Please tick the appropriate box for the call. If the call came from someone not on the list, please write in who it came from.

Who else attended Please note all others who were directly involved in the activity. Please write in specialty and role rather than names. E.g. Haem SpR, ENT SHO.

Urgency, Skill Needed, Patient condition, Stability, Where needed Please tick appropriate box. If in doubt, write in description.

Description code Please write in the 3 digit code that best describes the activity. Where one call involves a number of activities, please write in the code of each activity as it arises. If in doubt write in a description of the activity. Please make a note of any interruptions to other work, delays for other patients or other knock on effects. Write in the margin of the form if you run out of room within the box!!

Physical resources used Please make a note of physical resources used during the activity. Use shorthand as appropriate. You may need to turn the form 90 degrees to write in the description. This is OK. Again, write in the margin of the form if you run out of room.

Please make a note of any queries (again on the margin of the form) so we can resolve or clarify them.

Many thanks,

Appendix F HAN Data Collection Form Example

19/20 July (3

St George's Hospital at Night Project Data Collection Form

Data collector name	Doctor name	Date
KATHLEEN [redacted]	DR. [redacted] E ANSSpR	19·07·04

		Call	Call	Call	Call
	Time of call (24hr)	✓	✓	✓	
	Time of intervention	01·30	04·35	05·10	
Who called	Own team				
	Other staff		N/A		
	Nursing staff	N/A		N/A	
	someone else				
	Ward round				
	Who else attended	~~in theatre~~ as previously	theatre nurses in recovery room	theatre nurse in recovery room	
Urgency	Left from previous shift				
	At once	✓	✓	✓	
	Within the hour				
	During the shift				
Skill needed	More than subject				
	Appropriate for subject	✓	✓	✓	
	Less than subject				
	Non-medical				
Patient condition	Life/limb threatening				
	Physiologically unwell	✓			
	Physiologically normal		✓	✓	
Stability	Improving		✓	✓	
	Same	✓ → intra-op	post-op	post-op	
	Worse				
Where needed	Phone only				
	Ward				
	Theatre/ITU other	✓	✓	✓	
	A&E/Admissions				
	NICU/SCBU				
	Labour ward				
	Description code (see code sheet) also other comments	131 arterial blood gases	322 post-op review and drugs chart	322 post-op drug chart review and CXR review	
Physical Resources used	e.g. test results, patient records system, test equipment, procedures, protocols, bleep, reference books etc.		notes	PACS notes	

as [illegible]

Appendix G HAN List of Recorded Artefacts

Recorded artifact	Translation
general r/v and pat records	
pads	Treatment - Absorbent pads
ascitic drain pack	Treatment - Ascetic drain pack
Bleep	Communications - Telephone bleep device
Telephone	Communications - Ward telephone
telephone to get extra results haematology	Communications - Ward telephone
phone itu re packs code for access to comp x-ray	Communications - Ward telephone (to find out access information to patient computer based record)
comp patient list	Computer based patient list
comp pat rec pacs	Patient record - Computer based
comp pat rec	Patient record - Computer based
pat rec system	Equipment - Computer based patient records
blood culture bottle	Equipment - Blood culture bottle
gloves	Equipment - Protective gloves
scissors	Equipment – Scissors
scrubbed in	Equipment - Scrubbing in materials
Spray	Equipment – Spray
swab	Equipment – Swab
trolley pat to x-ray	Equipment – trolley
arterial line insert equip	Equipment - Tubes for arterial insertion
Intubation	Equipment - Tubes for insertion in patient
vacutainer bottles	Equipment - Vacutainer bottle equipment
venflon etc	Equipment - Venflon equipment
water bowl	Equipment - Water bowl
Fax	Equipment Fax machine

band	Equipment -Restrictive band
GA	GA??
protocol	Guidance -- Protocol
protocol for neutrogenia	Guidance - Protocol for neutrogenia
la gl	LA GL??
lp set	LP Set??
op equip	OP equipment??
r/v of pat in itu	Patient R/V
Pacs	Patient record
admission notes	Patient record - admission notes
pt drug chart	Patient record - drug chart
Drug chart	Patient record - drug record chart
pat drug chart	Patient record - drug record chart
history sheets	Patient record - history sheets
New drug chart	Patient record - New drug record chart
observation chart hr + o2 sats mon bipap monitor	Patient record - observation chart for HR and blood oxygen levels mon bipap monitor??
old presc chart	Patient record - old prescription chart
Picu pat notes	Patient record - Paediatric unit notes
comp notes	Patient record -Computer based patient notes
Patient notes	Patient record notes
Bnf	Reference - British National Formulary
emedicine website look up rare condition rel to pat	Reference - Computer accesses information
oxford hbook clin med	Reference - Handbook of clinical medicine
Grey book on comp	Reference - St George's 'Grey Book'
online atlas of dermatology	Reference Atlas of dermatology accessed by computer

paed formulary	Reference book – paediatric formulary
picu medicines for children	Reference book – PICU medicines for children
pocket mods for children (bnf for children)	Reference book – pocket mods for children
reference books	Reference books
switch	Switch?
chest x-ray request	Test - Chest x-ray request form
inv forms	Test - Investigation forms
inv req forms	Test - Investigation request forms
investigation forms	Test – investigation request forms
porter pat to x-ray	Test - Porter to move patient
abg analyzer	Test equipment - Blood gas analysis machine
abg mc in itu	Test equipment - Blood gas analysis machine
abg mc on other floor	Test equipment - Blood gas analysis machine
o2 sats monitor	Test equipment - Blood oxygen monitoring machine
broncoscope	Test equipment – Broncoscope
ecg	Test equipment - Electro Cardiagram machine
flexible nasdendoscope	Test equipment - Nasdendoscope equipment
orosccope tongue depressor	Test equipment - Oroscope tongue depressor
heart monitor	Test equipment - Patient heart monitoring equipment
Resp monitor	Test equipment - Patient Respiratory monitoring equipment
portable x-ray mc	Test equipment – portable x-ray
Steth in cannular	Test equipment – Stethascope
stethascope	Test equipment – stethoscope
tendon hammer	Test equipment –Tendon hammer
X-ray on film	Test result – x-ray on film

bloods cts	Test results - Blood count readings
abg results	Test results - Blood gas results
cxr	Test results - Chest x-ray results
comp blood res	Test results - Computer based blood results
comp cxr	Test results - Computer based chest x-ray
comp ct res	Test results - Computer based CT scan results
looking at cts on comp	Test results - Computer based CTS results??
Com ecg monitoring	Test results - Computer based ECG results
pat rec system to check inr	Test results - Computer based INR test results
comp biochem res	Test results - Computer based patient biochemical results
cxr on comp	Test results - Computer based patient chest x-ray picture
comp test res	Test results - Computer based test results
comp test res	Test results - Computer based test results
comp x-ray	Test results - Computer based x-ray
ct scan	Test results - CT scan machine/results
ecg test results	Test results - Electro Cardiagram test results
ecg read outs	Test results - Electrocardiagram test results
lab results	Test results - Laboratoiry test results
o-dimer results	Test results - O-dimer results
Fluid charts	Test results - Patient fluid record charts
rececent obs	Test results - Patient observation chart
obs recording	Test results - Patient Observation records
X-ray	Test results - Patient x-ray picture
tto inr test results	Test results - TTO INR test results??
Thudicums	Thudicums??

Warfarin	Treatment – warfarin drug
anaesthetic equipment	Treatment - Anaesthetic equipment
Antib perfus fluids	Treatment - Antib perfusion fluids
blood from blood bank	Treatment - Blood for the patient
platelets from blood bank	Treatment - Blood product for patient – platelets
bypass mc	Treatment - Bypass machine
cannula	Treatment - Cannula equipment
arrest trolley	Treatment - Cardiac arrest treatment equipment
catheter	Treatment - Catheter equipment
central line + equip	Treatment - Central line equipment
resus room central line	Treatment - Central line equipment
cpr resus	Treatment - CPR resuscitation equipment
Fluid set up catheter	Treatment - fluid catheter
needles	Treatment - Hypodermic needles
syringe	Treatment - Hypodermic syringe
needle syringe	Treatment - Hypodermic syringe and needle
iv antib	Treatment - Intravenous antib equipment
morphine iv cannula	Treatment - Morphine intravenous cannula
ng tube	Treatment - NG Tube
Prescription	Treatment - Patient prescription
Prescription	Treatment - Patient prescription form
Consents	Treatment - Patient treatment consent forms
plaster cast	Treatment - Plaster cast
Saline	Treatment – saline
Dressing	Treatment - Wound dressings
epidural central line GA	Treatment -Epidural central line equipment

Appendix H MAU Locum Consultant job specification

St George's Healthcare NHS Trust

ST GEORGE'S HEALTHCARE NHS TRUST

LOCUM CONSULTANT FOR ACUTE MEDICINE (MEDICAL ASSESSMENT AND ADMISSIONS UNIT) AND GERIATRICS

JOB DESCRIPTION

THE POST

There is a need for robust, enthusiastic clinical management and leadership to develop an enlarged Medical Assessment and Admissions Unit as an appropriate clinical facility which improves the management of emergency admissions. The post holder will join a recently appointed MAU consultant and will have a specialist interest in Geriatric Medicine to ensure the appropriate assessment and management of the older patients on the unit. In addition, this post has a pivotal role in further developing the clinical interface with Accident and Emergency services and developing a local network approach to the future development of emergency services.

The appointee will join a group of consultants responsible for the General Internal Medicine take within St George's Healthcare NHS Trust and will both participate in the on take rota and provide active medical and management leadership to the unit

The Geriatric Medicine service provides a comprehensive range of acute geriatric and rehabilitation services from St George's and the Bolingbroke Hospital. These services currently include:

- Acute and rehabilitation inpatient service based on two wards on the St. George's site, with a needs-related admissions policy (one of which takes Orthogeriatric patients).
- Outpatient clinics at St George's and the Bolingbroke Hospitals.
- Day Hospital service at the Bolingbroke
- Respite care
- Domiciliary consultations

The department also provides specialist advice to intermediate care beds which are managed by the Wandsworth PCT.

The MAU consultant post sits within the Acute Medicine Directorate which comprises General Medicine, Geriatric Medicine and Accident & Emergency Care Groups. There are close links with the Specialist Medicine Directorate and the Cardiothoracic Directorate. The post holder will be accountable to the Clinical Director for Acute Medicine and report to the General Medicine and Geriatric Medicine Care Group Leads.

The key objectives of this post (which may be subject to change in discussion with the Clinical Director for Acute Medicine) will be to:

Medical Admissions Unit

- enhance clinical leadership on Richmond Ward (RW) and Amyand Ward (AW) which together function as The Medical Assessment and Admissions Unit (MAU) to manage emergencies in an effective and timely way and to support the further development of the nursing role on the unit.

- increase the number of patients discharged directly from the two MAU wards

- reduce the overall length of stay on the MAU

- contribute to protocols on the wards

- ensure investigations are ordered in a timely fashion and work with the Professional & Scientific Directorate to provide a quick turnaround of these investigations.

- ensure all standards agreed with regard to emergency admissions are met by the medical teams, working with the Care Group Leader for General Medicine,

- ensure date of discharge is predicted on admission

To this end, the consultant will be jointly responsible for the day to day running of the MAU and:

- supervise and train assigned MAU junior staff,

- will be responsible for the effective use of the beds and ensuring that patients move through the unit effectively.

- take responsibility in hours and on each weekday for liaising with the admissions team and providing a senior opinion ensuring the appropriate specialty triage for each patient, determining whether discharge home is appropriate and identifying seriously ill patients who need immediate intervention.

- will have the responsibility of discharging appropriate patients when investigations are complete, and will have the authority to direct the junior staff of the in-taking team in the management of patients on the MAU

- provide in hours - immediate senior support for the junior staff of the in-taking team, reviewing emergency patients with a priority to teaching and training "on the shop floor"

- provide assistance to the admitting medical team of the day with unusually difficult emergency procedures (for example resuscitation, central line placement and chest drain insertion) although experienced specialist registrars will more usually be responsible for these procedures.

- provide senior clinical opinion on GP referrals to the MAU when required

- ensure that junior medical staff provide a brief discharge summary for patients discharged home from the MAU.

- maintain databases and performance records of admissions and assessment provision and act as a resource for the network for this information

Geriatrics Specialty

- The appointee will have a specific role in the acute assessment and management of elderly patients in the MAU, working together with the Acute Rehabilitation Team (a Consultant Therapist and Specialist Clinical Nurse) who assess every patient aged 75 and over to categorise their needs and identify those who will need admission to a Specialist Geriatric Ward. There will be the opportunity to take over directly the care of appropriate older patients with geriatric needs on the MAU. There will be close liaison with the A&E department and the Hospital Intervention Team (nursing and therapy staff with Social Services Support) in identifying older patients who can be discharged home following assessment. The appointee will work closely with colleagues in the department of Geriatric Medicine and will contribute to the teaching of medical students attached to the department and training of junior staff.

The post-holder may conduct a geriatric medicine outpatient clinic (1 programmed activity per week) to provide urgent follow up for patients who might otherwise need admission and to provide follow up for a minority of patients discharged to home from the MAU.

The Post-holder will have rapid access to investigations (e.g. CT and ultrasound scanning, gastroscopy, bronchoscopy) and specialist clinics.

Of the 10 PAs this post attracts, it is envisaged that 7 programmed activities per week will be allocated to the Acute Medicine function and 3 programmed activities per week free to follow the medical specialty interest in Geriatrics.

It is also anticipated that the post holder will be on take – 1 : 9 for General Medicine Emergencies sharing this responsibility with a renal physician. When covering the General Medical take, the post holder will be responsible for patients until they leave the MAU.

General Duties of the post

To:

- take an active part in the management and administration of the clinical service.
- take a leading role in clinical governance within the department.

- be active in research and to continue to maintain and update his or her professional knowledge.

The post holder is expected to liaise with his/her Consultant colleagues in providing internal cover for annual leave and sick leave and under exceptional circumstances this may require some flexibility in the post holder's hours.

To fulfill all the general conditions applying to employees of St George's Healthcare Trust (see below).

Management

The successful candidate will be expected to work with professional colleagues and local managers in the efficient running of the Service, and will share with Consultant colleagues in the medical contribution to management. He/she will be expected to participate in the Trust's system of governance, and audit and maintain their CME/CPD. He/she will also have a commitment to participate in the Trust's professional development. The appointee will be expected to observe the Trust's agreed policies and procedures, drawn up in consultation with the profession on clinical matters, and to follow the standing orders and financial instructions of the Trust.

The consultant appointed will have a continuing responsibility for the care of patients in his/her charge and for the proper functioning of his/her department. He/she will undertake the administrative duties associated with he care of his/her patients and the running of his/her clinical department.

Appendix I MAU Operational Policy

St George's Healthcare NHS
NHS Trust

Medical Service Centre

Medical Assessment Unit

Operational Policy

The Medical Assessment Unit (MAU) was set up in February 2003 to help the Trust meet the A&E waiting times and to improve the service given to patients who have been referred to the on call medical team by their GP. Its purpose is to serve as an area where rapid assessment, diagnosis and early treatment can be provided before admission to a ward or discharge home.

Location & Configuration
- The MAU is in the first Bay on Richmond Ward, ground floor St James' Wing.
- There are currently 7 beds but this may change to a mix of beds / trolleys and chairs.

Opening Hours
- 8am - 8pm Monday to Friday for GP referrals.
- 24hrs/day 7 days/week for medically accepted patients from A&E

Contact
- MAU has a dedicated telephone line - Ext 1148
- There is a shared Fax - 020 8725 1594

Management of MAU
- The MAU will be run and staffed by Richmond Ward and managed by the Matron for the area. The Consultant in charge of Richmond Ward will also cover the MAU. In the future this responsibility may be taken over by the physician of the day.

Patient Group / selection
- All adult patients referred by GP to the on call medical SpR with the exception of:
    - Chest pain of cardiac nature
    - Acutely unwell patients who would normally be triaged to the Resus area of A&E.
- Medically accepted patients who have been seen by A&E doctors, referred and accepted by on call physician but not yet seen.

Access to Unit

- All patients whether walking or by ambulance will access the unit via A&E to allow them to be triaged.
- A&E staff will phone MAU to organise their transfer.

PAS

- All patients will register in A&E. Once the decision to admit has been made by MAU the patient details will be entered onto PAS by Richmond Ward's receptionists.
- Notes will be requested in A&E at the stage that the patient registers.

Staff

Nursing

- MAU will be staffed by nurses from Richmond Ward and supplemented by A&E trained Bank / Agency nurses. The staff will be experienced nurses ideally of E grade or above. HCAs will support the staff and help with portering duties until own porters in post.

Medical

- The on call medical team will be responsible for the care of the patients. One of the 2 SHOs on call will be based in MAU to ensure rapid assessment and diagnosis. The on call SpR will work between A&E and MAU to make decisions on whether to admit or discharge patients.

Pharmacy

- The pharmacist from Richmond Ward will be available to see patients on MAU to provide a pharmacy service. (TTOs etc)

Diagnostic facilities

Patients in MAU will receive the same 'urgent' service as patients seen in A&E.

- X-rays will be provided by A&E X-ray dept.
- Requests for scans to be discussed with radiologists
- Pathology samples will be marked as MAU and taken around to A&E for the same urgent service.

Patient Process

- Patient arrives in A&E with GP referral letter. If patient expected and not acutely unwell, patient registers at A&E reception and A&E nurse phones MAU. Transfer of patient organised - either MAU collect or A&E deliver.
- MAU inform medical staff patient has arrived and agrees diagnostic tests required.
- Patient assessed by nurse using A&E documentation.
- Diagnostic tests ordered / carried out by appropriate person. Nursing staff will take bloods, cannulate and record ECGs. Not yet able to request X-rays.
- SHO assesses patients and reviews results of tests. Refers to SpR for decision to admit or discharge.

- MAU staff request bed from bed management team or organise discharge home.
- If not for admission SHO prescribes any necessary TTOs and writes GP letter.

Other Services

- MAU patients will use the same facilities & services as on Richmond Ward - bathrooms, laundry, meals and beverages.

Appendix J Emergency Assessment Units – Checklist

Emergency Assessment Units – a Checklist

This checklist is intended as an aide to all NHS Acute Trusts and their staff to ensure that all possible steps are being taken to improve and streamline the care of patients presenting to emergency care.

Although this checklist focuses on the functioning of emergency assessment units, it is recognised that this is a whole system problem and that many important actions can be undertaken in other areas of emergency healthcare that will impact beneficially on the work of ambulance services. In all improvement processes in emergency care it is vital that the whole patient journey is considered from the viewpoint of the patient and that changes in single components do not negatively impact on other parts of the patients journey. The role and functioning of the emergency assessment unit must be considered in relation to how the remainder of the local emergency care system functions, so as to exploit local strengths and avoid unnecessary duplication of resources. A series of checklists are being developed and will be available at www.doh.gov.uk/emergencycare
Further information about modernising the emergency admission process can be found at http://www.nelh-ec.warwick.ac.uk/ECL Toolkit/admissions.html

Professor Sir George Alberti
National Clinical Director
Emergency Access

July 2003

Further advice can be obtained from
Irving.Cobden@doh.gsi.gov.uk
Irving Cobden,
Consultant Physician, NHS Modernisation Agency Performance Improvement Team and Northumbria Healthcare NHS Trust

Or

Matthew.cooke@doh.gsi.gov.uk
Matthew Cooke
Emergency Medicine Advisor, Department of Health & NHS Modernisation Agency

Feedback on this checklist is welcomed.

NOTE: the electronic version of this contains appropriatte hyperlinks to information sources.

Many acute organisations have found that the setting up of an assessment area for adult emergency patients (who are clearly not "Minors") has greatly improved the care given to such patients. In some cases this has helped to free up the A&E department from a backlog of patients waiting to be admitted or discharged. In others with a tradition of direct admission to wards, it has still allowed the emergency team(s) to be focused in one area and for nurses to develop specific skills and experience. The working of these units varies; some are purely for medical or surgical cases (MAU, SAU etc.) while some function across various specialties (CDU ,AAU). For simplicity the term "EAU" is used in future to cover all types of assessment unit.

In many hospitals these EAUs function superbly providing excellent clinical care integrated into a robust emergency care stream. This checklist might be helpful for those planning to set up a unit or where its current functioning is perceived to be sub-optimal.

Key principles

There are several key principles without which an EAU is unlikely to be successful

- **early senior clinical assessment and decision making LINK**
- **maintenance of the flow of patients out of the unit**
- **relatively high level of direct discharges**
- **the process in the EAU must add value to emergency care of the patient**
- **it must not duplicate processes occurring elsewhere**
- **it must not be used as a holding area for admissions**

Starting an EAU will not solve emergency care problems unless it is integrated in to a whole system plan, which includes reducing delays throughout a patient's stay in hospital and discharge planning from the day of admission.

Checklist Headings

1. **What is a EAU**

   An assessment unit is:-

   - A pleasant and appropriate environment for patients, relatives and staff
   - Where emergency patients are assessed, with a clear operation policy on admission, discharge, lengths of stay and clinical support.
   - Where patients undergo prompt senior clinical assessment and any necessary tests rapidly; ideally the assessment process should be completed within four hours
   - Where total lengths of stay including observation and initiation of treatment should be limitted to the period of intensive investigation and observation (often 12-24 hours) with rare exceptions e.g. a dying patient or imminent discharge
   - For "sorting and shaking" patients in order to fast-track those who require admission, to the right specialty ward for their needs and those for potential discharge to a rapid investigation and assessment process.
   - A place to focus emergency admissions and the multi-disciplinary emergency assessment team.
   - A catalyst for examining and developing patient pathways
   - An opportunity to raise the profile of emergency care in an organisation
   - An opportunity to encourage the breakdown of traditional working boundaries

2. **What is not an EAU**

   An assessment unit is NOT:-

   - A holding bay
   - An admissions ward
   - A dumping ground
   - Another bit of A&E, HDU etc.
   - A panacea or substitute for a properly designed whole-system emergency care package
   - Going to work as a simple add-on, i.e. without sign-up to changed working patterns

   If any one of these occur then it is likely that the unit will fail to function properly.

3. **Groundwork to opening a EAU**

   It is crucial to success that thorough planning goes into the opening of an EAU. This will involve:

   - Project Planning
   - Mapping current practice and flows
   - Communication and Involvement – both Internal – Trust Board, Clinicians, Others and External - Primary Care, StHA, Ambulance Service, Social Services, EC Network, Other Trusts etc.
   - Stakeholder Meetings
   - Identifying Emergency Care "Champions" to lead the project and ensure sign-up

- Resource Issues – capital, additional staff, equipment, impact of changing senior working etc.
- Planning (e.g. exact function – assessment only or observation and/or initial treatment; recruitment, timing etc.)
- Assessing the impact on other services within and without the hospital
- Links to contingency and escalation
- Agreeing Protocols – any patients (e.g. chest pain) NOT to go to EAU
- Bed Management re-design, in particular to use an anticipatory style to ensure beds are available for flow out of the EAU to be unimpeded

4. **Environment**
   - Ward or ward area (as per sit-rep definitions) – new (e.g. prefabricated) or conversion of existing ward
   - Beds numbers as identified by mapping (usually about 90% of busiest day's take) – some trolley or reclining chair areas may be useful for ambulance patients undergoing rapid assessment or treatment
   - Some cubicles (for control of infection, terminal care etc.); any other areas used for assessment should have adequate privacy for history taking and examination
   - Single-sex bays
   - Single sex toilet facilities on the ward
   - Staff rooms, Interview room etc.
   - Provision of meals, drug rounds etc.
   - Kit – monitors, pumps, PC + links, blood gas machine, vacuum tube to lab

5. **Geography and co-location**
   - Adjacent to A&E, with potential for shared staff support and training, is ideal
   - Own ambulance entrance (ideal) or via A&E
   - Accessible for diagnostics e.g. X-Ray,endoscopy
   - Close to critical care facilities

6. **Staffing**
   - Leadership: Senior medical leadership and senior nurse leadership are crucial to the success of the unit
   - Protected senior medical time for clinical input, supervision and training is essential. This may be a Consultant of the day or week, but needs to be a daytime presence rather than specified wqrd rounds. It is unlikely that 24/7 cover will be provided by consultants with a sole interest in emergency care.
   - Junior Medical: ideally dedicated EAU junior medical staff supported by team of the day
   - Primary care, involvement of a primary care specialist has been found to be very productive, particularly in reducing admissions and investigations perfrormed. A GP with special interest in emergency care may be appropriate.

NOTE: Both Consultant and Junior emergency team MUST be freed of other duties whilst on duty (as advised by most Royal Colleges now). Regular senior input is of paramount importance in ensuring quality of care and maintaining patient flows. "Little and often", as well as the traditional tea-time and post-take rounds is extremely helpful to juniors and nursing staff.

- Elderly care – prompt and easy access to input, skills and facilities of elderly care can be of enormous benefit to patients and avoid unnecessary steps and delays in their care pathway
- Liaison psychiatry links will support a number of patient needs

Nursing:

- Staff interested and preferably experienced in acute medicine should be recruited. There are great opportunities to extend nursing roles, e.g. clerking and requesting of investigations.

Allied Health Professionals, Pharmacists and PAMs (Physiotherapists and occupational therapists):

- Input will assist in patient care and facilitate access to the correct level of care through the appropriate community links

- Clerical support is essential,
- Portering time must be rostered but have flexibility to increase at short notice
- Social work links are vital and should integrate with A&E support arrangements

Identified operational management structure

7. **Supporting systems and inputs**
   - Bed bureau e.g. senior nurse, with authority and ability to negotiate, offer alternatives to admission such as Community Action Teams, urgent clinic appointments, consultant opinion etc.
   - Bed Management is a crucial linked resource; patient flows must be clearly understood, demand monitoring and links to escalation policy robust
   - Diagnostics – must be tied in to a system that allows rapid performance of appropriate tests *and* a means of getting results promptly to the attention of relevant decision-making clinician. Most units benefit from having guaranteed same day access to CT, Ultrasound, Endoscopy and exercise testing
   - Medical Records – urgent access to files is crucial to decision-making
   - Escalation Policy (v.s.)
   - IT – PCs with access to Trust intranet and the internet
   - Access to care pathways and guidelines for the common presentations

8. **Flows in**
   - From GP: - N.B. bed bureau function (v.s.) offers great opportunities. Alternatives include senior nurse on EAU. Consultant or middle-grade

contact options can work *provided* they are promptly accessible. Avoid systems requiring multiple phone-calls or delays for G.P.

- From A&E: - Empower (experienced) A&E clinical staff to use judgement to admit directly without multiple "hand-offs". If A&E patients needa in-patient bed they should not have to be admitted via the EAU but should go directly to an appropriatte bed.

NB It should NEVER be appropriate for patient's pathway to include a move back to EAU from a specialty ward.

9. Flows out

It is crucial to maintain the flow of patients from EAU to stop the system clogging. Attention to systems and working "downstream" of EAU e.g. specialty wards must be part of examining the emergency pathways. Within the EAU, maintaining flows requires: -

- Early senior input
- Access to specialty wards
- Access to diagnostics
- Access to other "levels of care":
  - Rehabilitation
    - Intermediate Care
    - Home Support /Outreach
    - Respite
    - Home etc.

Hence importance of Social Work, OT input.

10. Development, Training, Audit

An EAU is an opportunity to try new ideas and develop or enhance functions.

Examples:

- Extended roles
- Discharge co-ordination
- Care Facilitation
- Out-reach
- Bed bureau
- Bed management
- Call centre

Training for:

- EAU permanent staff
- EAU teams of the day
- Other hospital staff

Information will be required about the EAU and its principles for:

- Primary Care
- Patients
- Relatives

Weekly training sessions should be available for all disciplines working in the EAU

Audit
Time should be set aside for regular review and feedback of the EAU functioning. Initially a meeting at least weekly of lead clinicians and managers will be essential to highlight issues and review systems and working practices. Less regular, but still essential, feedback will be expected by clinicians, Executive team, Trust Board and external partners.

USEFUL SOURCES OF INFORMATION

ECL toolkit www.nelh-ec.warwick.ac.uk/ecl_toolkit contains links to a variety of information about the admission process and other aspects of emergency care modernisation

Society for Acute Medicine guidelines
http://www.acutemedicine.org.uk/maguidelines.htm

Acute Medical Admissions Literature Review
http://nzhta.chmeds.ac.nz/acute.htm

Use of admission and assessment wards EMJ 2003
http://emj.bmjjournals.com/cgi/content/abstract/20/2/138

Royal College of Physicians *Acute Medical Admissions and the Future of General Medicine* Scottish Intercollegiate Working party Edinburgh and Glasgow, April 1998.
http://www.rcpe.ac.uk/publications/articles/acute.html

Federation of Medical Royal Colleges. *Acute medicine: the physician's role, proposals for the future*. A working party report, London: Federation of Medical Royal Colleges, June 2000.
http://www.rcplondon.ac.uk/pubs/wp_acute_summary.htm

Royal College of Physicians. The interface between Acute General Medicine and Critical Care. A working party report. London: RCP, 2002.
http://www.rcplondon.ac.uk/pubs/wp_ibagmacc_home.htm

Royal College of Physicians. *The interface of Accident and Emergency and Acute Medicine.* A working party report. London: RCP, 2002.
http://www.rcplondon.ac.uk/pubs/wp_interface_ae.htm

Royal College of Physicians. *Isolated Acute Medical Services.* A working party report. London: RCP, 2002.
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GLOSSARY

MAU – Medical Assessment Unit
SAU – Surgical Assessment Unit
AAU – Admissions (or Acute) Assessment Unit
CDU – Clinical Decision Unit
RATU – Rapid Assessment and Treatment Unit

Appendix K Recommendations for Medical Assessment (Admission) Units

RECOMMENDATIONS FOR MEDICAL ASSESSMENT (ADMISSION) UNITS

The role of Medical Assessment (Admission) Units (MAU) is to provide a high quality service for patients presenting with Medical Emergencies which operates 24 hrs per day seven days per week.

The systems in place should be designed to provide rapid assessment, diagnosis, stabilisation, observation and early treatment which is dictated by clinical need and is not time limited. As such the system is not a form of triage. MAU's will function as an integral part of the overall Acute Trust and primary care structure to ensure access to specialty care in a timely fashion.

STRUCTURE

1. **All MAU's should have a defined organisational structure to include**

    a. **Designated Clinical Lead**

    b. **Dedicated Nurse or Clinical Manager**

    c. **A bed capacity to accommodate and approximately reflect the average daily clinical take. Thus a routine daily admission take consisting of 30 patients daily requires approximately 30 beds**

    d. **A minimum of 20% of the bed complement should have fixed monitoring equipment preferably with central console monitoring**

2. **All units should have a clinical governance strategy which include monitoring of outcomes to include 24hr mortality, 7 day re-admission data linked to discharge diagnosis and monitoring of direct discharge rates.**

3. **Where possible, these Units should be co-located near to Accident and Emergency and Radiology.**

MANPOWER

All MAU's should have a dedicated staff to provide high quality patient focussed service and ensure staff training opportunities.

Nursing
Staffing levels and skill mix to reflect activity, patient dependency and unit size. The staff numbers and skill mix should reflect the spectrum of patients' conditions , from acutely unwell to complex needs.(A separate recommendation is being produced to more specifically address these

principles)

Medical
All medical staff (Consultants, Training and Non-training grades) participating in Acute Medical admissions through an MAU should have protected time with no other responsibilities.

In larger units then it is recommended that medical staff in training grades are specifically attached to the MAU as part of their training programme.

Allied Health Professionals

a. Physiotherapy and Occupational Therapy
There should be designated therapy input to MAU's 7 days per week
b. Speech and Language Therapy and Dietetics
Access to these services when appropriate.
c. Pharmacy
Dedicated pharmacy input is required 7 days per week
d. A&C Staff
Dedicated A&C staff are necessary because of the volume of activity and importance of patient records.

PATIENT STANDARDS

All patients admitted through an MAU should have

1. Prompt assessment
2. Institution of appropriate investigation and early management plan
3. Early decision making to include involvement of relevant specialties and other services as needed
4. Early review by an appropriately trained Senior Clinician.

References

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Appendix L MAU Patient Record Book example page

BEST COPY

AVAILABLE

Variable print quality

	Age	bed	ME GP	DIAGNOSIS / # HOSPITAL	Arr	Cl	SB	Dep	Dest
H	1742 77	A5	A+E	H[redacted] SCB. / COPD	1910	19[40]	2240	2330	R 4
ELL	1525 48	A2	A+E	CP S[redacted]	1950	1950	2210	2330	R 4
R	1748 30	A4	GP	H[redacted] DUT / Pregnant	2030	2040	2210	2330	R 4
	1802 38	A1	ME	V[redacted] palpitations	2000	2150		2330	H 4
n.	1643 57	A3	A&E	? PE V[redacted]	2150	2250	2350	2400	R. 4
	1639 19	A6	A&E (C/U)	Cough Myalgia H[redacted]	2245	2305		02 35	R 4
...ina	1840 65	A2	A&E	Chest pain (ozher Dialysis) H[redacted]	2310	2320	2350	2400	R 4
...re	1901 25	A4	A&E (C/U)	Flu like symptoms / Rodents / Preg V[redacted]	2320	2405 ?		02 35	R 4
	1854 64	A5	A&E	Chest pain H[redacted]	2330	0200	0445		R 4
	1939 18	A7	A&E	Chest drain (Pneumothorax). H[redacted]	2330	2400		9 20	R 4
	2109 26	A1	A&E	Abdo pain - CROHN'S H[redacted]	2345	0045	0445	50	? SAU Gra 4

9/2/06 (THURSDAY)

	Age	bed	ME GP	DIAGNOSIS / # HOSPITAL	Arr	Cl	SB	Dep	Dest
...on	2331 42	A3	A&E	Abdo pain H[redacted]	0015	0445	0445	13 15	R 4
	2001 66	A2	A&E	? Chest pain H[redacted]	0050	0215	0445		R 4
	2314 37	A6	A&E	Chest pain / unstable angina H[redacted]	0315	0325	0445		R 4
	[illegible]	A[illegible]		? G.I. Bleed [redacted]	0355	[illegible]			4

Appendix M MAU Patient Record Sheet

Please Complete or Affix Addressograph

Surname: Forename:

Address:

Post code:

Date of birth:

Hospital No.: Age:

Tel. No.: Mobile No.:

St George's Healthcare NHS
NHS Trust

Ward:

Resuscitation Status:

PATIENT HISTORY

ASSESSMENT CHART FOR ACTIVITY OF LIVING

PERSONAL DETAILS

☐ Male ☐ Female	Nationality: Ethnic group:
Mr / Mrs / Miss / Ms / Other	Language:
Preferred Name:	Religion:
Marital Status:	Occupation:
Registered Disabled: Yes No	Previous Occupation if Retired:

Practitioners

Admission Date: Time:	General Practitioner:
Admitted/Transferred from:	Address:
Team leader/Named Nurse:	Post code:
Consultant:	Tel No.:

Next of kin

1. Name:	2. Name:
Relationship:	Relationship:
Address:	Address:
Tel No.:	Tel No.:
Post code: Work Tel No.:	Post code: Work Tel No.:
Mobile No.:	Mobile No.:
Contactable at Any Time?	Contactable at Any Time?

History - Medical Diagnosis / Surgical Procedure

Reason for Admission/Referral:

Presenting Symptoms:

Medical Diagnosis/Surgical Procedure:

Relevant Past Medical History: (Should include info. re. earlier admissions - operations/treatment)

39°
38°
37°
36°
35°
260
240
220
200
180
160
140
120
100
80
60
40
20
0

4 HOURLY T.P.R. & B.P.

Appendix N MAU Triage Notes example

name: [redacted]   Number: Date: 9/3/06.

TRIAGE NOTES

Meet & Greet Nurse name: N[redacted]   Signature: Arrival Time: 2055

Flow Chart: Asthma

Meet and greet time:

Resus	ECG (16)	Paeds	Adult Triage	S&T
☐	☐	☐	☑	☐

Discriminator: ↓ SaO2

Pain Score

ACCEPTED TEAM ____ INFORMED ____

SUBJECTIVE: 2/7 Hx worsening asthma. Inhalers not effective. Recent cough + cold. Attended last week. Given prednisolone + antibiotics

OBJECTIVE ASSESSMENT

COMPONENTS OF LIFE ① Airway ② Breathing ③ Circulation ④ Communication ⑤ Eating and Drinking ⑥ Mobility ⑦ Personal Care ⑧ Safety ⑨ Social Care

COMPONENT		TRIAGE
2.	Audible wheeze. Talking full sentences. No ↑ resp effort. Cough	☐ Red
		☐ Orange
3	Looks well	☑ Yellow
4	No distress	☐ Green
		☐ Blue

PMH: Asthma.

MEDICATION: Beclotide, Salbutamol } Inhalers

ALLERGIES: Nil

VITAL SIGNS

P	BP	RR	T	O_2 SATS	PEFR	PUPILS
59.	86/55	24.	36.4.	93% Air	Best 650; 290	AVPU

URINE REQUESTED	PREG. TEST	BLOOD GLUCOSE	TETANUS
☑ 02 9/3/6	LMP		IMMUNISATIONS

NEXT OF KIN INFORMED ☐ YES ☑ NO

ACCOMPANIED BY

SOCIAL WORKER:

PAIN SCORE

2 3 4 5 6 7 8 9 10

GREEN — YELLOW — ORANGE

No Pain at all / Mild Stinging / Quite bad Moderate / Very bad Severe / Excruciating Worst ever

1 3 5 7 9

Appendix O MAU Nursing Evaluation Notes example

Number: Date:

NURSING EVALUATION NOTES

NURSE: SIGNATURE:

COMPONENTS OF LIFE

① Airway ② Breathing ③ Circulation ④ Communication ⑤ Eating and Drinking ⑥ Mobility ⑦ Personal Care ⑧ Safety ⑨ Social Care

PLAN OF CARE

COMPONENT

TIME	©	EVALUATION	NURSE
ꓘO		Chest assessment done by A+E SHO. pt commenced on Nebulisers.	

Appendix P MAU Doctor Patient Notes (History Sheet) examples

H

ST. GEORGES HEALTHCARE NHS TRUST

HOSPITAL

HISTORY SHEET

Surname [redacted]

First Names [redacted]

Ward/Clinic

Hosp

Con

05/03/?? O/E Apyrexial
2000

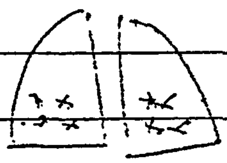
BP 136/81 HR 80 reg

H.S I + II + ESM radiating to carotids

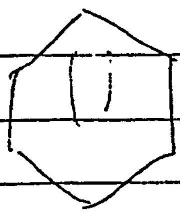
JVP to earlobe

Bilateral pitting oedema ↑ knees

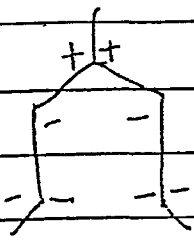
Sats: 95% on air



inspiratory crackles to midzone



Divarication of recti
Soft. Non-tender
BS ✓



Peripheral vascular exam limited by oedema

Neuro. Sensation grossly intact

AMTS. 8/10

	(L)	(R)	
			Year ✓
Upper limb			Age X
Tone	N	N	DOB ✓
Power	-5/5	5/5	Time ✓
Reflex	+	+	Place ✓
Lower limb			2 People ✓
Tone	N	N	Address X
Power	PAIN	5/5	WWI ✓
Reflex	PAIN	+	QE2 ✓

PMH/ Type II DM - Tablet controlled
Hypertension
COPD - Home O_2 cylinders
Stroke - R infarct 1999
MI 2001
Chronic renal failure Baseline Creatinine 200
Gastritis

Rx/ ☆ Flucloxacillin 250mg qds - No improvement
Clopidogrel 75mg od
ISMN 20mg bd
Senna 7.5mg nocte Lactulose
Paracetamol 1g qds
Ferrous sulphate 200mg bd
Salbutamol inh
Doxazosin 8mg od
Atorvastatin 10mg nocte
Furosemide 80mg od
Gliclazide 120mg daily

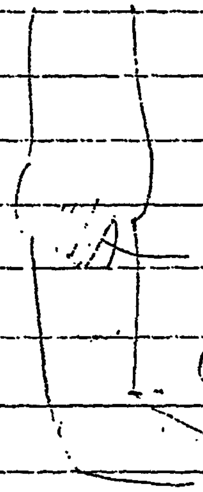
☆ Reaction to amoxicillin ☆ ?Headache, abdo pain

SH/ Lives ground floor sheltered accomodation
Mobilises with 2 sticks indoors, buggy outdoors
Carers 3x weekly
Independent washing/dressing
Family help shopping cooking
Ex smoker ~60 pack years
° ETOH

Systems/ - Constipation 2 days
~~Nil else significant~~
Noticed occasional black 'floaters' in vision

Fundoscopy - Not effective in bright room

(L) knee



(Δ) ΔΔ Bursitis, Cellulitis, Traumatic injury
(2) CCF
(3) Intermittent claudication
(4) ? Retinopathy
(5) CRF
(6) COPD
(7) LOC not collapses

(P) CXR, (L) knee X ray
Bloods
Old notes
Postural BP's
Echo
? Ophthalmology

J[illegible]
6326

ST. GEORGES HEALTHCARE NHS TRUST

HOSPITAL

HISTORY SHEET

Surname | Hospit

First Names [redacted]

Ward/Clinic | Cons

06/03/06 | A+E Referral | MC [redacted]

84 ♂

PC | Left leg pain

HPC | 1/7 hx. Suddenly noticed left leg pain
Around lower leg from patella to ankle
Pain more anterior than posterior
Very painful when weight bearing, now unable to mobilise. Tender when dressing
°Fevers °Sweating Denies trauma
Suffers calf pain on exertion ~10 yrs.
No rest pain. Relieved by rest.
This new pain is different

Chronic ankle swelling Worse last 3/52
°SOBOE (limited by calf pain)
Sleeps 3 pillows. Uncomfortable lying flat
Occasional PND, "years ago"

Recent hospital admission (discharged 15/02 Dr Mac[illegible]
Ix for collapses with LOC 24 h tape done
CT brain, mri, echo arranged.
No LOC since discharge but 3× 'funny turns'
Occur on standing, relieved by rest
Feeling of giddiness. °Vertigo °SOB °Chest pain °Palp.

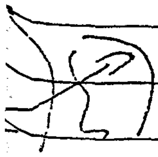
	Hosp. No.	Date:

Breathless

..p. 36.4

..: 124 89 BP: 88/55 RR: 24 SpO2: 93% on air

I-II-0. PEFR: 300 (Best 600-650)


No crackles / wheeze.

Soft
Non tender.

..: Mod- Severe asthma

..: Nebs.
Rpt PEFR.
CXR

..R = 300 post nebs

Rpt nebs + prednisolone
+ Abx.
IV fluids.
Admit to medics

Dr. [redacted]
Senior House Officer
Accident & Emergency

	Hosp. No.	Date:

No focal consolidation / effusion / PTx.
? ↑ interstitial markings throughout..

urinary antigen requested.
clotted sample - ?Mycoplasma + ASO titre sent.

HOSPITAL

HISTORY SHEET

First Names [redacted]

MAU

Ward/Clinic

10/3/6 [redacted] | [redacted] | [redacted] | [redacted]

42 yo ♂ known asthmatic

c/o SOB.

· was in A&E last week with SOB, cough

tight chested

↓ PEFR usual 600 - 650

given pred which he stopped Sat ?

deteriorated since. Woke this am

SOB

cough - little pale yellow phlegm

chest tightness.

denies haemop.

some rib pain c̄ coughing / deep breath

occ palps - attributes this to [illegible]

1 pint lager on pred.

Δ asthmatic age 9.

on ITU / ventilator 3-4 x most recently

was seen in asthma clinic until

~ 2 yrs ago.

asthma tends to come on c̄ coughing

extreme temps.

PMH
· nil
· tonsillitis age 6

°MI/CVA/HTN/Epi/DM/TB/Rhf/An/J/Thyr

Drug.

seretide $\ddot{\text{II}}$ bd
salbutamol $\ddot{\text{II}}$ bd did ↑ salbutamol but no help.

nil illegal/herbal.

SH lives alone
non-smoker
occ EtOH
younger brother + asthma as child.

AH cats furs.

FH
Mother has hypertension.

ODQ
°SOA
· F/N/V/D/C ~~[illegible]~~.
· urinary sy
° fits/faints/blackouts.

O/E looks well
°An °J °Cy °Cl.
sats 95% RA.
RR = 14.

obs P 80 reg BP 112/68 JVP → HS I + II + m°l

HOSPITAL

HISTORY SHEET

First Names [redacted]

Ward/Clinic MAU

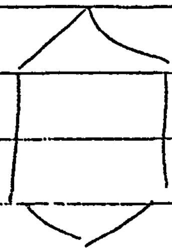
J [redacted]
19/6/[illegible]

Bo[illegible]

10/3/06

RS, Air Exp = good
PN - res
BS vesic + scattered wheeze throughout.
not severe.

Abdo



soft
not tender
° masses BS✓
° organomeg

CNS.
alert orientated
moving all 4 limbs
not formally Ex..

Bloods -

		Hb 14
Na 137		WBC 5.5
K^+ 4	Alb 43	Plt 251
Cl 102	γGT 36	
HCO_3^- 29	CRP 1.5	
U 5.0		
Cr 99		
Bili 4		
ALT 32		
ALP 68		

ECG - Normal.

CXR - ~~Normal~~.
Hyperinflated -

(R) Imp: Exacerbation of asthma
?weather related seems not infective

Plan - regular nebs 4hly + PEFR pre/post.
· pred 30 ?needs longer course.
- lansoprazole cover.
· CT seretide.
· recheck bt in am.
· ECG ✓
- asthma clinic

[illegible]
SpR bleep

13/6. WR Dr [redacted]
· Better, no wheeze
· PEFR 530.
· ? longer course prednisolone po.
· switch to inhaler then home
· re book for asthma clinic

[redacted]
SpR bleep

Appendix Q MAU Electrocardiagram examples

Measurement Results:

QRS		ms
QT/QTcB	/	ms
PR		ms
P		ms
RR/PP	/	ms
P/QRS/T	/ /	degr

Interpretation:

Unconfirmed report.

[redacted]

06 Mar 2006

GP:

Chung-hung-tseung*9qn1

ate	120	. Sinus tachycardia, rate 120
R	153	. Late transition
RSD	70	. Borderline low voltage in frontal leads
T	292	
Tc	412	

-Axis--

	81
RS	45
	42

- BORDERLINE ECG -

Unconfirmed diagnosis.

25 mm/s 10 mm/mV F ∿ 0.5 Hz – 40 Hz W HP708 33823

Appendix R MAU Pathology Blood Report

Pathology Reports   Next   • Report No 1/19   Print Preview
Display Request Details   Cumulative View of FBC - [C]

Hospital No.	[redacted]	Birth Date	[redacted]
Surname	[redacted]	Forename	[redacted]
Collection Date	06-Mar-2006	Collection Time	Unknown
Profile	FBC - [C]		

Test	Results	Units	Ref Range	Status	
HB	13.1	g/dl	12.0 to 16.0	Authorised	
WBC	10.9	10^9/L	4.0 to 11.0	Authorised	
PLATELET	346	10^9/L	150 to 450	Authorised	
MCV	79.0	fl	78 to 97	Authorised	
NEUTROPHIL	10.0	10^9/L	1.7 to 8.0	Authorised	↑
LYMPHOCYTE	0.8	10^9/L	1.0 to 4.0	Authorised	↓
MONOCYTE	0.1	10^9/L	0.24 to 1.1	Authorised	↓
EOSINOPHIL	0.0	10^9/L	0.0 to 0.8	Authorised	
BASOPHIL	0.0	10^9/L	0.0 to 0.3	Authorised	
HCT	0.39		0.37 to 0.47	Authorised	
RBC	4.95	10^12/L	3.8 to 5.5	Authorised	
MCH	26.4	pg	27 to 33	Authorised	↓
MCHC	33.5	g/dl	32 to 35.6	Authorised	
RDW	15.3		9.5 to 15.0	Authorised	↑

Cumulative View of FBC - [C]

Appendix S MAU Radiometer ABL 700 Blood Report

RADIOMETER ABL 700 SERIES

ABL725 A & E 725 — 19:29:00 — 06/03/2006
PATIENT REPORT — Syringe - S 195uL — Sample # 50644

till roll

Identifications

ON AIR

Patient ID		
Patient Last Name	[redacted]	
Patient First Name		
Sample type	Arterial	
Operator	[redacted]	

Blood Gas Values

	pH	7.393		[7.350 - 7.450]
	pCO_2	4.07	kPa	
↓	pO_2	7.13	kPa	[11.1 - 14.4]

Oximetry Values

	ctHb	12.5	g/dL	[12.0 - 17.5]
↓	sO_2	87.4	%	[95.0 - 99.0]
↓	FO_2Hb	85.7	%	[94.0 - 99.0]
↑	FCOHb	1.4	%	[0.0 - 0.8]
	FHHb	12.3	%	[-]
	FMetHb	0.6	%	[0.2 - 0.6]

Electrolyte Values

	cK^+	3.8	mmol/L	[3.5 - 5.0]
↓	cNa^+	133	mmol/L	[136 - 146]
	cCa^{2+}	1.20	mmol/L	[1.15 - 1.29]
↓	cCl^-	96	mmol/L	[98 - 106]

Metabolite Values

	cGlu	8.6	mmol/L	[-]
↑	cLac	7.9	mmol/L	[0.5 - 1.6]

Oxygen Status

ctO_{2c}	15.1	Vol%
$p50_c$	3.55	kPa

Acid Base Status

$cBase(Ecf)_c$	-5.8	mmol/L
$cHCO_3^-(P,st)_c$	20.0	mmol/L

Notes

↑	Value(s) above reference range
↓	Value(s) below reference range
c	Calculated value(s)

Printed 19:30:53 06/03/2006

Appendix T MAU Telephone Number Sheets

WARD TELEPHONE NUMBERS

copy of inside cover MAU admission book 17/3/06

A&E Majors 1222/3440/1282
Minors 1265
Resus 3446
Paeds 3518 TRIAGE 1285
Reception 1280/2666
CDU 3486/2908
Porter 6244
Fax 3470
X-ray 1485 – Bleep: 6254/6345 6955

Allingham	3160/1
Amyand	3175/3158
Belgrave	1567/8
Ben Weir	1508/9
Buckland	1080/0062
Caesar Hawkins	2020
Caroline	1292/3467
Cavell	3223/4
Champneys	2085
Cheselden	3188/3940
CCU	3166/3168
Dalby	2056/~~2053~~/2086
Duke Elder	2064/5
Endoscopy	1491
Gray	3194/1062
Gunning	3218/9
Gwillim	2012
Haemodialysis	1929/1979
Heberden	0388/9
Holdsworth	3388/3216
HDU	0492
ITU	3294/5
Keate	3226/7
Marnham	2003/2015
McEntee	3147/3280
Onc day unit	3254
Rodney Smith	3164/3185
Ruth Myles	2442
Thomas Addison	1429
Thomas Young	0523/4
Trevor Howell	1082/3
Vernon	3196/7

Bed manager *6447/6007
Bleep holder * 6471
Infection control *6797
Nurse bank 3743/3745/1127
Richmond Fax 0208 725 1594

SOCIAL SERVICES

Wandsworth	1446	Fax 0777
Merton	3006	Fax 1087
Lambeth	02079265877	

ICT 08456026292

Merton HDT 02082886471

SAU 2751
Brodie (stroke unit) 4502/4646
Medical Records (out of Hours) B/p. 6213

ASU 4502 (BRODIE)
Anticoagulant 5443
Night Coordinator 7740 (bleep)
Kerr Wd: 4671.
F. Nightingale: ~~3190~~ 3290
BEN (GIB) 7698.
~~02082820404~~

If this bx

Guide

\DEPARTMENTAL NUMBER

Biochem 5862/Bleep 6453

Blood Bank: **5355/5471**/5979 (clotting)

Cardiac Catheter Lab: **3274/3273**

Chest Clinic: **3318**

Computer Services: **2887/2888**

CSSD: **3244/6662**

CT Scanning: **1730/5125**

Diabetic Nurse: **6236/1429**
Bleep 6336

Dietician: **3049**
Bleep 6628

Domestic Supervisor: **bleep 6661**

ECG Technician: **bleep 6641**

Echo: **1371**

Equipment Library: **0260 bleep 6366**

Exercise Suite: **2720**

Haematology: 5355/5470

Laundry: 1201 bleep 6273

Medical Physics: 3553

MRI Scanning: 2933

OT Department: 2557 Fax: 1885

Overseas Patient: 0895

Patient Affairs: 3410

Pharmacy: 1764/5
- Kim: bleep 6898
- Paulette: bleep 7405
- Patricia: bleep 6701
- On call: bleep 6267

O2 order & top up: 1771

Physio: 2399

Porters: 2134
- Specimen: 6402
- 24 urine collection: 5862

Security: non-emergency 0044
Emergency 2222

Sewing room: 1205

Springfield: 42000

Social Services
- Lambeth: 02079265877
  02079265868
- Merton: 3005/6
  Fax: 1087
- Wandsworth: 1446
  Fax: 0777

Transport: 2120/2121/2122
Fax: 2869

Theatres(St. James):3113

X-ray: 1485
1296 (A&E)

Old Notes: bleep 6213

Medical Records: 1965/1966

VQ : 1776 / 1778

Mattress: 6681

ANTICOAGULANT 5443

Kitchen: 2428

SALT: 1457 Bleep 6380

ACS Nurse 7138

DVT (Nurse) 4502

Fracture Clinic 3436/1266

Infection Control/ 2459

HIT 7353/6622

Ultrasound 1776/8 & 1473

Overseas 0895

Pharmacy (St. James' Wing) 3557

Appendix U MAU Medical On-Call Rota example

E

DATE: THURS. 9/2/06

MEDICAL ON-CALL ROTA

CONS:

9AM – 5PM DR [redacted]

5PM – 9AM DR [redacted]

REG.

A+E

9AM – 5PM DR [redacted] 6484/7476.

5PM – 9PM DR [redacted] 7592/7476

9PM – 9AM DR [redacted] 6586/7476.

(WARD COVER) SPR 5PM – 9PM BLP 7477/ DR [redacted] 6590

SHO

A+E COVER.

9AM – 5PM (SHO 1) DR O'[redacted] 6106

9AM – 5PM (SHO 2) DR [redacted] 7688

5PM – 9PM (SHO 1) DR [redacted] 660

5PM – 9PM (SHO 2) DR [redacted] 704

SHO WARD COVER 5PM – 9PM DR [redacted]. 654

SHO WARD + A&E COVER 9PM – 9AM DR [redacted]. 780

H.O

A+E 9AM – 5PM DR [redacted] 6335

A+E 5PM – 9PM DR [redacted] 6424

WARD 5PM – 9PM DR [redacted] 6559

WARD 9PM – 9AM DR [redacted] 6579

Appendix V MAU 'Jobs to Do' Sheet examples

LOCATION	SEEN BY	NAME/ AGE HOSPITAL NUMBER	PROBLEMS	JOBS TO DO
AS	[redacted]	Roger [redacted] H [redacted] 21/1/48	Cerebellar ataxia ? chest infection	
A~ ~~A+E~~	~~[redacted]~~	~~Satyenda [redacted]~~	~~No CDU Beds Due 12° trop @ 11 am.~~	
B3 A+E	O [redacted]	Jane [redacted]	Asthma.	
A+E	O [redacted]	Davaine [redacted] 98	Upper GIT bleeding.	
Richard A+E	Student / [redacted]	George [redacted]	Exacerbation COPD	☐ Senior Rev
GP		Penny [redacted] 72.	Exacerbation Asthma.	
GP.	Dennis [redacted]	N[redacted] [redacted]IZABETH DOB: 10/10/1949 SEX: F	Chest pain ACS.	TROP
GP.		Lucy [redacted] 15	Chest pain ? PE on OCP	☐ CXR. ☐ D-Dimer.
GP.		Lanh [redacted]. 69 H [redacted]	Melena. Known oesoph varices.	
GP		Anthony [redacted]. 24	Diarrhea / vomiting ↓ BP - Known CAH on steroids	

Back to back copy

GP.		Herbert [redacted] H [redacted] 83.	Fall / Cellulitis	

PTO

WHERE & Time of Arrival	SEEN BY	NAME/ AGE HOSPITAL NUMBER	PROBLEMS	JOBS TO DO
A+E	[redacted]	Jean [redacted] 89♀	Confused, dehydrated	Trans Home COE
GP 09³⁵		Helena [redacted] 80♀	heart failure + renal failure	DMG Handback
GP 10⁰⁰ ✓ A+E	[redacted]	Sarah [redacted] 39♀	30 wks preg. SOB	
ENT 10⁰⁰ ✓ A+E	[redacted]	Indraj [redacted] 76♂	O.H. epigastric pain	
GP 10⁰⁰ ✓ A+E	[redacted] HO	David [redacted] 30	haematemesis + abdo pain	Seen Handback
A&E	[redacted]	ANN [redacted] 70	Angina	
GP ✓	[redacted]	? [redacted] Jean 59	bilateral swollen knees	
GP		Kate [redacted] 26 27-5-74	IDDM Nephrotic Synd May go to renal	
A+E ✓	N	Raymond [redacted] 78	TIA	acc stroke
GP		Yvonne [redacted] 63 [redacted]	MS / ... / UTI / ...	
ANU		[redacted]	...	

0207 287 9674

COPY 13.45 17/3/06

22 7370

b2 ·7129

Nurse cell

17/03/2006

leed		XR	3037	Bed Mx	#6447	CCU	3166/3168	Haematology	5468		
				A&E	1222/3490	Liason Psychiatry	5288	Microbiology	5689/5693/5692	Payroll	3981
Jonathan	6561	US	1473	Pharm	1764	Diabetic Nurse	#6236	Immunology	0025	Centra lpod recp	103
Nicky	7481	CT	1730/5125	Resp Nurse	1329/SG302	EEG	4637	Chem Path	5862/3/4/5871	CoE referral fax	2855
Kamran	6180	MRI	2933	SALT	3007	Peg Fax	3965	Nuc med	1776/1687	Stan (Discharges)	7430
Dominic	6580	Echo	1371	DALT	0601	Palliative Care	3311/6508/SG683	Pathology	2651	Neurophysiology	4624
Emily	6563	VQ	1804	NTU	1563/4/1491	Neuro Referrals	2470	Histology	5263/4	Lung MDT co-ord	B 7441
Ann	7571	Port XR	6284	Anti Coag	5443	Venous Nurse	6090	Chest clinic	3318	Blood Bank	5471
Audit	7476	ECG	1385	TB Nurse	1466	Dr Draper Sec//Dr Ong sec	1253/1956	Lung Function	1667 fax-3369	EMG request fax	4632
Julie	3012	Heart failure nurse	X4404/7376	Endoscopy	1491/1564	Lung Cancer Nurse	Bleep 6072	Merlin Man Andrew	3824	Acute Cardiac Nurse (Bridget)	7138

MARNHAM 2003 2015			
5	[redacted] Joanna [redacted] 25/02/64	Ehlers-Danlos, RA acute exacerbation, type I DM, 20mg prednisolone	Diabetic nurse to see, check urine dip OP Dexa Scan (H) Sat
26	Marguerite [redacted] [redacted] 22/3/1926 (H)	Diarrohea, diverticulosis SB need H-through	Convert colonoscopy request to OPD and OP U/S liver.
RODNEY SMITH 3164 3185			
2	Malcolm [redacted] [redacted] 05/03/42	Cervical spondylosis, laminectomy Na 132	
5	Leonard [redacted] [redacted]5/1/27	Exacerbation of COPD, Microcytic anemia. CRP 73.6 (improving)	FOBs
12	Reginald [redacted] [redacted] 30/12/26	Elective admission, chest drain and pleurahedesis	Mantoux. ?CT for localised empyema/collection
27	Moteelal [redacted] [redacted] 15/05/1928	COPD infective exac D16 ceftaz/gent D7 itraconazole, treat until CRP <10 on two readings	Repeat CT after treatment white cell scan
	Elizabeth [redacted] [redacted] 22/12/30	COPD. CRP 59.7 Po erythro (H) Mon	Microcytic anaemia, check repeat CXR
AMYAND 3158			
	Riaz [redacted] [redacted] 23/10/1941	Type 1 resp failure, deranged LFT Atypical resp screen	PA CXR Home ~~Friday~~ (H) Mon
Ruth Miles Unit			
7	Andrew [redacted] [redacted] 12/3/51	Ca Lung, splenomegaly for Ct staging, bronch, xray L femur and bone scan	Chase U/S Liver ?mets. Glees to see. Rigid bronch next Friday. LFT results.
FLORENCE NIGHTINGALE 3190 3290			
4	Rose [redacted] [redacted], 13/12/28	Abdo pain. Diarrhoea again.	Merlin done
10	William [redacted] [redacted]28/5/22	Chest infection, lung Ca.	Panel next week, low Hb. Myeloma screen - urine BJP/serum PP/Igs
11	Howard [redacted] [redacted] 11/10/24	Confusion. Confusion screen.	MRI Friday, chase MSU, cortisol and osmolalities. Book EEG.
12	Gordon [redacted] [redacted] 15/9/26	Confusion, AF, failed TWOC x2	Panel approved, home with incr package. Need to contact urology nurse upon d/c
14	Peter [redacted] [redacted] 15/08/1931 Xray hip	AF – Rx but not had dig and diltiazem in the community Macrocytic anemia ?alcohol TFT / B12 / folate	US/abdo / O/P echo. Dig level Friday PM
22	Dillwyn [redacted]	COPD	Await CT chest, bronchoscopy Home Saturday
25	Anton [redacted] [redacted] 22/07/62	Asthma normal PEFR 350	
GRAY 1062 3194			
4	Lawrence [redacted] [redacted] 14/1/32	Hypothermia, dehydration, HONK, IV cef. Ur 45.8, Cr 252, Na 166. UO +100mls/hr 5% dex	Culture end of week. If still pyrexial, add cipro. add cipro
5	Albert [redacted] 1929	Effusion, chest drain in situ	Suction (-5) ret
7	Henry [redacted] [redacted]12/5/14	ARF, USA results? Renal function slightly better. CRP 34 (rising).	M,C & S. Encourage PO fluids / US abdomen. ICT
20	Sheila [redacted] [redacted] 24/05/1952	Hypertension, epistaxis, vomiting	O/P barium swallow ?diabetic gastroparesis. Liver screen and O/P US abdomen.
KEATE			
	Martin [redacted] [redacted]20/6/49	Sarcoid with PO2 4.8, Bili 15, plat 70, fractured humerus Echo HRCT / CTPA	Repeat CXR, U/S abdo, haptoglobins, retic count, liver screen, echo. Need old films
RICHMOND 3299 3143			
SR	Sheila [redacted] [redacted] 30/08/1922	Expressive dysphasia	Bleep 7214 ?TX booked Check CXR, sando K (H)
	Naimur [redacted] [redacted] 25/12/1936	Pneumonia and UTI on background of multiple CVA over 20years asthma type II IDDM, epilepsy, IHD 3CABG bullous pemphigoid (on steroids) and multiple fractures	Check chest Xray
ITU 1307 3294			
	Adeel [redacted] [redacted]/11/73	Pneumonia ? cause	Atypical serology urine MC & S
	Ethlyn [redacted] [redacted]	UTI HONK ↑Na 9.5 Osm	
	Andrew [redacted] [redacted]8	Overdose. X to wards – Monitor	Sat
Cheselden			
4	Iris [redacted] [redacted] 17/7/29	Chest infection	US guided liver Bx (needs date tbc)
VERNON GUNNING 3218 3219			

To review (Nikki): Clifford Jarvis

paranoid

diazepam / olanzapine

Appendix W MAU Patient Throughput January 2006

St George's MAU throughput Jan 2006

		AGE	BED	FROM	ARRIVE	CLERK	BED BOOK	DEPART	TO
1	01-Jan-06	73	6	A&E	00:00	02:00	03:30	03:30	r
2	01-Jan-06	20	3	A&E	00:10	02:00	13:00	13:13	r
3	01-Jan-06	73	2	A&E	03:25	03:30	06:30		r
4	01-Jan-06	81	7	CDU	03:45	03:50	06:30		r
5	01-Jan-06	35	4	A&E	03:05	03:55	06:30	13:30	r
6	01-Jan-06	19	5	A&E	05:02	06:00	06:30	08:20	h
7	01-Jan-06	82	1	A&E	06:45	07:15	09:50	10:00	r
8	01-Jan-06	71	6	A&E	07:00	08:30	13:00	14:45	h
9	01-Jan-06	24	7	A&E	08:03	09:15	13:00	15:00	r
10	01-Jan-06		5	A&E	11:00	11:05	13:00	04:45	r
11	01-Jan-06	67	2	A&E	11:04	12:10	13:50	14:30	r
12	01-Jan-06	74	1	A&E	14:00	14:45	15:15	16:00	rich
13	01-Jan-06	82	2	A&E	15:04	16:50	10:40	19:45	r
14	01-Jan-06	90	7	A&E	16:02	17:00		18:40	r
15	01-Jan-06	84	5	A&E	16:04	16:04	11:00	18:20	r
16	01-Jan-06	28	4	A&E	17:03	17:44	18:15	19:50	r
17	01-Jan-06	43	3	A&E	18:00	18:30		20:45	h
18	01-Jan-06	83	1	A&E	19:21		20:40	01:30	cave
19	01-Jan-06	65	2	A&E	21:00	22:00	22:30	00:00	r
20	01-Jan-06	55	7	A&E	23:00	00:10		01:30	r
21	02-Jan-06	30	6	A&E	00:20	01:30	02:15	03:30	r
22	02-Jan-06	57	4	A&E	00:50	01:30	02:15	03:30	r
23	02-Jan-06	78	5	A&E	02:45	02:45	03:10		r
24	02-Jan-06	79	3	A&E	04:04				r
25	02-Jan-06	66	4	A&E	05:02	06:30	10:00		rodney
26	02-Jan-06	41	6	A&E	05:45		10:00	18:30	cave
27	02-Jan-06	75	1	A&E	06:03	06:30	10:00		rodney
28	02-Jan-06	65	7	A&E	07:15	07:50	10:00		marnham
29	02-Jan-06	65	5	A&E	08:03	09:00	10:00		marnham
30	02-Jan-06	72	2	A&E	08:05	09:15	10:00	01:40	marnham
31	02-Jan-06	37	6	A&E	18:45	18:50	20:24		r
32	03-Jan-06	69	5	A&E	03:00			12:30	R
33	03-Jan-06	64	6	A&E	03:00	03:15		21:30	R
34	03-Jan-06	30	2	A&E	05:15	05:45		13:30	PCT
35	03-Jan-06	43	4	A&E	06:05			13:00	R
36	03-Jan-06	88	3	A&E	08:02	09:20	09:50	13:50	R
37	03-Jan-06	88	6	A&E	10:04		13:30	14:45	RICH
38	03-Jan-06	81	7	GP	12:15	13:00	13:30		RICH
39	03-Jan-06	90	5	A&E	13:15	16:10			R
40	03-Jan-06	57	4	A&E	13:03	14:30			R
41	03-Jan-06	84	2	A&E	13:55	16:00			R
42	03-Jan-06	57	3	A&E	14:15	15:00			R
43	03-Jan-06	32	1	GP	14:45				SELF DIS
44	03-Jan-06	88	6	A&E	15:03	19:00		20:50	R
45	03-Jan-06	82	3	A&E	16:00	20:00		20:45	R
46	03-Jan-06	66	7	A&E	16:01	19:30		19:40	U
47	03-Jan-06	93	4	A&E	17:16	20:00		21:00	R
48	03-Jan-06	38	1	A&E	17:20	20:00	21:30	01:30	SAC
49	03-Jan-06	60	2	A&E	18:00	20:40	21:30	22:50	R
50	03-Jan-06	91	4	A&E	19:10	21:00	00:30	00:45	R
51	03-Jan-06	88	7	A&E	19:30	21:35	23:00	00:50	R
52	03-Jan-06	65	3	A&E	19:50	21:45	22:10	01:45	CHAMP

53	03-Jan-06	58	5	A&E	21:20	22:45	00:30	02:30	R
54	03-Jan-06	51	6	A&E	21:45	23:40	00:30	02:30	R
55	03-Jan-06	39	2	A&E	23:55	02:10	06:40	06:00	R
56	04-Jan-06	89	7	CDU	03:30	03:40	04:40	07:00	R
57	04-Jan-06	73	3	A&E	04:00	04:15	07:00		R
58	04-Jan-06	96	6	A&E	05:03	05:35	07:10		R
59	04-Jan-06	86	5	A&E	06:15	06:15	07:00		R
60	04-Jan-06	64	4	A&E	06:20	06:45	07:00		R
61	04-Jan-06	78	1	A&E	06:45		09:30		R
62	04-Jan-06	40	7	A&E	10:21	10:30	11:00		R
63	04-Jan-06	30	2	GP	11:30	12:00	19:00		H
64	04-Jan-06	34	3	GP	12:00				
65	04-Jan-06	80	4	A&E	12:00			15:00	R
66	04-Jan-06		6	A&E	14:20			16:50	R
67	04-Jan-06	54	5	A&E	16:30			16:30	R
68	04-Jan-06	62	2	A&E	17:00	17:30	20:45		R
69	04-Jan-06	56	6	A&E	19:30	19:50		22:10	H
70	04-Jan-06	85	2	A&E	20:55	21:30	22:00	22:40	R
71	04-Jan-06	40	7	A&E	21:10	20:35	22:00	00:45	R
72	04-Jan-06	72	3	A&E	22:45	23:15	00:15	07:20	R
73	04-Jan-06	40	4	A&E	23:10	23:50	00:15	07:20	R
74	04-Jan-06	40	5	A&E	23:35	23:50	00:15	07:20	R
75	05-Jan-06	40	7	A&E	00:25	01:30	05:10	13:50	R
76	05-Jan-06	71	1	A&E	04:05	04:15	05:10	13:00	R
77	05-Jan-06	34	6	GP	11:35	11:45		18:20	R
78	05-Jan-06	77	4	GP	12:00	12:30	14:15	14:40	R
79	05-Jan-06	78	2	A&E	12:20	12:50	14:15	14:30	R
80	05-Jan-06	65	3	GP	12:45	13:00	14:15	17:00	H
81	05-Jan-06	80	5	GP	13:05	14:00	14:45	16:45	R
82	05-Jan-06	77	2	A&E	15:05	15:20	16:45	17:30	R
83	05-Jan-06	92	1	A&E	16:10	16:30	17:30	18:00	R
84	05-Jan-06	87	7	GP	17:00	17:30	20:55		R
85	05-Jan-06	31	4	GP	17:05	17:20		20:40	H
86	05-Jan-06	61	3	A&E	17:40	21:45	22:05	22:15	R
87	05-Jan-06	89	5	A&E	18:00	19:30	22:05	11:15	R
88	05-Jan-06	77	6	A&E	18:30	20:00	22:05	11:15	R
89	05-Jan-06	56	2	GP	18:50	19:30	22:05	22:15	R
90	05-Jan-06	80	1	GP	20:20	21:00	22:05	00:45	R
91	05-Jan-06	95	4	A&E	21:10	21:45	22:15	22:30	R
92	05-Jan-06	70	7	ONCOL	21:40	22:00	00:45		R
93	05-Jan-06	75	4	A&E	23:30	23:45	01:50		R
94	05-Jan-06	80	7	GP	23:35	23:45	01:50	03:30	R
95	05-Jan-06	31	3	A&E	23:50	00:45	01:50	03:30	R
96	06-Jan-06	31	5	A&E	00:01	00:45	01:50	04:00	NICENTRE
97	06-Jan-06	84	2	A&E	00:20	01:30	01:50	11:30	R
98	06-Jan-06	55	6	A&E	02:00	03:30	03:30	14:15	R
99	06-Jan-06	44	7	A&E	06:30	06:30	07:00		H
100	06-Jan-06	65	1	A&E	09:00			15:30	R
101	06-Jan-06	63	5	A&E	10:00	10:45		13:25	R
102	06-Jan-06	66	3	A&E	10:20	10:30		13:25	R
103	06-Jan-06	34	4	GP	11:25	11:30		11:45	H
104	06-Jan-06	77	7	A&E	11:45			18:25	R
105	06-Jan-06	48	2	A&E	12:30			14:30	H
106	06-Jan-06	63	5	A&E	13:30			18:15	R

St George's MAU throughput Jan 2006

107	06-Jan-06	43	4	A&E	13:45	14:15		16:00	R
108	06-Jan-06	59	2	GP	15:45	16:00		18:20	H
109	06-Jan-06	77	1	A&E	16:00	16:00			R
110	06-Jan-06		3	A&E	16:15	21:30	21:35	22:50	
111	06-Jan-06	93	4	A&E	18:00	18:15	21:30	21:50	R
112	06-Jan-06	60	5	A&E	18:40	19:15	21:30	21:50	R
113	06-Jan-06	82	6	A&E	19:15	19:30	21:30	21:50	R
114	06-Jan-06	69	2	A&E	21:30	02:00	05:30	05:35	R
115	06-Jan-06	75	1	A&E	21:35	23:50	00:50	01:00	R
116	06-Jan-06	72	7	A&E	21:30	22:20	00:50	01:00	R
117	06-Jan-06	42	3	A&E	21:45	23:55	01:00	04:45	SAU
118	06-Jan-06	61	4	A&E	23:15	00:00	05:30	07:50	R
119	06-Jan-06	60	5	A&E	23:40	01:30	05:30	07:50	R
120	07-Jan-06	85	7	A&E	02:00	03:10	05:30	05:35	R
121	07-Jan-06	81	1	A&E	03:00	03:20	05:30		R
122	07-Jan-06	83	6	A&E	04:00	04:30	05:30		R
123	07-Jan-06	73	3	A&E	05:30		05:30		H
124	07-Jan-06	57	2	A&E	08:50		00:00	00:05	SAU
125	07-Jan-06	82	4	A&E	12:00	13:00			CORTILL
126	07-Jan-06	88	7	A&E	12:40	13:00	01:30	01:45	R
127	07-Jan-06	63	5	A&E	13:10	14:00	02:00	15:00	R
128	07-Jan-06	79	3	A&E	13:40	14:00	00:00	00:30	VAN
129	07-Jan-06	85	1	A&E	14:20	14:30	00:00	00:30	R
130	07-Jan-06	38	6	A&E	16:15	16:20			H
131	07-Jan-06	91	6	A&E	21:10	01:00	01:45	02:00	R
132	07-Jan-06	75	1	A&E	23:25	00:00	00:30	00:35	R
133	07-Jan-06	62	4	A&E	23:40	01:30	01:45	02:20	SAU
134	08-Jan-06	76	3	A&E	00:30	02:00	02:10	03:20	R
135	08-Jan-06	90	2	A&E	01:30	02:00		13:00	R
136	08-Jan-06	35	4	A&E	04:00			17:45	RUTH
137	08-Jan-06	69	6	A&E	04:10			18:40	R
138	08-Jan-06	78	1	A&E	04:30				R
139	08-Jan-06	59	7	A&E	07:30	08:00			SAU
140	08-Jan-06	37	3	A&E	08:45	10:15		19:10	H
141	08-Jan-06	77	2	A&E	14:00		00:00		R
142	08-Jan-06	85	5	A&E	15:20	17:30	19:45	20:15	R
143	08-Jan-06	74	6	A&E	18:45.	20:30	00:00	14:00	RS
144	08-Jan-06	87	4	A&E	19:15	23:00	00:00	14:25	R
145	08-Jan-06	67	3	A&E	20:50	23:00	00:00	16:00	R
146	08-Jan-06	80	7	A&E	20:12	23:00	00:00		H
147	08-Jan-06	47	5	A&E	22:30	23:00	00:00	13:50	H
148	08-Jan-06	48	1	A&E	23:55	00:00	00:00	12:30	ALLING
149	09-Jan-06	82	5	A&E	13:05	13:05		18:00	R
150	09-Jan-06	63	1	A&E	13:31	14:30	17:30	17:50	
151	09-Jan-06	57	4	GP	15:15	15:30		18:00	R
152	09-Jan-06		6	0	15:55	10:15		19:30	R
153	09-Jan-06	97	3	A&E	16:00	16:30	22:00	22:05	R
154	09-Jan-06	52	5	A&E	17:40	18:00	22:00	22:05	R
155	09-Jan-06	43	7	A&E	18:10	20:00	21:30	23:30	CHES
156	09-Jan-06	42	4	GP	19:30				
157	09-Jan-06	48	1	A&E	20:00	20:05	06:00	13:00	R
158	09-Jan-06	80	6	A&E	20:00	22:45	06:00	15:55	R
159	09-Jan-06	67	2	A&E	23:55	01:00	06:00	11:40	R
160	10-Jan-06	51	4	A&E	01:30		06:00	16:00	R
161	10-Jan-06	31	3	A&E	02:30		06:00	13:00	DIAL

162	10-Jan-06	55	7	A&E	02:50	04:45	06:00		H
163	10-Jan-06	49	5	A&E	03:50	04:50	06:00	08:30	DALEY
164	10-Jan-06	75	7	A&E	13:00	13:50	16:00	19:00	R
165	10-Jan-06	41	5	GP	10:20			16:00	R
166	10-Jan-06	40	2	GP	12:00				
167	10-Jan-06	76	3	GP	13:40		16:00	19:00	R
168	10-Jan-06	91	2	A&E	13:30		16:00	17:00	R
169	10-Jan-06	61	1	A&E	14:50			16:30	R
170	10-Jan-06	50	6	A&E	16:30		16:30	18:50	R
171	10-Jan-06	41	5	A&E	16:45		16:30	18:30	R
172	10-Jan-06	50	4	A&E	17:10	17:30	19:20	19:25	R
173	10-Jan-06		1	A&E	18:30	19:00	19:20		R
174	10-Jan-06	85	2	A&E	18:30				R
175	10-Jan-06	91	6	A&E	19:20	19:25			R
176	10-Jan-06	71	7	A&E	20:00	21:00	11:35	14:20	R
177	10-Jan-06	39	5	A&E	21:55		12:40	13:10	DOLBY
178	10-Jan-06	70	4	A&E	22:20	22:30		15:40	RODNEY
179	10-Jan-06	45	1	A&E	22:20		11:25	16:00	R
180	10-Jan-06	75	6	A&E	22:50			16:05	R
181	11-Jan-06	44	3	A&E	00:15		11:25	18:30	ALLING
182	11-Jan-06	80	5	A&E	13:20			19:15	R
183	11-Jan-06	67	4	A&E	16:10			19:20	R
184	11-Jan-06	40	6	GP	17:00			19:00	R
185	11-Jan-06	69	2	A&E	19:00	19:10	20:50	03:00	R
186	11-Jan-06	84	7	A&E	19:00	19:10	20:50	21:20	R
187	11-Jan-06	93	5	A&E	19:30	23:00	20:50	03:00	R
188	11-Jan-06	21	4	A&E	20:40				BUCK
189	11-Jan-06	94	6	A&E	21:50	23:50	02:40	03:30	R
190	11-Jan-06	63	1	A&E	22:00	01:25	02:40	03:30	R
191	11-Jan-06	26	3	A&E	23:35				R
192	12-Jan-06	46	4	A&E	00:45	04:00	02:40	06:55	R
193	12-Jan-06	82	3	A&E	01:35	04:00	02:40	07:00	R
194	12-Jan-06	73	7	A&E	03:00	04:20	06:00	12:30	R
195	12-Jan-06	68	2	A&E	04:00	04:55	06:00	06:45	R
196	12-Jan-06	97	6	A&E	07:40	08:45	09:00	16:00	HEB
197	12-Jan-06	42	2	GP	09:30	10:00	13:40	14:30	R
198	12-Jan-06	43	3	A&E	09:35	09:45	10:00	11:00	R
199	12-Jan-06	69		A&E					
200	12-Jan-06	60	4	GP	10:05	10:10		16:50	R
201	12-Jan-06	21	1	GP	11:05	11:20	13:40	13:56	R
202	12-Jan-06	74	3	A&E	12:20	12:40	13:40	15:00	R
203	12-Jan-06	80	5	A&E	11:30	12:30		14:30	R
204	12-Jan-06	85	7	A&E	13:30				R
205	12-Jan-06	52	1	A&E	14:30	15:00	18:00	19:30	VERNON
206	12-Jan-06	80	5	A&E	15:00	15:15	18:00	21:00	R
207	12-Jan-06	73	4	GP	16:15	17:30	18:00	20:00	
208	12-Jan-06	39	3	GP	16:00	15:30		21:00	R
209	12-Jan-06		2	0	17:30	17:40		21:30	H
210	12-Jan-06	93	4	GP	20:15	20:25	22:00	22:30	H
211	12-Jan-06	51	7	GP	18:30	19:00		21:45	R
212	12-Jan-06	37	6	A&E	19:00	19:15	21:15	22:00	SAU
213	12-Jan-06	71	1	A&E	20:50	22:30	23:00	01:00	HEB
214	12-Jan-06	56	5	A&E	21:20	23:40	01:30	01:45	H
215	12-Jan-06	43	3	A&E	22:15				R
216	12-Jan-06	81	6	A&E	23:00	02:00	08:30	12:30	R

217	12-Jan-06	46	7	A&E	23:30	00:00	01:00	02:00	R
218	13-Jan-06	67	4	A&E	00:15	00:20	01:00	04:00	SAU
219	13-Jan-06	40	1	A&E	01:30	02:00	03:00		
220	13-Jan-06	85	2	A&E	03:40	04:45	09:00	15:00	R
221	13-Jan-06	77	5	A&E	04:20	05:15	09:00	16:00	H
222	13-Jan-06	39	4	A&E	05:30	06:00	09:00	15:45	H
223	13-Jan-06	52	7	A&E	06:30	07:00	09:00	15:30	H
224	13-Jan-06	92	6	A&E	12:50	15:00	15:30	15:45	R
225	13-Jan-06	76	3	A&E	14:30	17:15	17:30	18:00	R
226	13-Jan-06	61	1	A&E	15:10	17:15	18:00	18:00	R
227	13-Jan-06	38	2	A&E	15:35	16:00	16:00	18:30	R
228	13-Jan-06	41	7	A&E	15:35	17:00		19:20	
229	13-Jan-06	83	6	A&E	16:20	17:00	17:00	21:10	H
230	13-Jan-06	48	4	A&E	16:25	17:00		18:45	H
231	13-Jan-06	86	3	A&E	17:00			23:00	R
232	13-Jan-06	85	5	A&E	19:40	20:00		23:00	R
233	13-Jan-06	77	1	A&E	19:50			23:00	R
234	14-Jan-06	15	6	A&E	00:00	00:15	02:20	02:45	R
235	14-Jan-06	69	7	A&E	00:55	01:00	02:20	02:45	R
236	14-Jan-06	30	4	A&E	01:10	01:30	02:20	02:45	R
237	14-Jan-06	25	3	A&E	01:15	01:50	02:20	03:45	R
238	14-Jan-06	31	1	A&E	02:00	03:00	02:20	03:45	R
239	14-Jan-06	79	5	A&E	03:05	03:05	03:50		R
240	14-Jan-06	86	7	A&E	04:00	04:20	06:00	14:00	R
241	14-Jan-06	84	2	A&E	05:00	05:10	06:00	11:30	R
242	14-Jan-06	59	1	A&E	08:15	08:30	11:30	20:30	R
243	14-Jan-06	87	6	A&E	11:30	13:30	11:30	20:30	R
244	14-Jan-06	74	3	A&E	13:20	14:00	18:00	20:45	R
245	14-Jan-06	63	2	A&E	17:10	18:00	18:00		R
246	14-Jan-06	64	5	A&E	19:00		18:00	23:00	R
247	14-Jan-06	29	4	A&E	19:30	21:00		22:45	GUN
248	14-Jan-06	57	7	A&E	20:20	21:00			H
249	14-Jan-06	72	6	A&E	22:15				
250	14-Jan-06	55	2	A&E	23:30	00:20		10:00	H
251	15-Jan-06	24	3	A&E	00:10	00:30	11:50	15:10	KENT
252	15-Jan-06	39	5	A&E	00:50	01:45		10:00	H
253	15-Jan-06	60	1	A&E	21:50	22:15		15:00	R
254	15-Jan-06	25	2	A&E	11:20			19:00	H
255	15-Jan-06	76	5	A&E	14:10	14:36	22:45	22:45	
256	15-Jan-06	31	3	A&E	15:40			20:35	BUCK
257	15-Jan-06	51	7	A&E	15:40			22:30	R
258	15-Jan-06	62	1	A&E	17:50			20:50	CHAMP
259	15-Jan-06	80	2	A&E	19:40	19:50		20:30	BRODIE
260	15-Jan-06	68	4	A&E	20:50				H
261	15-Jan-06	49	3	GP	21:50	22:00		22:00	R
262	15-Jan-06	57	7	A&E	23:20			22:50	R
263	15-Jan-06	63	4	A&E	23:30	12:50			H
264	16-Jan-06	68	6	A&E	14:30				R
265	16-Jan-06	74	1	GP	21:30				RS
266	17-Jan-06	65	3	A&E	00:30		12:00	15:30	MARN
267	17-Jan-06		4	A&E	12:25				TREV
268	17-Jan-06	69	4	A&E	16:00		22:45	14:50	R
269	17-Jan-06	94	3	GP	15:30			22:30	R
270	17-Jan-06	84	1	A&E	00:00			22:15	H
271	17-Jan-06	81	6	A&E	17:25		22:45		RODNEY

272	17-Jan-06	20	2	A&E	00:00			01:00	H
273	17-Jan-06	69	7	A&E	22:25		22:45		HDU
274	17-Jan-06	67	1	A&E	23:30			22:00	R
275	18-Jan-06	83	3	A&E	01:20	02:10	01:25	14:30	R
276	18-Jan-06	57	2	A&E	03:00		05:30		R
277	18-Jan-06	69	6	A&E	04:00		05:30		R
278	18-Jan-06	78	2	A&E	13:30			18:30	ASU
279	18-Jan-06	27	3	GP	16:00	16:15		16:00	RAY
280	18-Jan-06	68	5	A&E	18:00			17:00	R
281	18-Jan-06	85	4	A&E	18:20			14:45	RODNEY
282	18-Jan-06	73	2	A&E	19:20			13:15	FN
283	18-Jan-06	93	7	A&E	20:20			15:30	MARN
284	18-Jan-06	56	6	A&E	21:35			18:00	HOULDS
285	18-Jan-06	83	1	A&E	23:50			14:00	FN
286	19-Jan-06	84	2	GP	14:15	14:30	16:00	16:20	R
287	19-Jan-06	30	1	GP	14:15	15:00			R
288	19-Jan-06	87	7	A&E	16:10			21:30	R
289	19-Jan-06	90	3	A&E	17:10			21:30	R
290	19-Jan-06		5	DIAB CL	17:25				R
291	19-Jan-06		4	A&E	18:00				CAVELL
292	19-Jan-06	18	2	A&E	19:50	20:00	23:30	23:50	R
293	19-Jan-06	60	1	A&E	21:30	22:15	23:30	23:50	R
294	19-Jan-06	84	3	A&E	22:45	22:45	23:30	23:50	R
295	20-Jan-06	83	2	SPRING	00:50	01:00	02:00	03:50	R
296	20-Jan-06	82	6	A&E	02:20	02:30	04:00		FLOR
297	20-Jan-06	39	7	A&E	03:35	02:15	04:00		BUCK
298	20-Jan-06	67	5	A&E	05:05		05:45		H
299	20-Jan-06	26	3	GP	10:00	10:20			H
300	20-Jan-06	34	2	A&E	10:30	10:40		16:15	CH
301	20-Jan-06	85	1	A&E	10:50	11:00	14:30		R
302	20-Jan-06	18	4	A&E	13:10				H
303	20-Jan-06	93	5	A&E	13:30	13:45		20:45	R
304	20-Jan-06	77	1	A&E	16:00	16:30		18:30	R
305	20-Jan-06	61	7	A&E	14:45	15:15		19:00	R
306	20-Jan-06	93	4	A&E	17:40			23:00	R
307	20-Jan-06	74	6	A&E	20:00	20:15			H
308	20-Jan-06	76	7	A&E	20:20	20:30		23:00	R
309	20-Jan-06	57	2	A&E	21:00	19:30		23:00	R
310	20-Jan-06	25	3	A&E	21:35	21:45		23:00	H
311	20-Jan-06	90	1	A&E	22:15	22:30		23:00	R
312	21-Jan-06	75	5	A&E	00:55	01:00	02:45	03:00	R
313	21-Jan-06	78	2	A&E	00:55	01:00	02:45	03:00	R
314	21-Jan-06	37	7	A&E	05:15	06:30	07:00	07:00	R
315	21-Jan-06		7	A&E	10:00	10:15	11:40	11:50	R
316	21-Jan-06	50	3	A&E	10:55	11:30			H
317	21-Jan-06	86	2	A&E	11:35				R
318	21-Jan-06	50	7	A&E	15:20	15:30	18:30	22:00	R
319	21-Jan-06	66	6	A&E	15:45	16:10			H
320	21-Jan-06	55	2	A&E	18:45	19:45	22:00	22:00	R
321	22-Jan-06	96	6	A&E	02:25	02:30	02:40	04:45	R
322	22-Jan-06	79	3	A&E	02:45	03:15	03:25	04:45	R
323	22-Jan-06	37	7	A&E	04:30	04:45	04:50		R
324	22-Jan-06	97	3	A&E	04:50	04:50	05:00	06:30	R
325	22-Jan-06	26	4	A&E	05:00	05:00	05:50	06:30	R
326	22-Jan-06	74	6	A&E	09:52	10:00	12:30	13:00	R

327	22-Jan-06	43	4	A&E	10:15	10:30	12:30	13:00	R
328	22-Jan-06	79	1	A&E	12:05	12:30	15:00	21:45	H
329	22-Jan-06	38	2	A&E	13:30	14:30			R
330	22-Jan-06	90	5	A&E	14:00	17:00	15:00		R
331	22-Jan-06	73	5	A&E	18:20	18:40		21:00	R
332	22-Jan-06	74	2	A&E	19:00	19:00		20:30	R
333	22-Jan-06	42	5	CDU	19:02	19:20	21:00	22:35	R
334	22-Jan-06	83	2	A&E	19:20	19:30	22:35	22:50	R
335	22-Jan-06	79	7	A&E	20:00	21:00	22:35	00:10	R
336	22-Jan-06	77	3	A&E	21:20	22:35	22:35	01:30	R
337	22-Jan-06	67	6	GP	23:00	00:25	02:00	06:00	R
338	23-Jan-06	50	4	A&E	06:10	06:45	02:00	09:00	R
339	23-Jan-06	61	6	A&E	06:20	07:00			R
340	23-Jan-06	76	3	A&E	07:20	11:00			R
341	23-Jan-06	85	5	CDU	11:20	13:00			R
342	23-Jan-06	37	4	WALK IN	11:35	12:30	16:30	17:00	R
343	23-Jan-06	49	6	A&E	12:35	13:40	16:30	17:00	R
344	23-Jan-06	67	2	GP	13:00	17:00	18:00		R
345	23-Jan-06	67	1	A&E	13:40	17:00	17:20	17:45	R
346	23-Jan-06	82	7		14:00	17:30	18:30	19:20	R
347	23-Jan-06	68	3		15:40	18:00	18:30	21:15	R
348	23-Jan-06	34	4	GP	16:35	17:10			H
349	23-Jan-06	90		CDU					
350	23-Jan-06	34	4	GP	16:40				
351	23-Jan-06	82	6	CDU	16:45	19:15	21:00	22:50	R
352	23-Jan-06	90	5	CDU	17:30	19:30	21:00	23:00	R
353	23-Jan-06	68	1	GP	18:50	19:35	21:00	23:00	R
354	23-Jan-06	25	7	GP	19:35	20:00		22:10	H
355	23-Jan-06	88	4	A&E	21:00	22:00		00:10	BUCK
356	23-Jan-06	87	3	A&E	22:30	22:30	01:20	02:30	R
357	24-Jan-06	45	6	A&E	00:00	00:15	01:20	00:50	R
358	24-Jan-06	86	2	A&E	00:25	01:30	01:20	02:20	R
359	24-Jan-06	76	6	A&E	00:50	01:30	01:20	02:45	R
360	24-Jan-06	80	7	A&E	01:15	02:45	01:20	04:10	R
361	24-Jan-06	90	1	A&E	02:30	04:10		13:15	R
362	24-Jan-06	67	7	A&E	04:30	04:50	09:00	11:30	R
363	24-Jan-06	44	6	A&E	04:50	05:30		08:00	H
364	24-Jan-06	61	2	A&E	08:30	09:45	19:00	21:00	SAU
365	24-Jan-06	76	3	CDU	09:45	09:50		19:00	R
366	24-Jan-06	59	6	RESUS	10:00	11:00	13:45		R
367	24-Jan-06	69	4	GP	12:55	14:15			R
368	24-Jan-06	36	5	ANTI COAG	13:15	13:30		15:45	R
369	24-Jan-06		6		14:10			16:30	R
370	24-Jan-06	58	7	RESUS	16:00	16:05	19:00	19:30	R
371	24-Jan-06	38	1		16:25			17:30	DRUM
372	24-Jan-06	70	5	A&E	16:40		19:00	20:20	CAVE
373	24-Jan-06	80	4	A&E	17:50	17:40	10:45	10:45	R
374	24-Jan-06	56	6	A&E	17:25	18:08		23:06	R
375	24-Jan-06	86	1	A&E	18:15	19:15	20:50	21:00	R
376	24-Jan-06	83	7	A&E	20:00			23:00	R
377	24-Jan-06	91	3	A&E	20:10		01:00	23:10	R
378	24-Jan-06	78	5	A&E	20:50			22:20	R
379	24-Jan-06	83	2	A&E	21:50	22:00		01:00	R
380	24-Jan-06		5	A&E	22:30	01:00		16:00	R

381	24-Jan-06	91	1	A&E	23:00	01:30		14:00	R
382	25-Jan-06	44	7	A&E	01:20	01:50		09:45	R
383	25-Jan-06	87	6	A&E	00:00	01:04			R
384	25-Jan-06	71	2	A&E	01:50	02:00		13:00	COE
385	25-Jan-06	21	7	A&E	02:15		06:45	07:00	MCENTEE
386	25-Jan-06	28	6	A&E	04:40	05:00	06:10	06:15	HOULDS
387	25-Jan-06	36	4	A&E	05:40	06:00		18:45	F/NA
388	25-Jan-06	77	6	A&E	08:00	06:30		19:00	MCENTEE
389	25-Jan-06	87	3	A&E	08:20			18:15	R
390	25-Jan-06	51	7	A&E	11:30	12:00		20:00	HOULDS
391	25-Jan-06	39	2	A&E	13:25	14:10		20:30	HOULDS
392	25-Jan-06	84	1	A&E	15:10	16:30	18:00	19:30	R
393	25-Jan-06	91	5	A&E	17:30	17:45	19:00	20:00	R
394	25-Jan-06	43	6	A&E	19:30	19:30	20:40	01:30	R
395	25-Jan-06	67	3	A&E	18:20	18:55	20:40	23:15	F/NA
396	25-Jan-06	82	2	A&E	22:45	23:00	02:00		R
397	25-Jan-06	89	4	A&E	23:00	00:00	02:00		R
398	26-Jan-06	20	6	A&E	02:45	02:50	09:30	13:15	R
399	26-Jan-06	43	7	A&E	03:25	04:00	09:30	10:30	R
400	26-Jan-06	73	2	A&E	04:30	04:15	09:30		R
401	26-Jan-06	36	5	A&E	07:15	07:20	09:30	14:18	R
402	26-Jan-06	61	3	A&E	08:15	09:30	09:00	13:15	R
403	26-Jan-06	66	4	A&E	10:50	11:15	16:45	20:45	R
404	26-Jan-06	74	7	GP	11:05	12:05		15:30	R
405	26-Jan-06	56	1	GP	12:05	12:30			R
406	26-Jan-06	86	2	A&E	13:25	14:30	16:40	16:40	R
407	26-Jan-06	80	6	A&E	14:55	16:15	16:45		R
408	26-Jan-06	93	3	CDU	15:00	16:00	16:45	19:05	R
409	26-Jan-06	25	5	A&E	15:05	15:05	16:45	19:30	R
410	26-Jan-06	86	7	A&E	16:10	17:00		21:10	R
411	26-Jan-06	61	2	A&E	17:35	18:10			R
412	26-Jan-06	92	1	A&E	18:50	19:05			R
413	26-Jan-06	83	5	A&E	19:20	19:25			R
414	26-Jan-06	85	3	A&E	19:25	19:40			R
415	26-Jan-06	78	7	A&E	21:00				R
416	26-Jan-06	51	6	A&E	22:00	22:30		12:30	R
417	26-Jan-06	89	4	A&E	22:00	04:00			R
418	27-Jan-06	85	2	A&E	00:35	03:00		13:10	TY
419	27-Jan-06	75	5	A&E	01:45	03:20		14:30	HEBERDEN
420	27-Jan-06	51	3	A&E	02:00			13:30	CAVELL
421	27-Jan-06	42	7	A&E	03:25	05:00		12:30	R
422	27-Jan-06	71	1	A&E	07:00	07:15			HEBERDEN
423	27-Jan-06	80	4	A&E	08:20	08:45		15:20	R
424	27-Jan-06	91	7	A&E	11:31	11:50		15:55	R
425	27-Jan-06		6	ANTI CO	13:00	13:00			R
426	27-Jan-06	73	2	A&E	13:30	13:45			R
427	27-Jan-06	69	3	A&E	14:00			20:56	R
428	27-Jan-06	74	1	A&E	14:25	14:50		18:40	R
429	27-Jan-06	82	5	A&E	15:45	16:20			AM
430	27-Jan-06	44	4	A&E	15:50	16:20			GREY
431	27-Jan-06	59	7	A&E	16:40	16:10			R

432	27-Jan-06	38	6	A&E	19:00			19:30	HEBERDEN
433	27-Jan-06	61	6	A&E	20:10	23:30	01:20	01:30	R
434	27-Jan-06	92	2	A&E	18:50				R
435	27-Jan-06	63	1	A&E	21:30	22:00	23:15	00:30	R
436	27-Jan-06	71	4	GP	21:30		23:55	00:50	R
437	27-Jan-06	40	5	A&E	22:05		00:30	20:41	R
438	27-Jan-06	29	2	GP	23:05	01:05	01:50	02:00	MCENTEE
439	28-Jan-06	69	7	A&E	00:05	02:15	02:30	03:00	R
440	28-Jan-06	37	5	A&E	01:00	02:15	06:55	06:58	R
441	28-Jan-06	56	3	A&E	01:00	01:30	02:30	03:10	R
442	28-Jan-06	63	1	A&E	02:00	02:50	03:55	04:00	R
443	28-Jan-06	63	4	A&E	02:05	02:50	04:20	04:30	R
444	28-Jan-06	85	6	A&E	02:50	04:15	05:05	05:05	R
445	28-Jan-06	65	2	A&E	03:00	05:00	06:55		R
446	28-Jan-06	60	6	A&E	07:00	07:00		11:20	FN
447	28-Jan-06	46	1	A&E	07:50	08:20	16:30	13:00	CHES
448	28-Jan-06	75	7	A&E	09:20	09:30	17:45	17:45	R
449	28-Jan-06	91	3	A&E	09:45	10:00	14:00	14:00	R
450	28-Jan-06	75	5	A&E	10:35	11:45	18:00		R
451	28-Jan-06	39		A&E	11:30	12:10	17:00		R
452	28-Jan-06	84	4	A&E	12:00	13:00	18:00		R
453	28-Jan-06	90	1	A&E	14:35	16:30	18:00		R
454	28-Jan-06	62	3	A&E	19:00	20:00			R
455	28-Jan-06	69	4	A&E	19:30	20:30	21:30	23:20	R
456	28-Jan-06	80	5	A&E	20:00	20:30	21:30	23:00	R
457	28-Jan-06	76	7	A&E	19:00	20:30			R
458	29-Jan-06	44	6	A&E	01:45		02:00	14:00	SAU
459	29-Jan-06	78	5	A&E	01:50	03:00		14:30	R
460	29-Jan-06	67	2	A&E	03:35		14:00	19:10	R
461	29-Jan-06	61	1	A&E	03:20	02:00	14:00	14:30	R
462	29-Jan-06			A&E			10:00	10:00	H
463	29-Jan-06	85	5	A&E	11:00	14:00			SPRING
464	29-Jan-06	86	4	A&E	11:55		14:30	18:30	CAVELL
465	29-Jan-06	71	6	A&E	14:20	15:05	14:30	23:00	R
466	29-Jan-06	91	7	A&E	16:00	17:00	20:00	23:40	R
467	29-Jan-06	46	1	A&E	17:00	17:30	20:00	23:41	R
468	29-Jan-06	76	3	A&E	20:00	20:10			SAU
469	29-Jan-06	80	2	A&E	21:20	00:00	00:10	06:30	R
470	29-Jan-06	79	4	A&E	21:35	08:45			R
471	30-Jan-06	84	1	A&E	01:00		03:30	03:50	SAU
472	30-Jan-06	88	6	GP	01:45	03:00	03:20	03:45	R
473	30-Jan-06	93	7	A&E	02:55			09:30	TH
474	30-Jan-06	50	6	A&E	04:25			16:00	FN
475	30-Jan-06	58	3	A&E	05:00		13:15		BUCK
476	30-Jan-06	47	2	A&E	06:45			12:50	H
477	30-Jan-06	45	1	A&E	07:10				GUNNING
478	30-Jan-06	27	1	A&E	09:30	09:40	13:15	14:30	RS
479	30-Jan-06	41	7	A&E	12:00	12:20	13:11	13:20	R
480	30-Jan-06	46	5	A&E	13:25	14:00	15:00		R
481	30-Jan-06	83	2	GP	13:50			22:25	R
482	30-Jan-06	76	7	GP	14:30			17:00	R
483	30-Jan-06	68	5	GP	14:45	17:20	18:15	18:10	R

484	30-Jan-06		1	A&E	16:15	18:00	18:15	18:15	R
485	30-Jan-06	50	4	A&E	18:10	23:25			R
486	30-Jan-06	62	6	A&E	17:30	18:15	23:00	00:10	HOLDS
487	30-Jan-06	59	7	A&E	18:15	18:20	19:30		R
488	30-Jan-06	79	5	A&E	19:10	21:00		01:25	R
489	30-Jan-06	55	1	A&E	19:35	21:30			R
490	30-Jan-06	72	7	A&E	20:45	21:30		01:00	R
491	30-Jan-06	42	3	A&E	21:15	22:20		23:15	R
492	30-Jan-06		2	A&E	22:20	22:20		01:35	SAU
493	31-Jan-06	68	3	A&E	01:25			06:00	SAU
494	31-Jan-06	91	6	A&E	01:40			17:58	R
495	31-Jan-06	79	4	CDU	01:45			13:10	HEB
496	31-Jan-06	63	2	A&E	02:00			11:40	R
497	31-Jan-06	65	1	A&E	03:30				RSM
498	31-Jan-06	32	7	A&E					RSM
499	31-Jan-06	18	5	A&E	05:00				R
500	31-Jan-06	92	3	A&E	06:50				RIP
501	31-Jan-06	58	3	A&E	12:30			17:00	R
502	31-Jan-06	40	4	GP	14:00				R
503	31-Jan-06	38	1	A&E	14:15			18:50	R
504	31-Jan-06	62	6	A&E	15:00				R
505	31-Jan-06		2	A&E	15:50			18:50	R
506	31-Jan-06	60	3	A&E	17:15			17:50	HEB
507	31-Jan-06	85	5	A&E	17:40				SELF DIS
508	31-Jan-06		3	A&E	19:00				R
509	31-Jan-06	83	2	A&E	19:45		23:30	00:00	R
510	31-Jan-06	69	5	A&E	20:20		23:30	13:00	GREY
511	31-Jan-06	79	7	GP	19:00		23:30	00:15	R
512	31-Jan-06	34	1	A&E	21:05		23:30	01:30	R
513	31-Jan-06	76	4	GP	22:55		03:00	14:30	R

480
480

Appendix X MAU Diary of Significant Events

Ref	seq	Date	Activity
0	0	25.01.2006	interview David Flood re short circuit AE to ward
1	1	25.01.2006	Organised observations
2	2	25.01.2006	Ref KSF framework book
3	3	25.01.2006	dialogue doctors observation
5	1	26.01.2006	Interview SHO re process
6	2	26.01.2006	interworking Telephone diagnosis
7	3	26.01.2006	dialogue doctors observation
8	4	26.01.2006	material Telephone use
9	5	26.01.2006	process jobs to do sheet use
10	6	26.01.2006	interworking MCP activity
11	7	26.01.2006	Process notes
12	0	31.01.2006	process ward round
13	1	31.01.2006	process use of PRB
14	2	31.01.2006	Reflections re AT elements
15	3	31.01.2006	interview with locum re process
16	4	31.01.2006	problem Porter at lunch
17	5	31.01.2006	Reflections MAU as communications centre
18	6	31.01.2006	Problem lack of clarity re patient status
19	7	31.01.2006	process Ward round
20	8	31.01.2006	interworking Computer data entered by receptionist PRB
21	9	31.01.2006	Materials list by table
22	10	31.01.2006	process Handover to evening team
23	11	31.01.2006	interview with locum re process
24	12	31.01.2006	interview re objectives
25	13	31.01.2006	process Handover AE to MAU
26	14	31.01.2006	problem Porter not available
27	0	1.2.2006	problem ae to ward due to no beds
28	1	1.2.2006	problem lost patient
29	2	1.2.2006	dialogue doctors observation
30	3	1.2.2006	dialogue doctor and student
31	4	1.2.2006	process doctor tools use of patient notes
32	0	6.2.2006	process doctors on duty
33	1	6.2.2006	material patient notes
34	2	6.2.2006	interworking bed manager activity writes IS
35	3	6.2.2006	process reg coordination
36	4	6.2.2006	problem scan wait
37	0	7.2.2006	interworking interaction nurse and doctor
38	1	7.2.2006	process use of ECG charts
39	2	8.2.2006	interview Student interaction
40	0	10.2.2006	Interview with consultant
41	1	10.2.2006	Process within MAU
42	2	10.2.2006	process Decision making by Reg re catheter out
43	3	10.2.2006	interworking HIT team social issues
44	4	10.2.2006	materials in MAU
45	5	10.2.2006	process priority system for test results
46	6	10.2.2006	interworking ACS practitioner
47	7	10.2.2006	dialogue Reg and sHO re TBD sheet
48	8	10.2.2006	process use of ECG charts
49	9	10.2.2006	process who answers telephone
50	10	10.2.2006	materials use of BNF
51	11	10.2.2006	process doctor tools getting blood results#
52	12	10.2.2006	process use of xray display by group
53	13	10.2.2006	process use of ct scan by group

54	14	10.2.2006	process handover to next Reg
55	15	10.2.2006	process for infection control by nurse
56	16	10.2.2006	interview re method of teaching
57	0	15.2.2006	process ward round
58	1	15.2.2006	process interworking with infection control
59	2	15.2.2006	process consultant emphasis on importance of handover
60	3	15.2.2006	problem confusion over use of IS
61	4	15.2.2006	process use of telephone
62	5	15.2.2006	process 7 hour patient and bed manager actions
63	6	15.2.2006	dialogue reg and GP
64	7	15.2.2006	interworking with doctor from atkinson morley
65	8	15.2.2006	problem john missing
66	9	15.2.2006	material doctor and found again stethascope
67	10	15.2.2006	dialogue reg asking about patient condition
68	11	15.2.2006	process reg asks about which tests carried out
69	12	15.2.2006	dialogue rega nd consultant re 7 hour patient
71	0	22.2.2006	MAU closed due to bug
72	1	27.2.2006	MAU closed due to bug
74	3	6.3.2006	MAU back in use
75	4	6.3.2006	Material new patient record book
76	5	6.3.2006	process patient notes as communication possible diagnosis
77	6	6.3.2006	material use of portable ECG
78	7	6.3.2006	process what nurses can do
79	8	6.3.2006	process when tests are carried out
80	9	6.3.2006	process cleaning
81	10	6.3.2006	dialogue on telephone re bed situation
82	11	6.3.2006	problem patient admitted without med problem - social only
83	12	6.3.2006	dialogue doctors re signs and causes
84	13	6.3.2006	dialogue reg and GP
85	14	6.3.2006	dialoguue social conditions
86	15	6.3.2006	process decision re admittance
87	16	6.3.2006	process SHO writing blood test sheet
88	17	6.3.2006	dialogue re ward round patient review
89	18	6.3.2006	process handover of bleep
90	19	6.3.2006	process handover from AE
91	20	6.3.2006	dialogue difficult patient
92	21	6.3.2006	process feeding patient info into computer
93	22	6.3.2006	dialogue SHO and nurse re tests and obs
94	23	6.3.2006	process role of tests in knowing problem cause
95	24	6.3.2006	process SHO keeping nurse informed re patient condition
96	25	6.3.2006	dialogue concern over patient lactose level
97	26	6.3.2006	dialogue SHO and reg over ppatient condition and readings
98	27	6.3.2006	problem reg it's a factory
99	28	6.3.2006	process bed use negotiation by a nurse
100	29	6.3.2006	dialogues re readings, tests and patient condition
101	30	6.3.2006	material - hospital records arrival
102	31	6.3.2006	problem waiting portable oxygen equip
103	32	6.3.2006	interview student learning process
105	0	9.3.2006	all beds full so no movement
106	1	9.3.2006	problem nurse tries to borrow BIPAP
107	2	9.3.2006	material use of BIPAP
109	4	10.3.2006	all beds full so no movement
110	5	10.3.2006	problem difference reg list and mau list
111	6	10.3.2006	process priority change due to 4 hour
112	7	10.3.2006	interview doctor describes learning process

Appendix Y MAU Transcriptions of observations

MAU Observations Diary

Transcription notes
David = Acting Matron
John = the porter usually carrying out MAU portering duties
Reg. = Registrar
SHO = Senior House Officer
A&E = Accident and Emergency department on St George's Hospital
Bleep = Device carried by doctors that indicate (by a bleep sound) they are need to telephone a number indicated on the device.

25 January 2006
Met with Acting matron to set up observations arrangements.
Met with hospital sisters to outline the study.
Chased up honorary contract and Doctor information.
Met matron of 4 medical wards. These are where patients are sent off to Richmond Ward.
Spotted national health service framework book on Acting matron's desk, identified the assessment and treatment planning guide. This applies directly to the diagnosis and treatment decision-making process that I wish the study. The framework not only defines the activity but also different levels of capability in four levels. It also discusses the tools etc. used during the capability.
As such it forms a strong theoretical basis for the object my research.
Met three doctors in the tea room. I explained my research and one had received the information about the study from Annabel.
Honorary contract information has disappeared. I have filled up new forms and need to get through different department in human resources. Last one was medical Honorary only. More grinding bureaucracy and doing things multiple times.

18.00 examined MAU admissions book. This is the book used by the MAU staff for monitoring throughput. Each patient entry comprises name, age, where they come from, bed, perceived complaint, time of arrival, time of clerking, BB?, departure time and destination.

18.15 sitting at desk in MAU. Watched and listened to a number of conversations between Doctor's discussing patient condition and test results. Conversations had no specific outcome but a number of potential causes or factors were voiced. "have you thought about"

Researcher leaves MAU

27th January 2006

11 20 arrived on MAU after brief discussion about research intentions with Acting matron

1125 a new patient is admitted to bed A7. A nurse bleeps doctor for patient in bed A1. A nurse from A&E does handover of patient details to MAU nurse.

Interview with SHO who describes:
During first clerking the Doctor takes history, medicines and the medical problem - what may be the cause? Looks at test results on the computer then maybe five or six possible causes. Then Doctor correlates with blood reports and this narrows it down to 2 to 3 diagnoses. Will ask registrar to review. He or she will look at tests and compare and discuss them then outline possible treatment. Check is then done with the consultant during the consultant round. Every step is refining the diagnosis the results and thoughts are written down.

11.47 the patient in A2 goes to ultrasound

11.55 the registrar arrives and discusses the patient condition and diagnosis by telephone with the Ward. The registrar also suggest tests that need to be done. He says "without this information we cannot tell, you need to check..."

12.00 another Doctor discusses by telephone, asks for drug results for patient and writes it down on the patient record sheet and asks the patient questions. A nurse updates the patient record.

1205 another Doctor arrives, examines the patient's Doctor 'jobs to do' sheet. The registrar discusses the patient condition with other doctors. The registrar asks a nurse regarding the patient reading "take blood sugar". Writes on the Doctor 'jobs to do' sheet. Two more doctors arrive.

12.15 the registrar is bleeped. Picks up the telephone and discusses a patient condition. The registrar asks the question "has the patient any history of alcohol abuse".

12.20 Registrar phones and discusses patient condition. Doctor arrives with blood results and discusses them with the registrar. The telephone rings. Nurse she says no beds available. Registrar and Doctor look at Doctor 'jobs to do' sheet and discuss it. Bed Manager arrives and discusses Richmond bed availability with the Staff Nurse. The Staff Nurse goes to collect an empty bed. Patient in A6 is moved to Richmond Ward. The nurses move the bed to the new ward.
The telephone rings. A doctor answers and asks the registrar a question and says "I think patient was not accepted".
The registrar and Doctor discuss the patient drug amount. The registrar asks Nurse for tests on patient A1. Registrar updates patient record on papers.
The registrar makes a telephone call and updates Doctor 'jobs to do' sheet and makes more notes.
Two doctors arrive and look at the patient notes. Another 3 arrive, senior registrar from accident and emergency discuss the introduction of new patient previous discussed by telephone with the clinic.

12.38 patient arrives in bed A6.

A doctor completes blood results form for a patient with the blood sample.
Registrar is on the telephone and discusses patient condition.
Doctor looking through and completing notes for the patient in A7

12.42 the telephone rings, a nurse answers it.
Registrar and a doctor discuss the patient on the Doctor 'jobs to do' sheet.

12.44 the telephone rings, the nurse checks the Doctor 'jobs to do' sheet

12.45 the nurse takes patient A1 to Richmond ward
Registrar answers the telephone to bleep, discusses the patient condition and suggests tests and treatment. Doctor asks nurse where patient in bed A6 notes are. The nurse answers A&E. Registrar and the Doctor discussed the patient on the Doctor 'jobs to do' sheet.

12.54 nurse answers the phone and discusses a patient and reviews the patient record book.

12.57 the telephone rings, a doctor says that the patient is in the MAU. A patient uses the MAU telephone. Then Doctor asks about drug use.
Consultant asks nurse to get another specialist Doctor to see patient and then reviews the Doctor 'jobs to do' sheet and checks the notes. The consultant makes notes on the Doctor 'jobs to do' sheet and the consultant discusses patients on the Doctor 'jobs to do' sheet with the SHO.

13.30 reflections on this morning after nice lunch of coffee and toasted cheese and veg focaccia. Knotworking by doctors - two or more coming together to discuss the immediate list and particular patients test results, what to do next, patient condition. This may only take seconds. Do I need to time them? One doctor was very happy to describe the MAU protocol, refining the diagnosis of five possible causes to 3 to 1 using ascending levels in combination of hypotheses and testing. There is a system of acceptance of patients. The patient is not accepted into the MAU until a doctor agrees it. The bed allocation is a separate system to medical and nursing these are interconnecting systems that uses the Doctor 'jobs to do' sheet as a centre of attention. Both single. Doctor or nurse or multiples of the nurses and doctors or doctors and doctors. Doctor 'jobs to do' sheet is used more than the MAU admissions book.
Use of the telephone - communications between nurses and others about bed availability, used by a patient for talking to family and friends, used by doctors either prompted by a bleep or initiated by the doctor to discuss the patient condition, agree to admission, fact-finding about the patient, ordering tests, ordering minor treatments or discussing diagnoses.

14.05 Anna, a medical care practitioner does blood samples and writes up notes. Anna was one of the doctors referred to earlier. Junior Doctor is writing up patient notes after clerking. A bed manager says there is a need to accept the patient from resus to clear a bed there.

14.17 patient A7 is off to a ward.

14.23 patient A1 arrives with a huge patient file.
The phone rings

14.26 patient A7 is waiting for the porter to take the patient to x-ray.
A sister from accident and emergency discusses patient condition with Staff Nurse. There is a conversation about ringing for the porter but porter dept could not supply someone.
A doctor in blue outfit discusses the patient and asks to be informed if the patient is admitted. Says he will arrange tests.

14.30 Doctor writes blood test form and refers to patient notes. Doctor and MCP discussed the meaning of the signs "dark brown - light brown".

14.35 a doctor reviews the patient notes for patient A1.
The bed manager discusses admissions with Staff Nurse.
Phone call - someone asking for patient whereabouts. Staff Nurse tells caller and transfers the call.
The SHO gets a bleep call to emergency in a ward.
The registrar writes up the Doctor 'jobs to do' sheet.
The MCP asks registrar about the meaning of the test. The registrar uses Doctor 'jobs to do'

sheet to suggest MCP sees the patient.
Registrar reviews the patient on Doctor 'jobs to do' sheet.
MCP uses telephone to ask about patient movement plan and discusses the patient condition.
The registrar is on the telephone, gets bleeps of patient with cardiac arrest and leaves the MAU.
MCP was previously a nurse. She has had six months theory training and practical ward-based experience. She carries out clerking, primary tests and primary diagnosis

14.50 SHO reviews Doctor 'jobs to do' sheet and writes patient notes

15.48 a nurse gives MCP an ECG printout from a portable machine. What is the impact of this local machine? Why does the MAU need a bed for every patient?

Clinical nurse reads clerking results to SHO "sounds straightforward", they discuss blood results the SHO asks questions.

16.00 Staff Nurse transfers notes from plain lined sheets to pre-formatted forms.
Bed A7 is empty

16.08 registrar from A&E seeks to refer patients to MAU. Describes the patient condition and uses patient form Asks "what do you think" Registrar checks different signs and tests. A&E doctor asks about giving drugs. The conversation is a discussion about what is being done. They discuss the recent history. "right drug but not enough".
registrar gets bleep but number is multiple engaged.

MCP prescribes six units of intravenous *only five have been* sent because of patient weight.

16.20 matron advises registrar on getting every registrar and SHO to start.

Researcher leaves MAU

31st of January 2006

8.53 ward round
Consultants (weekend duty) plus around six doctors. Doctor asks "where is observation chart?" patients are in beds A2, A4, A5 A6, A7
Throughput scale leads to losing patients - how to know where the patient is? either before or after the stay in the MAU.

11.30 nurse says the patient is held in the MAU as no bed is available in a ward.

12.30 MAU consultant and registrar discuss patient condition - their social situation has influence on discharge.

13.15 Reflections
1. Will there be different patterns of activity - reacting to arrivals as they come and ward rounds where systematic reviewing is taking place.
2. Acting matron says MAU operates SITREP standards - why patients must have a bed and not a trolley.
3. Potential of a locum as informant. A particular viewpoint as someone neither in nor out of the organization and process.
4. Connected to point 1, is there more than one rate of busyness?
5. The MAU patient record book is not an accurate reflection of what happens. Entries are completed at convenient times rather than event by event. There is evidence of multiple same time entries for clerking and departure

Areas of study
1. Interaction between doctors how the diagnosis and treatment decisions unfold - record discussions between doctors.
2. Use of information technology how the doctors use the information technology systems when is data entered. Shadow nurses station. doctors single and multiple uses.
3. Use of other test results - process by which test results are achieved and made available. Ask Acting matron or the nurses or doctors
4. How doctors use other test results - meaning and relevance of different kinds of result - discuss with doctors. Is there a key collection?
5. Doctor patient relationship - is it Doctor to patient or doctor to illness discuss with the doctors Objectives of the patient Doctor interaction what are the options? how are they judged? discuss with consultant or registrar or doctors or nurses.
6. Rules what are of the rules of the MAU? How are they learnt? discuss with consultant or registrar or doctors or nurses
7. What is the impact of targets
8. Use of the patient record information what is the role within the MAU in a broader context what components are there?
9. How do doctors learn to do diagnosis treatment decision making - discuss with consultant, registrar or Doctor

14.23 patient A2 goes to x-ray and then to ward

Questions for doctors
how are test results made available.
how are test results used in diagnosis - it informs the doctor and used as object in discussions
how does doctor relate to illness and patient
what are the options when patient presents what are the benefits of the options
what are the rules of the MAU SITREP, grey book, Judy Dent says sitrep does not affect use of bed
how are rules learnt
what is role of the patient record

what is diagnosis and treatment process - clerking decide if tests needed, decide if immediate treatment is needed, identify diagnosis, identify what trajectory is appropriate
how is diagnosis leamt - question - what is more important, diagnosis of patient condition or decision on the next step or trajectory

14.45 Venal SHO Doctor is using a portable mini blood sugar tester to test a specimen of the blood for sugar level. (James the locum)

14.53 Discussion about bed availability - different people accepting patients - no beds are available which was a bit of a surprise.
Interview with James the locum. He has been a locum for the last few months. he worked here in general medical last year and spent some time in the MAU.

15.19 a patient is unable to be taken for a CT scan because the porter is at lunch

15.31 patient A5 is taken to Richmond ward

15.51 sitting in reception area. MCP awaits fax from Chelsea and Westminster Hospital, MAU consultant sends a fax. Reflection - MAU is a centre of a communications network. Today this has been to a general practitioner, hospital, social services, accident and emergency other wards and the bed manager.

Foms used per patient -- abilities, medication, lifting, observations and doctors notes.
tests - x-ray bloods CT scan, radiometer ABL, blood pressure, urine analysis
There is a lack of clarity about the status of patients. Discharge is dependent on the combination of positive decision and no issues remaining.

16.35 Consultant is reviewing Doctor 'jobs to do' sheet patient by patient and writing in jobs to do entries. locum and consultants - locum describes possible diagnosis and signs/symptoms. Both go to examine x-rays on screen behind nurses station. Consultant adjusts darkness and points then brings up test results on screen. Outcome - locum writes radiology request form.

16.45 Sue the receptionist takes the MAU record book to the nurses station
Other materials in the MAU below the chart boxes - guidelines for the management of common medical emergencies and for the use of anti-microbial drugs. This is the grey book and describes standard procedures for many problem types. It describes the problem and the management.

17.00 registrar hands over to the evening team uses the Doctor 'jobs to do' sheet to describe patient conditions patient by patient.

James describes the objectives of the Doctor - to set up a 12 hour management plan as the decision has already implicitly been taken by accident and emergency that the patient is unwell enough to be admitted. A sub objective is to clear the list before the handover from day team to evening team as it is not seen as good form to lead lots of day works to the evening team.
"Objective is to see as many patients as possible"
A nurse can check the status of a patient from the availability of doctors notes - has patient been seen by the Doctor.

17.36 team leader from A&E brings in the patient. Helps them into bed then describes the patient condition and drug and medication history to the Staff Nurse

17.40 evening team members arrive and review the Doctor 'jobs to do' sheet. There is confusion about whereabouts of patients on the list here or in A&E or somewhere else. There is further confusion, a patient referred but waiting elsewhere. Beds are empty but have been allocated to particular patients who are not yet ready to fill them. One in CDU. A&E phoned and said MAU have beds available

18.10 Staff Nurse said "John should have a bleep - it *would save me 20 minutes a day*" John is the porter. She also says "where are the keys" the keys to the room go walk about with staff members and then time is taken to locate them.

Researcher leaves MAU

1st February 2006

16.00 arrive in the MAU - situation around six patients in A&E. Some going straight to Richmond as there are no beds available in the MAU. Confusion - a nurse asks if X was here, visitor was pointed towards Richmond but patient is actually in the MAU.

18.38 resus bleep call to registrar. Registrar takes in details of patient over the phone lots of ums and half questions back. Registrar describes basic condition to SHO, a brief discussion of key signs then SHO leaves to examine patient. Registrar says "look out for doctorink and drugs and family history".

18.46 registrar asks "how is your patient" to the SHO who describes the signs. Registrar asks "how are readings" and looks at ECG results and asks questions. Says " look at blood history and in computer what test she has had". Doctor goes to check.
Registrar asks SHO her history - what duties and when. SHO describes experience and view of situation in St George's. Does the registrar understands the capabilities of the SHO?

SHO asks student about a patient. Asks what year student is in who answers third year. SHO asks student questions then suggests possible causes. This is while waiting for the patient to arrive. SHO suggests a series of tests to be done and possible cause. Says "perhaps she had... ... Or perhaps she had..."

19.00 Staff Nurse from A&E resus. describes patient condition. MAU sister asks temperature. SHO and two nurses listening. There is a question from Doctor... inaudible

19.07 SHO looks through patient notes of white set with doctors handwriting on it. There is much concentration by doctor, meanwhile a nurse is taking temperature and completing the colour patient infomation sets. SHO looks at ECG results sheet and rereads notes

19.14 SHO approaches patient to ask questions

19.17 SHO describes readings A2 to registrar. Registrar asks question and suggests another test (tomorrow). House officer also describes condition, registrar responds and asks for other readings. Registrar describes "if X then Y if Z then W" "If .... then we will ......" Registrar describes things that need to be found out. House officer describes previous treatment. Registrar asks for further questions about patient statistics. The conversation finishes.

19.25 patients A1 taken by porter for x-ray

Researcher leaves MAU

6 February 2006

10.15 arrived at MAU six beds are occupied, bed A1 is free.

10.38 patient A4 to go to x-ray two porters arrived to do it.
medical on call rota sheet is on the table in the MAU. Has details of consultants, registrar A&E, SHO A&E, SHO Ward cover, SHO Ward and A&E cover and house officers

11.10 Registrar arrived added 2 entries to Doctor 'jobs to do' sheet then called 2 duty SHO to Asks them to attend patients. Registrar then leaves. The registrar who arrived is different to the registrar on the list?

11.55 the bed manager answers ringing phone and writes in patient on Doctor 'jobs to do' sheet - it was the registrar on the phone.

12.15 patient A6 arrives

13.20 registrar arrives and telephones to check if patients have arrived meanwhile reviews Doctor 'jobs to do' sheet

13.25 Doctor is attending to patient A6, doing clerking and asks sister to assist him in setting up portable ECG for patients is having missed heartbeats.

Registrar arrives and updates Doctor 'jobs to do' sheet with handwritten notes from her personal action sheet

13.41 Doctor goes to write up notes for patient. Sits at screen in nurses station.

13.44 nurse phones to check planned time for scan. department do not know when scan will be carried out.

13.47 Doctor returns to continue conversation with patient - asking further questions about condition and writes up patient notes.

14.05 lunch reflections - I may need to arrange to shadow a number of patients through the process I have seen interesting glimpses of the process today and last week. I will probably need to sit for a day to do this. Another approach to modelling the throughput would be to carry out randomly timed checks on what each patient is waiting for. This would illustrate different parts of the process.

Researcher leaves MAU

8 February 2006

10.25 patient brought in by 'genetic....' And put in A5. Beds A1,5,6,3 are occupied. Doctor is clerking patient A1 and says he is "seeing the patient".

10.30 ACS practitioner arrives for patient A6 and reviews notes.

10.40 ACS goes to nurses station to review x-ray?

10.45 Nurse describes patient pain symptoms – doctors discuss possible alternatives for resolution. Doctor write prescription.

Doctor writes patient notes for patient A1. Doctor says "I feel more confident now you are here". Doctor describes patient arrival history via walk in clinic to other doctor.

10.53 Doctor in scrubs walks in with patient notes and out again.

10.56 Doctor discusses ECG readings, cross referring to 4 different charts. Doctor describes area of numbness to other doctor. Other doctor asks "have you heard of ..... suggest this not associated with main problem". Doctor ask "what were sats?"

11.03 ECG arrives for patient A3.

11.00 Renal doctor arrives and asks about patient A5 asks "patient for a scan" looks at patient notes – hospital file, not MAU small set.

11.10 Doctor 3 and genetic..discuss patient history A5 history using records paper.

11.12 Doctor 3 and genetic and sister discuss movement plan of patient A5.

Student doctor arrives and sits at table with observer and doctor.

11.15 Doctor still on notes patient A1 copying over notes made at bedside onto new sheet – but adding further details OO and hexagon diagrams.

Student is reading A1 notes and refers to 'Oxford Handbook of Clinical Medicine' and 'practical drug therapy' – discusses ECG with doctor. Doctor explains. Student asks "how do you recognise...."
Student asks "has she been given ....drug"
Doctor says yes then describes use of a drug.
Student asks further questions about giving drugs.
Student looks at bloods – analysis sheet.
Doctor refers to blood sheets and writes more into patient notes.
Original notes are binned by the doctor.
Student refers to Oxford Handbook.

11.40 Doctor takes doctor notes to nurses station.

11.43 Doctor describes patient condition using doctor notes to registrar plus has ECG and key blood readings from notes. Registrar says "needs to go on treadmill" "speak to Bridget".

11.30 A5 removed for CT scan and movement to renal ward.
A5 details have not been entered in MAU patient record book.
"wouldn't give her drug" registrar asks question re recent history.

11.47 Doctor and Staff Nurse discuss drug chart and update it with new drugs that will be administered.

Researcher leaves MAU

10 February 2006

11.15 Arrive in MAU All beds full.

11.20 Patient A7 catheter is causing pain – Registrar checks notes to check if catheter is necessary – suggest it can be removed (implicit suggestion to Staff Nurse that is OK to remove it)

All patients look quite poorly – mostly more elderly – very quiet sleeping – 5 people on Doctor 'jobs to do' sheet.

Registrar describes signs to Consultant. Consultant asks patient age, whether on statins, *dialogue continues*, they discuss tests taken. "sounds like..." also if...then discussion.

11.30 researcher carries out interview with *MAU Consultant (see separate sheet)*

12.40 Consultant looked at Doctor 'jobs to do' sheet, identified from patient entry (for A1) that an immediate ECG should be taken rather than wait for clerking (by a student) to finish. Raises question in researchers mind whether clerking in the MAU is different from other wards?

12.43 Phone rings, no one answers – keeps ringing, eventually answered by a nurse.

13.10 Patient A5 taken to Richmond ward.

13.55 Researcher reviews notes made with MAU consultant this morning. Checking I understand what I have written and completing entries where I have not completed them at the time, while still fresh in my mind. Checking further questions to ask. MAU consultant says "CT scan dept operates on a list with a couple of places reserved for A&E/MAU but may have other spots available if not busy".

15.30 Patient A6 *brought in on bed.* Nurse *describes patient condition to Staff* Nurse *and* hands over patient notes.

15.35 ACS practitioner says " if x comes for A2 then .... Otherwise we send him home with ... spray".

Nurse telephones to see if blood results are ready quoting hospital number and name. MAU is waiting for blood results to see if patient may be discharged. Staff Nurse says "if MAU is n the blood form, they are done urgently like A&E but not if Richmond (ward) is written on"

15.45 Nurse is writing out blood test form for A6 – checks with Registrar which tests are needed who says "what we need is chasing up results" and "him we have talked about" Registrar and SHO running through patients on Doctor 'jobs to do' sheet and identifying what needs to be done.

ACS practitioner – heart specialist who is fully floating – not based at any particular ward and has come in to look at specific patients.

16.42 SHO is writing out patient notes – hands ECG results to another SHO, discusses patient condition with other SHO and asks what bodily problem would give the results obtained. Shows another SHO who describes the good features of the results. First SHO describes problem area.

Patients A1 and A2 go discharged with a prescription drug.

The 3 SHOs review the patient Doctor 'jobs to do' sheet.

16.51 Phone rings. The doctors ignore it. Nurse picks it up and answers. It is the wife of patient A6 – nurse gives advice as to whether patient is to be discharged.

A6 blood results have arrived. Registrar reviews them and states to SHO the prescription that the patient will take. Says "can't remember dose" so SHO checks in BNF45 and leaves it open for Registrar who is on the telephone answering a bleep re a patient and writes in Doctor 'jobs to do' sheet.

SHO writes blood test sheet with blood samples and takes it to nurses station where it will be collected.

17.00 Consultant arrives.

17.04 SHO describes patient condition using notes. Consultant listens and looks at ECG. SHO suggests cause. Consultant suggests looking at x-ray. Doctor brings up x-ray on screen at nurses station and both examine it. They then go to speak to patient A6.

Day registrar discusses Doctor 'jobs to do' sheet to another (night) Registrar Handover process.

17.09 Another SHO describes patient condition A5 to Consultant using patient notes – daytime Registrar also listens. New evening SHO also joins group. Consultant suggests looking at CT results. Group are around screen and examine scan. Group goes to the patient.
Phone rings about patient. Initially Registrar suggests to bring patient to MAU – Nurse reminds doctor that because of diaria, patient needs to be seen in a cubicle in A&E because of danger of cross infection.

Day registrar describes patient A3 condition to consultant using patient notes – shows consultant the notes and describes patient signs. Group go to patient.

17.25 SHO describes patient condition A7 using notes and group goes to patient.

Consultant and registrar look through printed version of the Doctor 'jobs to do' sheet and go to nurses station.

A7 taken from MAU

Talked to duty PRHO and two third year medical students. PRHO describes medical education in Ghana – very traditional where one of the students described how their education was more case based (than Ghana). This seems to be the difference between pure theory and applied and contextual theory.

Researcher leaves MAU

15 February 2006

9.30 Arrived in MAU Beds A1,3,4,5,6,7 occupied.

Consultant round is going on – Consultant with duty doctors.
Doctor gives patient condition description and consultants asks clarification questions. Other doctors listening to dialogue. Consultant clarifies and checks understanding. Doctor says "I wanted to get ... test". Consultant says "good – if in doubt" Consultant is giving feedback – lots of "good"s Group goes to nurses station to look at test results on screen – chest x-ray. Consultant points out features the group goes to patient. Consultant talks to patient A6 and gives feedback to doctors round bedside.

9.44 Patient arrives on trolley to A2. Moved into bed using flat slider plate. Patient has very noisy breathing.

Phone rings but no-one answers.
Doctors have been examining patient A7. Doctors come out and one says "I will have a word with the medics that we are happy to have her. Doctors are from infectious diseases ward. Consultant emphasises that referral is documented and the need to be clear on team referral procedure.

9.53 Another doctor describes patient condition to consultant – other doctors listening. Consultant and doctor are in dialogue – using patient notes – sound like a particular test has not been done – Consultant emphasises to doctor that ... is part of the assessment. Group moves to patient then return to centre of MAU. Consultant and doctor examine history and discuss ECG result – consultant gives feedback to doctor re process A5.

10.00 Then back to patient and consultant asks patient questions.

10.03 I check contents of table – doctor list for previous day, 3 undated Doctor 'jobs to do' sheets. Nurse is confused about which sheet is for today.

10.08 Group go to nurse station, gather round screen then back to MAU centre

Phone rings and nurse writes on Doctor 'jobs to do' sheet.
Group have further discussions re patient – Consultant is not happy with the procedure followed? Group moves back to nurses station and have further discussions.

10.18 Group returns to look at patient – but patient is away having a scan.

10.20 Doctor starts describing another patient condition. Group listens in and consultant talks to patient with group around.

Phone rings and Staff Nurse writes patient details on Doctor 'jobs to do' sheet
Phone rings and Staff Nurse gets patient notes.

Bed manager brings a bed and reviews MAU record book – discusses which patients will be moving with Staff Nurse. Bed manager tells patient they will be moving. Bed manager asks Staff Nurse to help with patient but SN refuses as she is writing out blood test details.

10.25 Bed manager gets another helper to help move patient.

Consultant is still with group talking to patient A3.

10.31 Patient A6 moved to Richmond ward.

10.32 Patient A4 brought from scan in a chair by a porter.

Consultant doctor group leave MAU.

Bed manager moves a patient cupboard.

Bed manager says " I am going to get ... patient sent over – she hasn't been seen (by a doctor) for 7 hours". Bed manager tells Staff Nurse and Staff Nurse queries about CDU but BM says not needed – i.e. patient will be accepted into the MAU.

Day registrar and sho arrive and review Doctor 'jobs to do' sheet and divide the patients between themselves for attention.

Registrar tells the researcher "there is a lovely endoscope unit upstairs – it would make a lovely MAU"

10.52 Group returns from nurses station to talk to patient A4.

Registrar and another SHO discuss which patient to see, discuss symptoms of patient and suggest course of action and that patient will be the responsibility of rheumatology.

Phone rings and registrar takes notes of patient condition and tests done, discusses patient condition and entry situation. Gives fax number – call was from GP.

10.58 Doctor arrives and looks through patient notes – he is from Atkinson Morley – talks to patient A3.

Friend of patient A1 asks doctor "will my friend be seen by a doctor today?" Doctor replies that he is from another ward so cannot answer – but consultant is doing round so should be able to say. This patient A1 has already been referred to another ward (Amyard?)

John the porter is being looked for – has been found. A1 is taken to ward in a chair.

11.09 Group now discussing in corridor.

Registrar and SHO discussion patient condition "came to neurology" "no she came to A&E"

Registrar is very excited by a phone call that her stethoscope has been found – it was lost some months previously – obviously very attached emotionally to it.

Registrar and SHO review patient notes. Registrar asks "has she had fits since she was given 'Velcro'"

11.14 Doctor from Atkinson Morley with A3 goes to nurses station.

Registrar suggests further physical tests "test her gag (reflex)" and suggests giving patient a doctorink. Asks SHO to check that range of blood tests have been done –"test her glucose, sodium...."

Group have now gone (to ward?)

11.20 MAU consultant arrives and checks patient notes, discusses patient condition with registrar. Consultant and registrar discuss patient A6 27 hour wait" and clarify situation.

11.25 Group returns – consultant and SHO holding the computer printed Doctor 'jobs to do' sheet list and then move to Richmond ward.

Researcher breaks for coffee and lunch

12.10 back in MAU A2,3,5,6,7 occupied.

Registrar calls by phone with SHO and discuss patient A6 – what SHO has been given. SHO discussed which patient to see next.

12.12 Patient A3 goes to Richmond ward

12.20 Leave MAU

22 February 2006

9.35 Arrive at MAU – there is a sign outside saying that a patient has vomiting and diarrhoea so no entry unless crucial. Have retired for coffee and review what I am going to do. Tried to ring Acting matron Floor for advice – but no answer.

27 February 2006

MAU still shut. Hospital meeting held at 10am to discuss the situation (David)

6 March 2006

10.15 Arrived in MAU.

New MAU patient record book has arrived – entries start 18 February, then 20th then 2nd March.

A1,2,3,4,5,6,7 beds in use.

10.20 Doctor reads notes A2 and goes to see patient.

10.22 Nurse brings in notes (photocopy of A&E notes) for A1 and places them in A1 slot. Doctor looks through notes for A1 and updates MAU doctor notes.

Patient notes ex A&E include note of chest x-ray, history, patient condition and suggested problem.

10.33 Patient A5 in wheelchair – has blood pressure taken by nurse.

10.45 Nurse explains to patient A7 – doctors awaiting notes of previous then will decide if she has to return for outpatient based tests.

10.50 John the porter arrives and is asked by a nurse to take patient A6 for chest x-ray. John asks nurse the name of the patient.

10.58 Pharmacist removes notes and goes to nurses station and makes phone call.

Nurse asks another to carry out ECG on patient A3. Uses portable ECG machine on a trolley.

11.10 ECG output given to nurse and filed in record compartment A3

11.20 Nurse looks for drug chart for patient. A nurse describes the tests that a nurse can take. These are done according to condition e.g ECG taken if any suspicion of a heart problem. Describes basically a battery of tests that are taken in preparation for doctors diagnosis for example blood sugars using prick of blood in blood machine, blood pressure taken every four hours and monitored by nurses to see if any changes present could indicate a risk to the patient condition

11.30 Cleaner is cleaning the toilet area

Patient A6 returned by another porter and seated by the bed the telephone rings and a nurse answer was no beds, estimate two hours and two or three other patients are coming

11.50 patient A1 is taken to Richmond Ward

Cleaner is now cleaning round the desk area. check with medical registrar.
A5 is admitted but has a social problem
patient A2 awaits a bed available in the CDU. Also beds A3 and A2 awaiting patient being clerked in A&E and a GP referral

12.25 Registrar is looking at ECG of patient A5. "heart is a little fast but patient has chest infection so that could be the cause of the fast heart beat". Looks at old patient notes

12.30 Doctor is still looking through different documents

12.35 Registrar finishes and goes to talk to patient and patient's wife. (Patients may have had a stroke). The patient has constipation. The Doctor speaks to the patient's wife.

12.40 The registrar is bleeped and uses the telephone. writes notes on Doctor 'jobs to do' sheet asking questions it's a referral from a general practitioner

SPR talk s to the patients wife. Asks about home condition and the support available.

12.47 Registrar and the wife finished talking. SPR goes to the nurses station and uses telephone

12.46 nurse returns blood sugar test form to the box.
There on no beds free at present. One is empty but a patient is expected.

12.55 the registrar discusses patient and identifies a social problem describes situation to the acting matron to get the H I T team to pick up the patient

Notes written on a train at 1330 after leaving st George's. a patient had been reported as behaving aggressively and had been exhibiting strange behaviours - strange grunts and shouts

This reflects what the lead consultant said about the wider links of the MAU with social care through the H I T Team

It looks like the registrar had concluded from looking through the notes that there was no serious medical problem that needed resolution (a chest infection was being treated with antibiotics) the registrar said this to the acting matron

15.50 back on the MAU bed A1 has a new patients A3 and A5 are occupied all other patients have gone

16.00 patient A1 is being clerked

16.10 patient A5 goes to Richmond Ward and is "kept in overnight"

16.30 SHO has taken blood sample and is writing blood bottles for patient A4 writes blood test form and is taken to a basket by the nurses station. This is for the patient who was admitted previously 3 March but discharged according to a record in the MAU admissions book. the Staff Nurse returns from taking observations of A4

16.45 the registrar writes out a new Doctor 'jobs to do' sheet using the old sheet, has 3 bleeps

16.48 SHO is writing notes for patient A4 using notes written by the nurse

16.50 SPR takes call and tells caller to ring a different number

16.54 registrar continues writing in Doctor 'jobs to do' sheet

17.10 consultant Ward round. Registrar uses notes to describe patient condition and the consultant asks questions and gets responses from the Doctor

Evening registrar arrives and day registrar describes patients and conditions using Doctor 'jobs to do' sheet. this is the new one written out by the day registrar

Registrar hands over bleeps to evening registrar consultant leaves the MAU

Evening registrar and SHO discuss the Doctor 'jobs to do' sheet list and allocate SHO to see to patient

Another SHO arrives and is allocated a patient to see

17.45 patient A6 arrives the nurse writes out notes for the patient

The consultant is with the day registrar with patient A4. the consultant discusses the patient with the day SHO and other SHO and day registrar

18.05 nurse from A and E describes patient condition to MAU Staff Nurse who writes entry in admissions book the A& E nurse hands over patient notes

18.08 consultant speaks to patient A1 and tells the patient what is happening - this is a stay overnight and have tests

Patient A1 brought in on trolley and is clerked by the SHO

18.10

Registrar takes a call about eight patient condition and bleep goes. Registrar discusses new patient condition and takes notes. The nurses discuss patients one Says " I'm going to catheterized him"

Another Doctor arrives waits for the registrar

18.20 Registrar is still discussing and confirms the acceptance of patient and writes on the Doctor 'jobs to do' sheet

Registrar allocates a Doctor to patient in 80 registrar says need to cut to the chase to identify why she is here today she has lots of history

Registrar heads off to get notes for A6 and sees patient A6

18.30 SHO is still clerking A7 Registrar is still clerking A6

18.40 Doctor emerges from A7 and tells patient friends that she will be taking blood test. Doctor returns with blood test equipment.

18.43 Staff Nurse updates admissions book with details of patient A7 and does a general update

18.44 registrar writes Doctor patient notes and looks at nurse patient notes and referral letter

SHO from patient A7 writes up blood test chart and checks notes

18.50 Staff Nurse updates nurse patient notes for patient A1. Registrar looks at BNF and continues writing notes.
Staff Nurse updates computer system with patient notes for patient A1 and A2

18.55 SHO asks Staff Nurse to do S ATS and observations for patient A7

Staff Nurse tells patient A1 he will be transferred to Richmond Ward

Registrar is on telephone discusses readings of a patient " she has been scanned " discusses whether patient should be scanned and suggests that she should.

Staff Nurse writing out blood test form

19.01 SHO says to patient A7 and friends " we will not know exactly what's going on until we have done a few more tests"

Registrar writing out beige forms

SHO describes the patient condition to registrar

Registrar suggests possible previous incidents

SHO and registrar discuss possibility of anticoagulation medicine and whether they should be given before blood test results are taken

SHO writes out Doctor patient notes on white sheets uses blood gas sheet this is a white till roll

19.07 a student Doctor is clerking patient A2 or A3

SHO describes blood gases to Staff Nurse and describes general condition. (question is this keeping the nurse informed) SHO up dates the Doctor 'jobs to do' sheet then writes out blue chest x-ray request form and walks off towards A and E " she has a lactose level of seven" the registrar voices concern.

Staff Nurse takes nurse patient notes with A7

19.22 patient A5 arrives in a wheelchair by porter. Researcher asks about lactose level - normal level is 1.2 and patient A5 has a level of seven

SHO takes blood test kit to patient A5

Registrar orders x-ray using a blue form for patient A6

19.40 SHO returns to the table with blood results and tells PRHO that patient A5 is really ill " bicarb is XXX " why should lactose be so high?"

PRHO describes patient condition to another SHO (Ward cover)

SHO asks about the patient's social situation PRHO describes patient ability and the doctors discuss the possibility of sending the patient home and what needs they have. "haemoglobin is chronic" white cells seven

PRHO says "it's not cellulitis". The SHO and PRHO discuss the patient. SHO describes possibilities " worth... normal criterion are", "people who need...." "see what other".

Registrar puts head on desk and Says "it's a factory it's a factory" referring to throughput of the patients

19.50 SHO is with patient A5

19.54 PRHO orders a chest x-ray on a blue form

Staff Nurse does blood reading for patient A2

20.05 Staff Nurse discusses booking beds in Richmond for patient A3 and A7

PRHO tells Staff Nurse that three patients can go for x-ray

Staff Nurse is writing nurse patient notes

Phone rings and Staff Nurse says " I have 2 empty beds at the moment" and writes on Doctor 'jobs to do' sheet. Says "I have to move 2 patients to Richmond then can accept them. I will phone you when I am ready"

20.10 PRHO still writing Doctor patient notes the white sheets for patient A2 files and writes beige form

Staff Nurse returned to desk with beige forms for A6

Phone rings Staff Nurse says waiting for porter for x-ray

Phone rings Staff Nurse gives patient condition summary for transfer and says " that leaves me three empty beds"

20.20 Staff Nurse takes patient A6 for x-ray in a chair

SHO asks student why patient would have "peaked right atrial... " student makes suggestion. SHO Says not right - registrar returns and SHO describes condition and readings of bicarb reading. Registrar reviews condition elements and medication and comes to no conclusion " need to look up causes of lactosis" SPR suggests " keeping her hydoctorated and hope it goes away and need to check again before we go home"

20.30 SHO " could have had multiple PES which could cause the problem"

A fat patient file for patient A3 arrives and is filed in filing box for A3

A2 is taken by the Staff Nurse to x-ray PRHO looks at patient file for patient A3

Phone rings and Staff Nurse gives details of patient A7 and A4 for transfer. She reads out a description of the patient condition.

SHO asks the pharmacist questions and checks bnf (British National Fprmulary)

20.37 Staff Nurse takes blood pressure equipment to patient A5 and gives a blood pressure test

Staff Nurse says "awaiting oxygen to be able to take patient A7 for x-ray"

Researcher speaks to student doctor who has been in the MAU this afternoon. He describes the learning process as taking history and presenting to more senior doctors or consultant. He has clerked one patient today.

Patient A3 goes to Richmond Ward

21.15 day registrar is in a handover meeting with night team. The Staff Nurse asks "do you want patient A1 on cardiac monitor" SHO says "no"

Researcher leaves MAU

9 March 2006

10.45 arrived at MAU beds 1,2,3,5,6,7 are in use patient
A4 just arrived in a bed. The researcher asks the Staff Nurse if they are busy. The Staff Nurse replies " no" The researcher asks if the beds are full. The Staff Nurse replies "that's because there are no beds anywhere that are available"

The patient notes for patient A4 include emergency diabetic chart, A&E notes, temperature and blood glucose forms, medical notes from housing trust, doctor patient notes, blood gas results, observations, urine analysis and ECG.

11.15 two SHO arrive and check list decide non to be seen and say they are going to A&E. they say "oh Sam was busy must have something to prove" they referred to a doctor who seen four patients on the Doctor 'jobs to do' sheet

A new format Doctor 'jobs to do' sheet today. Researcher mentioned this to Acting Matron who said "oh that's because of xxxxx - he likes computers".

11.25 nurses have doctorawn back curtains from patient A4 they have soiled sheets and have completed cream drug chart. They have taken three swaps. A nurse writes a label for attachment to the swab container.

11.35 Doctor arrives and writes blood test form for patient A4. Staff Nurse gets blood kit and takes blood samples. This is the doctor from last night rather than today's says the nurse.

11.50 Staff Nurse calls another Ward to try to borrow Bipap machine

11.55 Nurse takes blood pressure for patient A4

Staff Nurse checks book in nurses station to check degree of amputation of patient A4. That is *how his condition* should be described in nurses' patient notes

12.00 nurse checks details and other history *with patient A4*

12.05 Acting Matron takes notes of Bipap telephone number to resolve an issue *over its use. He* returns 5 min. later saying MAU will keep the machine in use and other wards will resolve appropriately.

12.10 patient A4 is given lunch

12.17 phone rings Staff Nurse rights in patient on the Doctor 'jobs to do' sheet. It was the registrar who rang.
Researcher leaves MAU

10 March 2006

11.30 Arrive in MAU. All beds full, no places in other wards says the Staff Nurse

Pt A6 has cardiac history (source admission book) is on cardiac monitor. ECG was taken in A&E 9 March 2006 at 20.26. Pidgeon hole has hospital record file (large) plus n/pt notes.
12.00 A3 to Richmond
Patients being served lunch.
12.05 Patient JH on immediate sheet – David looks at list and states she will be brought in.
Staff Nurse tells doctor that JH will be coming.
David concs and says Reg.has patients on SpR list that are not on the immediate sheet. Asks Staff Nurse to check.
12.15 David describes patient condition of JH. Patient arrives on foot.
Cleaner is cleaning around doors.
Patient from Richmond asks for jug of water. Staff Nurse says "one of nurses in Richmond should find it for you". Man wanders off towards kitchen – no response from David.

12.21 Doctor examins ECG for A3 goes to look at computer terminal – returns with notes.

12.30 Doctor goes to talk to patient (clerking) A3
Patient notes have ECG 10/3 12.31.16
Nurses have prepared n/pt notes

12.41 A1 goes to Richmond ward by bed transport by 2 nurses
Cleaner still cleaning (12.50 cleaner leaves)

12.55 Have we old notes and gasses – very important has dark patch that could be infection, using CXR as indicator of potential problem

14.15 A4 goes to Richmond by bed and two nurses.
HO calls SHO re patient drug "is that because we are sending them home" this looks like treating the patient as a person.
Raises question – does doctor pay atrtention and how
-signs and symptoms
-diagnosing problem
- person

14.26 Staff Nurse writes patient on immediate sheet and talks to responsible Reg.

14.30 HO takes blood gases sample A1 (small sample)

14.36 A6 arrives with bed by porter.
Nurse does handover – tells condition A4, has CXR and bloods

15.00 meet David

15.45 Return MAU

15.50 Doctor comes to discuss patient – describes condition.

15.55 SpR looks at old blood results and other history says "0.3 is the cutoff"

HO doing notes A4

Researcher leaves MAU

17 March 2006

11.40 On MAU, all beds full

Doctor clerks and writes notes – patient who was on ward – needed endoscopy – this was done and patient discharged – now returned (source Reg). Suggested by Reg.that drink may be part of the problem.

12.15 SHO with two students – looks at patient notes and discusses test indications – explains reading the ECG in the context of a particular patient – recording this conversation.

12.30 Doctor and student clerks A1, the patient about who the earlier conversation was about.

12.40 David returns with list. Reg.and SHO and David by table. Reg.and SHO discuss patient condition using doctor notes. Reg.examines blood gases and ECG.

12.48 Reg.checks Jobs to do list and leaves to visit A&E.

12.55 SHO returns from A1 – student continues with A1.

12.58 Reg.returns and is bleeped.
SHO and student discuss what was and was not heard.
A4 moved to Richmond by bed with nurses.

13.10 A2 moved to Trevor Howe ward – nurse and porter (John)

SHO writes doctor notes re A1.

Doctors have on bleep for each responsibility – e.g Reg.refers doctor with responsibility for on-call plus own bleep.

13.15 Admissions book has disappeared.

13.25 SHO says "what could cause an arthritic knee?"

13.30 Researcher asks SHO and Reg.status of A1.

13.43 Reg.gets bleep with cardiac arrest message for another part of the hospital. Reg.and SHO run off.

Possibilities and desired outcomes – considerations regarding whether to have further tests.
14.30 Back on MAU

14.50 A4/5 Patient swallow been checked and is OK. SHO waits blood results.

15.06 A1 taken by bed to Richmond ward by nurses

15.23 SHO and student discuss Dedimen test – what can cause it "everything" – doctor very dismissive of this test. Only good if it is negative. This is a test that only resolves one issue i.e. has lots of false positives.

SHO to take MRCC exam in early April – if also pass clinical exam will become Reg.

15.35 A1 arrives in chair – nurse from A&E does handover to Staff Nurse. Student listens in.

A4 has transferred to ward (ASU)

Neuro SHO doctor looks at patient notes and says bed available in ward. Asks if OK to transfer patient A4 direct to ward. David says OK.

15.45 SHO talks to parents of A1. Tells them implications of Reynards (using knowledge of disease and imnplications) Parent suggest transfer to Colchester Hospital as carers can look after patient there. SHO discusses wirth parents, calling Colchester to discuss. SHO examines patient and discusses options. Goes to call Colchester Hospital – calls and asks for medical bleep. Asks if patient can be transferred. Offers to email x-ray. Feedback to parents. Parents ask doctor if wound can be dressed – doctor says to ask nurse.

15.58 John takes A3 for x-ray or scan.
Doctor goes to sort out x-ray of A1.
Parent asks nurse to dress wound. Nurse says to speak to doctor first.

16.04 SHO speaks to Radiologist and asks them to look and report on x-ray for A1. Makes note in patient record (needed to send to Colchester)

16.17 SHO discusses with student whether to do blood test –" does he warrant one". "Pain on eating – what could cause it – might have ...., why ...., blockage in ....". "Carcinoma", what else could he have?" " I don't think he has.....had a barium..."

16.25 A1 returns as no bed available in Florence Nightingale ward.

16.42 A5 moved by bed and nurses to Richmond ward.

16.50 Reg.asks for Coronors office *phone* number as patient has died and it has to be reported (someone off ward).

17.04 Preparing for ward round – doctors accumulating in MAU area. I brief Reg.on why patient went to Colchester.
Two evening duty SHO and Reg.arrive and Reg.describes patient condition to tham (these are patients on other wards and MAU)

Reg. (evening) briefs team of 3 SHO/HO with patient condition and use of student (to do clerking)
A1 taken away again.

17.13 A3 taken away by bed and nurses to Richmond ward.

HO cleking A6.
"platelets 539", ..."has she been travelling"..."symptoms"..."how well is she with her problems..."
"um...headache"..."needs assessment...because haven't form..send Monday...patient can be seen soon"..."*if patient* gets worse – call me and we will see her in casualty"

18.00 Researcher asks Reg. what looks for in good *SHO. "Safe, competent* – knows when to ask for help. This is better than high flyer who takes risks, and good handwriting".
Reg. briefs consultant (briefly).

HO writes up blood test sheet with blood sample. Researcher asks him why these tests have been asked for. "because they will point towards *the diagnosis* of ...." (medical term)

18.07 Reg.asks "what's your diagnosis doctor" (jokily) Reg.says "complete your paperwork then we will discuss it".
HO responds with "it looks like ...." (mediacl term)

18.10 HO returns and writes up doctor patient notes.
Researcher leaves MAU.

22 March 2006

12.00 Arrive in MAU A1,2,4,6 occupied.

Reg. using blood results as an indicator of the immediate treatment needed for A1. "I'm not happy that he is so hypoxic". Suggest that treatment will be given that will result in some change that will result in bloods of a more satisfactory content.

12.35 A5 brought by chair by nurse from A&E. A&E nurse describes patient condition to satff nurse. Staff Nurse checks if x-ray and bloods have been done.

12.45 Reg. checks with GP surgery if patient allergic to Penecillin – has problems with receptionist at practice who is unwilling to put Reg.through to GP. Reg.told that GP will ring back with info.

12.50 SHO responds to phone call fro A2's daughter – gives update and asks about patient's medical problems.

12.54 A7 arrives by chair and nurses.
SHO takes reaction hammer to A3.

13.15 SHO says "why is this patient falling" to people in general (Researcher, HO, Staff Nurse present)

13.17 SHO repeats "why is this patient falling" (HO and researcher only in attendance)
"it really is annoying me"
HO throws in suggestion and questions with responses from SHO
"patient has occurencies when sitting"
HO says "could it be ...."
SHO says "not if it happens 4/5 times a week"

13.20 SHO arrives (not on MAU duty)
Reg. asks "how are things upstairs?"
SHO describes patient condition and conversation starts between Reg.and SHO.

13.44 A1 taken to Richmond ward by bed and nurse.

14.20 Back on MAU
A4 taken by external porter and chair for x-ray
A7 to x-ray by Richmond nurse and chair
A5 to x-ray by foot

Pharmacist to SHO – asking if he can sign a drug chart
SHO agrees and signs and asks "why can't you do this?"
Pharmasist says "in case it goes wrong – it won't be my responsibility" (In jest but a grain of truth?)
Pharmacist describes that pharmasists are not allowed to prescribe but there is a new grade of consultant pharmasist who can prescribe. I say there are numbers of situations where other people take decisions that are signed off without question by doctors.

14.30 SHO and HO respond to SHO cardiac arrest bleep and rush off.

14.40 A2 by bed/nurse to Richmond ward.

14.45 A2 arrives by bed/nurse.

Staff Nurse accepts patient from A&E and says all beds are full.

14.50 A5 returns by foot from x-ray.

14.55 SHO examines notes for A2.
A1 arrives by chair from A&E with A&E Staff Nurse.
Staff Nurse in response to phone call "there's a crash going on so you may not be able to contact them".

15.03 A3 by bed/nurse to Richmond.
SHO now clerking A2.

Need to get someone to describe to me the patient status – how does everyone know what needs to be done and who can move'

15.15 A6 by bed and MAU nurse to Richmond ward.
HO asks nurse in other ward to put patient on peak flow chart.

15.20 Patient singing in Richmond – fine Irish voice!
Cleaner cleaning floor with rotary cleaner.
SHO takes reaction hammer to A2.

15.25 SHO returns washes hands then returns to A2.

15.30 SHO writes up doctor patient notes.
Staff Nurse takes blood pressure of A1 – writes up observation chart.

15.35 HO speaks briefly to A5 – who puts shirt on.

15.45 (by receptionist desk) Man who was doing the floor now putting loo rolls and boxes into store room.

How do Staff Nurses know that a patient can be moved to Richmond or other ward? Man says bed manager tells them. Question how does Bed Manager know that a patient can be moved?

16.04 SHO asks Staff Nurse for urine dip for A2.
A3 arrives in chair – charge nuse from A&E describes patient condition and what she is in for – a scan.
SHO 1 arrives and asks if A3 has arrived. Staff Nurse confirms and says another patient is waiting to be seen.

16.14 SHO 1 cleks A1.
HO checks list for next patient to see.
Uncvertainty whether bloods have been taken in A&E – SHO goes to IT system to check x-ray and if bloods have been taken.

16.20 A6 arrives on foot and A&E nurse describes condition to MAU nurse. Nurse asks if bloods have been taken, nurse goes to check blood pressure.

16.25 SHO rtetums and says bloods have been taken – suggests there is an infection and continues to clerk the patient.

16.28 SHO 2 completes forms for A2.

SHO 2 writes drug chart for A4.

16.30 Nurse describes reading for patient and SHO 2 tells nurse the treatment to follow – 2 litres. SHO 1 still clerking A1 and says "need to give antibiotics by drip" but will ask pharmacist (because of allergy to Penecillin)

SHO answers bleep – pharmasist phones annd gives new number to ring – SHO rings and describes patient condition and suggests anti-bacterial...... Writes doctors notes whilst waiting advice from Pharmacist – gives patient and his details.
Nurse puts in cannulator A1 – SHO asks for "blood cultures and a line".

16.45 A2 taken by bed and nurses to Richmond ward.
A5 goes for newspaper by foot.

16.53 Pharmacist calls SHO 1 with suggested antibiotic. Reg.and SHO discuss antibiotic choice and Reg.says micro biology need to be consulted due to patient condition (after she had quick look at patient).

17.05 Reg.describes patient condition to evening SHO and asks him to see patient. Ditto another SHO and hands over bleep.

17.15 Reg.sends student to clerk A3.
A2 arrives in chair and A&E nurse describes condition to MAU nurse.

17.25 Reg.clerks A7.
Someone clerking A6?

17.35 A1 by bed to Richmond ward.
Reg.writing doctor notes for A7.

Reg.gets incorrect bleep 7477.

17.45 (copied immediate sheet)
A5 (released by consultant) and goes home.

17.50 SHO finishes clerking A6

Does patient move location purely dependent on bed availability?

18.20 A5 arrives on foot and nurse does observations.

Reg.asks SHO to look at a patient but is suspicious of referral – describes GP's lack of clear reason for the referral.
Reg.says "it would be very nice not to hand over patients to night group".

18.40 Son of A1 asks SHO "is it serious?" indicating a spot on his hand. SHO says (approx.) " it is not realy done to ask a doctor like this – I cannot advise you without giving a complete examination – and this isn't my job".

19.09 A6 goes on foot to Richmond ward.

SHO says to patient "we had a test that showed a marker that indicates a problem with the heart. You have been given some treatment but we need to decide in the longer term what to do for you".

19.30 Researched asks Medical Bed Manager how she knows that patients can be moved e.g. to Richmond ward. She says a nurse rings to tell her that patient has been clerked and decision made. Question – how does Staff Nurse know that patient is clerked and decision made?

SHO asks if there is a policy about patients over 70 years and gastric protection for people taking aspirin. Reg.replies "I think it's on the shared drive".

19.55 Patient arrives and is moved directly to Richmond ward because no bed is available.

Researcher leaves MAU