The multi-disciplinary team members' use of the electronic patient record within one emergency medical assessment unit

by

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SUMMARY

This is a qualitative case study of socio-technical work. This study provided a rare example of an in-depth study of an electronic patient record system in (recent) use, in the only site in Wales where this was possible. The study explored the actual use of the Welsh Individual Health Record (IHR) technology by the multi-disciplinary team members working in an emergency medical assessment unit (EMAU). Purposeful sampling was used. Data collection methods were interviews, informal observations and documents. Interviews were audio recorded and transcribed verbatim. Complex Adaptive Systems Theory was used as the lens during data analysis. Three main themes emerged: Managing the dynamic context of the EMAU; Patient safety and Issues with the adoption of the IHR.

Clear findings emerged on the usefulness of electronic patient record re: medication safety, bridging the intersection of care, as a vessel for information in the case of patients unable to give their medical histories and facilitating co-production to enhance safe, patient-centred care. The IHR system can mediate the information gaps and should not be developed as static entities but should be allowed to grow and adapt to emergent user requirements.

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Most of all I must not forget that my strength and "...my help comes from the Lord who made heaven and earth" (Psalm 121: 2).

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CHAPTER 1: INTRODUCTION TO THE STUDY

1.1 Setting the Scene

The impetus for undertaking this study was influenced by the Informing Health Care: Transforming healthcare using information and Information Technology strategy (Welsh Assembly Government 2003). The vision of this strategy was to transform healthcare in Wales by placing information technology (IT) as central to the process of modernising healthcare provision. The drive was to make healthcare patient-centred. Wales is part of the United Kingdom (UK) and has a population of just over three million people. The health service in Wales is massive and complex. Primary and secondary care are delivered by NHS Wales through seven fully integrated health boards. Specialist services are delivered through three national trusts. It manages over 10 million face-to-face healthcare events every year and has a workforce of over 70,000 people work (NHS Wales 2013). Much good work is being done by NHS staff in Wales in improving patient care, however, there have been also enquiry reports which had identified problems within the current health service. These have been linked to the day-to-day experience of patients and carers, health professionals and management decision-makers which have been often related to long-standing and systemic information problems.

New information and communications technologies (ICT) infrastructures are required to support service improvement and integration. The aim, as detailed in Achieving Excellence – the Quality Delivery Plan for NHS Wales 2012-2016 is to provide excellent patient experience and the highest possible quality care where services are safe, effective, accessible, affordable, and sustainable – reducing harm, variation and waste. Everyone who works in or for the NHS at every level is expected to play their part in driving up standards of safe and effective patient-centred care (WAG 2013: Safe Care, Compassionate Care: A National Governance Framework to enable high quality care in NHS Wales). Every health board and trust in Wales, individuals and stakeholders have to start to apply these principles in their own areas to put quality outcomes first and

always work in the best interest of the patients. To achieve such care transformation for both staff and patients requires a change in the way healthcare professionals work. Healthcare work is information intensive and against this background, the need for swift access to comprehensive information and communication between healthcare professionals is intensified if the patient is to receive relevant beneficial care. Greater use of technology and having access to electronic systems, applications and tools at the point of care delivery are key enablers to support this vision for care transformation. Clinical and management information systems offer clinicians considerable potential to improve standards and efficiency of patient care delivery and communication. The ability to access and exchange relevant information on individual patients can influence the quality of service and outcomes.

Healthcare organisations have previously been criticised for lagging behind in the use of information and communication technologies (Slight *et al.* 2014, Zhang *et al.* 2013, Crosson *et al.* 2012, Robertson *et al.* 2010, Jha *et al.* 2006). This is set to change within NHS Wales as the Informing Healthcare (IHC) strategy aims to build new ways of delivering clinical services and care supported by modern information and digital technologies. New methods of information sharing between multiple users in the workplace are emerging, including the single integrated electronic patient record (EPR) with data available when and where it is required. NHS staff will have to change the way they think and work. The introduction of innovative ways of working will change the nature of the environment and create new learning for the workforce.

The achievements of an organisation are the results of the combined effort of each individual – their human capital. Takeuchi (1998) defines human capital as possessing knowledge, skills, innovativeness and employees who are able to meet the organisation's set tasks. An organisation's employees are arguably the most important tangible asset, and workforce planning is essential to high performing organisations. The introduction of information communication

technology in the clinical environment has meant healthcare professionals must have information management and technology competencies or their employers will have to explore ways to make learning available to them (Gallacher and Reeve 2000).

My interest in health information and information communication technology (ICT) began when I was reading for my Master of Nursing Degree. In 1991, I submitted a dissertation which explored 'The Student Nurses' Use of Information Technology: A Welsh Perspective' for the fulfilment of the award. The study was undertaken when the White Paper: Working for Patients (DoH 1984) brought into the public eye the growing pressure on the National Health Service (NHS) to improve its resource management where the need for information management was intensified. The method of inquiry was a survey by questionnaire which yielded a positive response rate of 87.1%. The results of the study at that time revealed that the student nurses' level of knowledge of information technology was poor despite the positive attitude held towards the use of computers in nursing. Their lack of knowledge, encouragement and support from nurse educators were perceived as factors contributing to the poor utilisation of computers. The system of education at the time was passively impeding the development of computer literacy and familiarity with the concepts and objectives associated with information technology. At the same time there were calls from champions in nursing informatics for the provision for information technology knowledge and skills at different levels. As a nurse lecturer I have attended European Summer Schools of Nursing Informatics, presented at conferences and published on this subject. I have taught and have been involved in projects focusing on the development of a framework for information technology education and competencies within the undergraduate nurse education programmes. Prospective nurses have now been encouraged to achieve the European Computer Driving Licence (ECDL) as the coming of the Internet age, which began for the masses in 1995 with the development of Web browsers has attracted considerable attention on Internet use and the role of Internet as a means to improve health and healthcare delivery. This marked a

new period of the role of the Internet in healthcare and the development of policies that might influence this role. The Internet appears to have promise as means to produce important improvements in healthcare and ultimately, the health of the population. The potential to disseminate information about health and healthcare, enhance communication and facilitate a wide range of interactions between patients and the health care delivery system presented opportunities for the use of information communication technologies (ICTs) to support operational and organisational issues and at the intersection of patient care (Kilbridge and Classen 2008). With the NHS environment, change impacting the workplace has implications for the higher education institutions who prepare the healthcare workforce for a contingent and dynamic world of practice. The higher education institutions such as the one I belong to awards academic degrees that are professionally integrated, hence they are required to take into account their graduands' performance in the workplace (Halliday and Hager 2002). Changes attributed to the emergence of new technologies (Ridoutt *et al.* 2002) create new challenges/opportunities for higher education to develop curriculum models that will foster the development and continuous adaptation of emerging knowledge and skills caused by the changes. Their graduands will be the new cadre of workers who must not only be "computer smart" but also be easily redeployed in flexible new workplaces.

The implementation of the Informing Healthcare strategy (WAG 2003) has brought about significant changes for the workforce, both in developing new skills and finding new ways of working.

1.2   Context and Policy Drivers

The publication of a series of policy reports such as Better Health, Better Wales (1999), Better Information Better Health (1999),   Better Wales (2000), Delivering for Patients (2000) and The Human Resource Strategy for NHS Wales signalled that NHS Wales faces considerable challenges. Better Health, Better Wales (1999) – A strategy for health improvement recognised that joint working between the NHS, local government, the voluntary sector and other

interested parties is a necessity. Better Wales (2000) outlined the Welsh Government's strategic vision for Wales over the next decade and Delivering for Patients (2000) articulated The Human Resource Strategy for NHS Wales. These series of reports revealed that Wales is grappling with the rising demands for health care and changing public expectations. For instance, the impact of chronic conditions on people's lives and services is a growing concern when Wales has the highest rates of long-term limiting illness in the United Kingdom (UK) (Designed to Improve Health and the Management of Chronic Conditions in Wales: An Integrated Model and Framework 2007). With an ageing population, the numbers of people with complex health and social care problems are increasing. Dementia was highlighted as a major public health issue. Approximately 42,000 people in Wales suffer with dementia which is most common among older people. Dementia affects one in twenty over the age of 65 years and one in five over the age of 80 years. http://www.wales.nhs.uk/healthtopics/conditions/chronicconditions. The Welsh population was reflected as older, sicker, has more deprivation and requires optimum contribution to health improvement. All of these factors affect people's health and put greater demands on the Welsh health service and account for a large proportion of unnecessary emergency admissions to hospital.

Another area of concern is unscheduled care, a term used to denote any unplanned health and social care. People were experiencing delays at various times during their episode of unscheduled care, caused by a particular service being slow to respond or by problems at the interface between services. A disjointed pattern of services reflects inefficiency as well as uncertainty and service user dissatisfaction. Improvement in the system is required (Delivering Emergency Care Services (the DECS strategy: WAG 2008) and strong primary, emergency and unscheduled care are essential to an effective and efficient health service. To meet the changing and complex health needs of its citizens, the rising cost of healthcare expenditures, the fragmentation of services, difficulties in continuity of care for patients and rising demands and expectations impact on public funding. Thus, public sector bodies are required to think in radically new

ways about how they build on the strengths of the system to deliver improved services and in ways that make better use of their collective resources. Healthcare is a vital service that touches the lives of millions of people at significant and vulnerable times.

These problems are not just local to Wales for at the forefront of policy and service development successive governments in the four countries of the United Kingdom (UK) have continuously pursued to restructure the NHS to reflect how healthcare should be provided and financed. Bold actions it appeared are required in each of the four UK countries for the delivery of an NHS strategy that can be responsive to the needs of users. In 1998, the NHS Information Authority, then part of the Department of Health (DoH 1998), published a central vision and drive for joined-up national information and communication technology (ICT) systems across care settings. In Wales, Better Information Better Health (1999) proposed a new strategic approach to Information Management and Technology for health care and health improvement, as well as to guide the development of information management and technology in NHS Wales. The NHS Plan: A plan for investment, A plan for reform (DoH 2000) set out an ambitious agenda for a decade of changes and improvements at the interfaces between services, within organisations, across sectors such as health and social care, and between professional groups. The purpose and vision of the NHS Plan (DH 2000) was to provide a health service fit for the 21st century. The emphasis was on implementing information technology (IT) systems throughout the NHS and building a health service designed around the patient and which meets the standards patients expect and staff wants to provide. The result was the evolvement of a number of key streams of work attached to the Government's National Health Service (NHS) modernisation agenda (Department of Health 1997a, 1997b, 1998, 1999, 2001a, 2001b, 2001c, 2004, 2005, 2009, DoHSSandPS 2005, NHS Wales 2003, NHS Scotland 2008a, 2008b). Examples of the streams are:

- developing and deploying the use of ICT;

- supporting the patient and the delivery of patient-centric care;

- supporting staff services through effective electronic communications, better learning and knowledge management; and

- Improving management and the delivery of services.

Modern information communication technology (ICT) with its capabilities to create, store, exchange and use data, information and knowledge (McKeown 2001) became a significant building block (Wanless 2002) to support not just the provision of safe and high quality care (IoM 1999, 2000) but also the many important healthcare priorities towards delivering healthcare in a cost-effective manner (Curry and Ham 2010, Goodwin *et al.* 2012).

> *"[W]hat was once considered on the horizon,*
> *somewhere off in the future, is now in our face…".*
> *Feeg (2004:1)*

Feeg (2004) was referring to the technological advances which are rapidly transforming the way business is done in every industry which as health professionals we are now witnessing as occurring for the accumulation and interchange of clinical information (Ammenwerth *et al.* 2004, Ovretveit *et al.* 2007) and to support new ways of working.

1.2.1 Statement of Aim and Research Questions

The intention of this study is to explore the multi-disciplinary team members' use of the electronic patient record within one emergency medical assessment unit. A number of research questions have been formulated for exploration in this thesis:

- How will the multi-disciplinary team members view the use of computers in healthcare?

- What kind of issues or factors motivated the multi-disciplinary team members to use the electronic patient record technology?

- What were the opportunities and barriers that influenced the multi-disciplinary team members' adoption of the electronic patient records?

- What policy interventions are required to maximise the benefits of IHRs and increase the healthcare professionals' use of the electronic patient record technology for quality improvement?

1.2.2 Scope of the Project

What do I want to achieve? – Clinical usefulness should be the goal of research. There is increasing national and international interest in the potential of electronic patient record systems. The emergency medical assessment unit (EMAU) was an early adopter site, the only place in Wales where the electronic patient record (EPR) first went live and in regular clinical use. The electronic patient record is a national product (section 1.3.2) which has been developed and planned to be rolled out to all unscheduled and emergency care settings across Wales as part of the Welsh Assembly Government, NHS Wales Information Service (NWIS) Programme. A qualitative case study research drawing on the experiences and insights of the users to generate a detailed picture of their adoption and actual use of the electronic patient record will be of interest to the designers of programmes and all stakeholders. This was the only possible site in the whole of the country for me to generate data in. The research design process and how the questions are answered will be discussed in Chapters 4 and 5. Knowledge and understanding of workplace change and actual use of innovation has become critical to the organisation.

What question do I want to answer? What issues am I addressing (or measuring)? -The focus of the study is the clinicians' views of the EPR system' how they use it in their everyday work/practice and the factors that influence or hinders their use of the technology as the EPR system is new to them. The EPR is accessible only from the designated computers within the unit. Their work practice relates to their roles and activities within the complex environment of the EMAU. The users are early adopters adjusting to the complex change, so their views are important. The study is not to develop theory or to make generalisations. The user's participation in the study will also recognise the value of their roles and promote ownership in clinical research. The findings, although not generalisable, but if rich in description can be transferable to other

units as the EPR is to be log rolled to all emergency assessment units (medical and surgical –unscheduled) in Wales

How big is the study? – This is a single case study. The research site is the EMAU within an acute District General Hospital, which is part of NHS Wales.

What is the study covering? - It is a study about how the users (clinicians) go about using a new technological tool (the Welsh Individual Health Record /electronic patent record) in their work (Kilmon *et al.* 2008, Gruber *et al.* 2009). Nemeth *et al.* (2007:384) referred to this kind of study as "technical work studies".

Who is the study covering? – The EPR (technology), the users (multi-disciplinary team members) and the organisation (EMAU within a District General Hospital) in which the EPR is pilot implemented. The EPR is different from those of other organisations. There are different types or degrees of EPRs. This EPR is distinguished as the Welsh Individual Health Record (IHR) technology, is local and confined within Wales, Therefore the participants can only be recruited if they have worked in the EMAU and have used the EPR or is involved with the development of the EPR to have knowledge and understanding of the EPR in that unit.

1.3   Nature and Context of the Focus of the Study

Historically, the introduction of ICT into the NHS has been slow and fragmented. The NHS is beset with interoperable systems and the huge numbers of healthcare professionals are expected to work collaboratively to provide safe, patient-centred care. The well-being and performance of the workforce is clearly a matter of concern. Such concern translates to considerable costs in the form resistance to change, non or low adoption of technology or poor productivity. A multitude of factors influence the workplace. The EMAU is a unique setting, the "front door" to the hospital and an unscheduled care environment where the EPR system has been implemented. Science is about asking questions of the world

and building models to better understand this world (Giere 1999). In this study I conceptualised the participants themselves as actors, their work practice, the technology and EMAU as complex inter-relationships between them. A qualitative case study and the use of Complex Adaptive Systems thinking will help me in understanding the nature of the phenomenon of interest from a wider range of viewpoints. This applied research involved designing a research strategy that best can capture what was actually occurring at the intersection of clinicians, technology, end users and patient care in everyday practice. A study of actual use of the EPR in the workplace can contribute to the discipline and extend the literature. Health care organisations (HCOs) have been studied in a mechanistic manner and Bar-Yam (2000), Plsek and Greenhalgh (2008) and Dennard *et al.* (2008) who have undertaken studies representing complexity and dynamics in healthcare organisations have shown how complex adaptive systems (CASs) theory can open a window through which we can do research to make these imaginations real (people using technology in work).

1.3.1 Operational Concept Definition

There are several terms used to depict the electronic patient record (Waegemann 2002), such as Electronic Health Record (EHR), Electronic Medical Record (EMR), Computer-Based Patient Record (CPR), Digital Record (DR), and Computerised Medical Record (CMR), however, the use of the term EHR remains widespread. EHRs are defined as computer information systems supporting data collection, storage and access in hospitals or healthcare centres, for the purpose of providing information and knowledge across diverse settings to improve healthcare quality, safety and efficiency (Mandl *et al.* 2001, Shua *et al.* 2014). They are longitudinal collection of personal health information of a single individual (Advisory Committee on Health Infrastructure (ACHI) 2001), generated by one or more encounters in any care delivery settings (Healthcare Information and Management Systems Society (HIMSS). The aim of these electronic patient records is to capture and provide the clinician with accurate data, support continuing, efficient and quality health care. Health data can

include information about the individual across their life time, information on allergies, immunisations, history of illness, injuries, diagnostic studies, observation charts/assessments, plans and outcomes, prescriptions, consultations and treatment records (Dick andSteen 1991, Health Information and Management Systems Society (HIMSS) 2006). The EHR reflects what the ISO has termed the shareable EHR (SEHR) (The International Standards Organisation TC 215 (2005) which can be made available at any time to several providers, once authorised by the individual whilst the EMR is more of an organisational system (Table 1).

EMR	EHR
The EMR – does not move from the provider's office /unit.	The EHRs allow a patient's health record to move with them to other health care providers, laboratories, specialists, hospitals, nursing home
The EMR contains standard medical and clinical data gathered in one provider's office	The EHRs go beyond the data collected in the provider's office and include a more comprehensive patient history

Table 1: Differences between EMR and EHR

1.3.2   The Welsh Individual Health Record (IHR)

The Welsh Individual Health Record is the national electronic patient record which is one component of a much wider work programme of the Informing Healthcare: Transforming healthcare using information technology (IT), (WAG 2003) modernisation programmes. The IHR currently contains patient information gathered and accessed from a single site or information transferred from another site. It is a patient summary kept by their General Practitioner (GP) and offers healthcare providers electronic information on patient demographics and essential healthcare matters such as patient history, allergies, active problems, test results, and medications. It will ultimately provide summary information about individual patients gathered through all of the clinical settings where they receive care. Currently it is only available to other clinicians working within the local health board of the patient's GP and with the patient's consent. To date, only emergency doctors providing Out-of-Hours (OoH) services and

doctors, nurses and pharmacists working within an Emergency Medical Assessment Unit (EMAU) who can access this vital information on patients to help make important clinical decisions about the best care and treatment (NHS Wales 2010). The vision is for every citizen to have an electronic patient record and for the IHR technology to reach all Out-of-Hours services and into all unscheduled care settings in Wales including Accident and Emergency Units, Surgical Assessment Units and perhaps ambulance services (NHS Wales 2010). For the purposes of this research I will use the general term of electronic patient record (EPR) interchangeably with the EHR and Welsh Individual Health Record (IHR). **EPR adoption** is conceptualised as the process of using the technology, from initial trying out to more embedded use or according to Rogers (1995), a decision to make full use of an innovation at the best course of action available.

1.4   The Theoretical Framework

A theory can be viewed as a set of analytical principles or statements designed to structure our observation, understanding and explanation of the world (Tabak *et al.* 2012).   A "good theory" provides a clear explanation of how and why specific relationships lead to specific events. A theoretical framework shapes the questions and serves to help the researcher find some focus, such as defining the selection and parameters of cases (Yin 1994). Traditionally theoretical frameworks are developed a priori, before data collection or it can evolve during the course of the study, of which the latter is the situation for this study. There are different lenses that have been used in the process of knowledge construction about information communication technology (ICT) but for this study, it was at the analysis stage of the research process (Chapter 4) that the Complex Adaptive Systems (CAS) Theory evolved. In seeking to understand whether and how the EPR was used, I discovered themes in interview data and that influenced my selection (Chapter 9) of Complex Adaptive as the lens with which to view the world and for understanding the phenomenon.

1.5   Structure of the Thesis

A short summary of each chapter is presented to show the logical flow and overview of this research.

Chapter 1 introduces the study and sets the scene for the thesis: the research problem, research questions and aim. In Chapter 2, a literature review on the state of the art and knowledge of the electronic patient record adoption, the gaps and need for the study to be done will be discussed. The theoretical considerations: Complexity theory, Health Systems as Complex Adaptive Systems and the EMAU as microsystem will be introduced and discussed in Chapter 3. In Chapter 4, the methodological considerations and justification for the methodology and research procedure will be discussed. The practical issues and reflexive notes relating to the journey of the research will be incorporated. In Chapters 5-7 the results of the case study will be discussed under broad themes. There is a concerted effort to understand how practice members use the electronic patient record technology to support the complex work of healthcare. Complex Adaptive System theory will be used as critical lens to explain and understand the interdependencies amongst the individuals, to both understand a system and improving its functions. Chapter 8 presents the implications, recommendations, strengths and limitations, aspects for future research and conclusion. Chapter 9, the final chapter will be a reflection on the research journey and each decision made will be discussed.

CHAPTER 2: LITERATURE REVIEW

2.1   Search Strategy

A literature review is a way of summarising critical points found in pre-existing work which is used as a foundation to support new ideas (Kowalczyk and Truluck 2013). The subject of information communication technology and electronic patient is written and studied across many disciplines such as organisational studies, economics, public health, business, epidemiology, sociology, psychology and information science. Therefore the literature on Electronic Patient Records (EPR) is very diverse. The aim of this study was to explore the multi-disciplinary team members' use of the electronic patent record within one emergency medical assessment unit. As electronic patient records are automated I wanted to know views of users. Therefore the objective of this literature search was to create an overview of the existing literature on electronic patient record adoption and use in hospitals and to identify generally applicable findings and lessons for users and their attempts to adopt the electronic patient record, what drove or motivated users to adopt and use the electronic patient record, the opportunities and the barriers that influenced adoption and use of the electronic record system in hospitals. The literature review was to assist the researcher to gain an overall view of what theoretical discussions or practical studies have been undertaken to date so as to inform the proposed study. The literature review was to identify empirical studies that were explicitly focused on hospital-wide adoption of electronic patient record system for clinical practice and service delivery.

2.2   Methodology

In order for a literature review to be comprehensive, it is essential that all terms relevant to the aim of the research are covered in the search. I divided the literature search into: literature collection, assessment and selection. I needed to include relevant synonyms and related terms, both for electronic patient record system and for hospitals. So my first phase of the search strategy was conducted

using the following three categories of keywords. The first category for electronic patient records I included the following terms: Electronic Health Record OR Electronic Medical Record OR Electronic Patient Record OR Computerised Medical Record OR Computerised Medical Record OR Computerised Patient Record OR Digital Health Record OR Digital Medical Record OR Digital Patient Record. The second category was for users and these terms were used: Physician OR Doctor OR Clinician OR Specialist AND Nurse OR Practitioner. For the third category, the term Hospitals was used. This was a relatively large set of keywords as I was seeking articles about the adoption and use of electronic medical information systems in hospitals. I tried to include every possible combination in the search to ensure that articles were not missed in the search. A large number of search strategies were used to cover all those keywords.

Data for this literature review were gathered using bibliographic databases and other information sources of relevance to the research questions. To identify published and unpublished studies, separate databases like Google Scholar, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Pubmed were searched. The databases were chosen based on their relevance to the field and their accessibility by the researcher. These databases were searched in a systematic manner for English-language medical, nursing and healthcare literature published. To address the issues of grey literature and publication bias (Walsh and Downe 2005), additional concepts or search terms were suggested, scrutiny of books, policy documents and supplemental hand-searching of relevant academic and discipline specific journals were undertaken to identify any recent publications that have not been indexed on the electronic databases. Bibliographies and citations were also followed up. The search strategy is an iterative process of searching by finding a relevant article and then back chaining related articles. I used the reference lists included in articles that met the selection criteria for other possibly relevant studies that had not been identified in the database search. Internet searches using the Google Scholar Search Engine

technology and Government corporate websites were also used to uncover additional literature or documents which may be catalogued in electronic databases outside the medical and nursing domains.

Searches were limited to full text, peer-reviewed journal articles in English language, full text available online and these time frames were chosen to take into consideration that the information technology field develops rapidly: December 1980–2013 and December 1988–2013. The intention was not to exclude relevant data by defining initial search criteria too narrowly, however, using these keywords yielded a vast amount (12,8524 and 11,8197) of literature. When the groups were combined using the Boolean AND, 617 articles were retrieved. The literature retrieved contained various terminologies which were used interchangeably, different electronic patient record functionalities or design as well as outcome measures. The breadth of this subject though interesting posed not only management and synthesis challenges to find a consensus on the contexts, methods of evaluation and the effects of the implemented technology and many of the articles were not relevant to the research question.

This led me to seek the assistance of a subject librarian for undertaking the second search. The search criteria were amended to focus on combined search terms such as "Electronic Health Record adoption", "EHR adoption" OR "Electronic Medical Record adoption" OR "EMR adoption" AND Hospital" within parentheses and with the Boolean operator OR. Finally, I combined the searches with the Boolean operator AND. This narrowed the criteria to assist in identifying the most commonly mentioned factors listed in the articles. Searches were limited to full text, peer-reviewed, research papers which are in English language. The time limit for the second search was adjusted to run from December 1993 (instead of 1988) to December 2014. This time frame was adjusted to capture the evolving EPR field. It was noted that the EHRs described in older and newer studies illustrated the rapidly changing scene in the field of information technology. So for inclusion criteria, papers were searched for from

December 1993 as this was when electronic patient records emerged in the healthcare context. This search terms were repeated for all the three databases.

Assessment and selection –During this phase articles were retrieved, read and selected. The titles and abstracts of studies identified by this search were reviewed for their relevance to the objective of this review and the full-text articles of all potentially relevant studies available in print or electronically were retrieved. Eligible papers were identified using the following criteria: any literature which mentioned how the EPR was being utilised/adopted in the provision of healthcare, included perceptions of users or providers to adoption and the challenges encountered with adoption such as technical, individual, organisational and environmental perspectives were included. Aspects of interest were the social, technical and environmental (organisational) processes involved and the consequences of adoption and employment of electronic patient record technology. Non-English language studies and those that focused on nursing, medical or allied health student training, education and curricula or Paediatric management were excluded. As the area of research interest is not to measure clinical outcomes, articles focusing on management of disease outcomes were not included. Only articles that focused on hospitals, physician's, nurse's or multi-disciplinary team member's practice patterns and electronic patient record (EMR, EHR) adoption were included in the review The main objective was reviewing work that had been undertaken within the area of my research interest as this will not only provide a thorough understanding of the topic but assist in identifying knowledge gaps that demand further investigating to compare previous findings. The selection criteria outlined above were applied to the articles. The references of these articles were screened for papers that were missed in the initial search. I then reanalysed the articles to identify ideas or findings and grouped them into themes after the articles reached information saturation and for ease of description/presentation. Duplicate articles were accounted for and consolidated before the findings table was created. The final number of references included in the literature review totalled 55 (Table 2).

CINAHL	PUBMED	GOOGLE SCHOLAR
(((((("Electronic Health Record Adoption") OR "EHR adoption") OR "Electronic Medical Record Adoption") OR "EMR Adoption") OR "Electronic Patient Record Adoption") OR "EPR Adoption)) AND Hospital.	(((((("Electronic Health Record Adoption") OR "EHR adoption") OR "Electronic Medical Record Adoption") OR "EMR Adoption") OR "Electronic Patient Record Adoption") OR "EPR Adoption)) AND Hospital	"Electronic Health Record Adoption" AND "Hospital"
Retrieved 29	Retrieved 405	Retrieved 260
Date of Publication December 1993 – December 2014, Peer Reviewed, Full text, Research papers		Date of Publication December 2014 – 2015, Full text,
Removed duplicates	Removed duplicates 9 Discard 361	Removed duplicates 5 Discard 245
Used 10	Used 35	Used 10
N=55		

Table 2: Search methodology

In December 2015, I undertook an extension of the literature search and review post viva. The same search terms were used. I extended the time limit for the recent search to run from December 2014 to January 2016 to capture current knowledge regarding EPR adoption and use. The same search engines were used Articles retrieved CINAHL (19), PubMed (24).

2.2.1   Emerging themes

The literature was read and with the help of a modified extraction tool the information was synthesised into a readable format to enable the central ideas in these articles to be captured. The following three themes that were previously identified remained current. In the following section the themes are presented and with the updated information. The themes that emerged were:

- Collaboration network for efficiency of health service delivery
- The benefits of electronic patient records
- Barriers to Electronic patient record adoption

2.3 Collaboration Network for Efficiency of Health Service Delivery

Emergency care settings are complex care settings, characterised by high pressure, and high intensity patients (Creswick *et al.* 2009). These patients report quickly to the hospital at irregular hours, are usually acutely ill, may have altered mental state and are especially vulnerable. They often present themselves to the emergency department without their primary doctor's knowledge and may be unable to provide crucial information themselves (Geisler *et al.* 2010). In a demanding environment such as this, efficient communication and effective interpersonal interactions between staff members who are providing and organising care are crucial to balance the complex set of care steps for every patient (Pare *et al.* 2006, Creswick *et al.* 2009, Geisler *et al.* 2010). Coiera and Toombs (1998) highlight that the mechanisms for sharing of information between the health care provider is prone to tremendous inefficiencies especially when patient's care trajectory involves unplanned visits crossing multiple care providers as the he clinical information gathered by one health care provider is not readily available whenever and wherever needed (NHS Executive 1998). The paper record is still the most widely used medium for storage of patient data (van Ginneken 2002, Haux 2005, Ayatollahi *et al.* 2009). Taking into consideration the dispersal of healthcare professionals across a wide geographical area, the paper records posed problems to effective coordination of care. Real-time information sharing falls apart, causing delayed, incomplete or absent communications. Relying on the patient's memory as the main vessel for information continuity is problematic (Reid and Wagner 2008). When huge information gaps emerge (Rigby 1999, Evans *et al.* 2007 and Pirnejad *et al.* 2007, Reid and Wagner 2008), there lies the propensity for delays in diagnosis, adverse events and greater errors (Creswick *et al.* 2009). The advances in computer technology and the complexity of healthcare have made the

shortcomings of paper record (Ronquillo 2012) more visible. From a pragmatic perspective, the paper record which has traditionally served different occupational groups is now being criticised as creating 'islands' of information which is a hindrance to clinicians as it is available to one person at a time and cannot be accessed remotely or at a time and place needed. Such fragmentation and inability to share information across systems and multi-site organisations do not best serve the information needs of multiple self-autonomous users who are increasingly delivering health and social care in diverse and non-traditional settings (Leape and Berwick 2000, WAG 2005). Managing information is managing the lifeblood of any organisation. If the patient records are incomplete and disorganised the knowledge-incorporating function is hindered and the environment becomes uncontrollable making it difficult for the clinicians to self-organise with resultant delivery of suboptimal care. Poor coordination, cooperation and collaboration between services and agents have profound clinical governance implications for patients and the health system for at stake are major issues of quality of life (Bodenheimer 2008).

Brockstein *et al.* (2011) reflecting on an article on the effect of an electronic health record on the culture of an outpatient medical oncology practice in a four-hospital integrated healthcare system revealed that the EHR has dramatically changed practice environment, improved efficiency, patient safety, research productivity, and operations. According to Brockstein *et al.* (2011), a particular value of the EHR has been the opportunity for optimal communication in the multidisciplinary care of patients with cancer. The EHR had enabled internal messaging and sharing of laboratory, radiology, and other data between their oncologists and other health care providers, physicians, surgical and radiation oncologists and referring physicians. The EHR has also provided information needed for consultation, new appointments, test scheduling and facilities operations. Brockstein *et al.* (2011) also pointed out the benefits of on-demand access to monthly statistical, cost, and revenue reports to evaluate growth, productivity, future staffing needs, inventory management and budget variances

and projections. These were itemised by drug, physician, disease site, and treatment plan. Adverse event and dose tracking has also facilitated medication use evaluations that have affected patient safety, regulatory adherence and cost containment. Capturing information accurately, communicating and using it promptly to improve the effectiveness and efficiency of health care is significant not just to the United Kingdom (UK) Government's vision to modernise the National Health Service (NHS) (DoH1997a, 1997b, 1998, 1999, 2001a, 2001b, 2004, 2005, 2009) but globally in countries such as the United States of America (USA), Denmark, Finland, Sweden, Japan, Hong Kong and Australia (McConnell 2004) as well. Promoting and supporting inter-connectivity using improved information and communication technology in the health sector have been identified.

2.4   The Benefits of Electronic Patient Records

Medical errors can result from human causes such as limited provider recollection of necessary information or patient failure to remember information about their medical histories (IoM 1999, Edwards and Moczygemba 2004). To reduce preventable medical errors and hospital deaths, the Institute of Medicine (IoM) (1999) recommended the need to use a computerised health record system to facilitate improvement of patient safety. The EHR can provide access to important patient information, identifying harmful drug reactions or possible allergic reactions and by facilitating preventive medicine and helping clinicians manage patients with complex chronic conditions (IoM 1999, Hamid and Cline 2013) and reduction of unnecessary care costs (Wang *et al.* 2003, Barlow 2004, Hillestad *et al.* 2005, Kaushal et al 2005, 2010, Choi *et al.* 2013). Kaushal *et al.* (2003), and Berger and Kirchak (2004) report fewer medication errors. The most commonly cited positives were electronic medication prescription (e-prescribing) capabilities, efficiency, and ease of access to notes, including legibility (Raglan et al 2015). Hollenbeck *et al.*'s (2015) evaluation of the impact of the electronic medical record on efficiency, completeness and accuracy in an academic orthopaedic practice showed that the EMR was 1.3

times more likely to include pertinent clinical information. Furukawa *et al.* (2016) explored electronic health record adoption and rates of in-hospital adverse events involving a retrospective analysis of patient discharges using data from the 2012 and 2013 Medicare Patient Safety Monitoring System. Their sample included patients age 18 and older that were hospitalised for one of 3 conditions: acute cardiovascular disease, pneumonia, or conditions requiring surgery. The findings revealed that cardiovascular, pneumonia, and surgery patients exposed to a fully electronic EHR were less likely to experience in-hospital adverse events. Enriquez *et al.* (2015) studied the associations between electronic health record use and acute myocardial infarction quality of care and outcomes. The conclusion drawn was that EHR use was associated with some markers of patient safety, such as less frequent heparin overdosing, and slightly greater use of evidence-based therapies. Kaiser Permanente, the US health maintenance organisation which also offers an electronic record system indicated that the most common use of the records by its members is for repeat prescription and has led to 10% fewer visits to the physician and a significant reduction in telephone calls (Zhou *et al.*2007).

Electronic health records (EHRs) are thought to significantly improve healthcare processes, yielding safer, more cost-effective care (Menachemi *et al.* 2006). According to Shanks *et al.* (2012) one-quarter of the behavioural health providers have commented that EHRs provide more complete information and would save time for clients. Benefits to quality of care were mentioned by 100% of the participants in Shank *et al.*'s (2012) study. Adler-Milstein *et al.* (2015) studied the relationship between EHR adoption and three hospital outcomes (process adherence, patient satisfaction, efficiency). The study revealed that higher levels of EHR adoption were associated with better performance on process adherence and patient satisfaction but not efficiency. This finding was also supported by Tall *et al.* (2015) who undertook a study to determine the impact of an EMR system on patient-related factors that correlate to Emergency Department (ED) workflow efficiency. This was a quantitative study using a

retrospective chart review and analysis of a total of 61,626 individual patient records. It was found that the installation of a hospital-wide EMR system had minimal impact on workflow efficiency parameters in an ED. There was a significant decrease for patients who were admitted to the hospital from the ED, however, the percentage of patients who left without being seen between the pre-EMR and post-EMR periods was 1.8% and 2.7%, respectively, representing a significant increase. The number of patients who left against medical advice did not change across the periods of the present investigation.

Health services are organised in different ways in different countries, but most typically they are divided between primary, secondary and tertiary care. Primary care is health care provided in the community by the staff of a general practice. Secondary care is medical attention provided by a specialist facility upon referral by a primary care physician and tertiary care is provided by a team of specialists in a major hospital. Patients often cannot recall previous diagnostic tests or medications, but the clinicians still have to make decisions The problem of having inadequate information can be corrected with the assistance of health information technology by creating the EHR from various data sources in the healthcare system and then delivering it to physicians and other healthcare providers for use in making more informed clinical decisions. EHR information is used by healthcare professionals to make decisions regarding patient care issues. These often include reviewing the documentation of other clinicians, evaluating the patient's response to treatment, and understanding the patient's overall clinical picture. Using an EPR can improve clinical decision-making (Ben–Assuli *et al.* 2013, 2014a). Information components from the EHR have significant relation to improved quality of healthcare processes. Ben-Assuli *et al.* (2014a) evaluated the contribution of electronic health record and health information exchange to improvement in medical decision-making processes and concluded that accessing the medical history of patients can lead to better decision-making and outcomes. The quantitative study used formulated hypotheses to examine the extent to which physicians used the information

components available to them when diagnosing and admitting patients. The findings revealed that the ability to access patients' medical history and their long term health conditions (via the EHR), including information about medications, diagnoses, recent procedures and laboratory tests is critical to forming an appropriate plan of care and eventually making more accurate admission decisions. The study identified previous encounters, imaging, and laboratory as most influential information components, having the strongest relationship with physicians' decisions to admit or discharge the patient. Three types of clinical information (diagnoses, previous medications and allergies) were rated as high use. In another study, Ben-Assuli *et al.* (2014b) highlight that the use of EHR contributes to more efficient admission decisions and reduces the number of avoidable admissions, illustrating a relationship between the reviewing of medical history and improved medical care, including admission decisions. Franczak *et al.* (2014) also found that the additional clinical data derived from the EHR influenced radiological interpretations and that the lack of that data would have adversely affected medical management in those patients. They advocated healthcare providers to recognise the value of implementing EHRs and foster their widespread adoption.

The EHR is mainly used for the setting of objectives and planning of patient care as well as documenting the outcome of care. The primary purpose is to support continuing, efficient and quality integrated healthcare. The electronic sharing of information across health care organisations (health information exchange) is one approach to obtain missing information. Thus EHR systems can help to bridge this gap by providing physicians with clinical information at the point of care. According to Tully *et al.* (2013), primary care doctors thought it particularly helpful to be able to access the shared EMR when explaining to the patient what had happened during their recent hospital admission. It was also convenient when discussing a patient with a colleague by phone as both could have access to the EMR simultaneously during the conversation.

Electronic health records can provide important information for secondary purposes such as health policy planning (Ronquillo 2012, Laird-Maddox *et al.* 2014). They have the potential to significantly facilitate management within healthcare systems by providing accuracy of information exchange, speedier care delivery (Bowen and Jones 2010) and lower costs through decreased utilisation of healthcare resources such as redundant diagnostic tests. Menachemi and Collum (2011) highlight three particular built in functionalities that have the potential to aid improvement in the quality of care and cost reductions at the healthcare system level. These are clinical decision support (CDS) tools, computerised physician order entry (CPOE) systems (Radley *et al.* 2013) and health information exchange (HIE). A CDS system can provide the latest information about a drug, cross-referencing a patient allergy to a medication, and alerts for drug interactions and other potential patient issues that are flagged by the computer, therefore assisting the provider in making decisions with regard to patient care. To eliminate potentially dangerous medical errors caused by illegible writing, CPOE systems allow providers to enter orders such as drugs, radiology and laboratory tests into a computer rather than doing so on paper, thus making the ordering process more efficient. This also relieves nursing and pharmacy staffs having to seek clarification or to solicit missing information from illegible or incomplete orders. CPOE system, especially when it is linked to a CDS, can result in improved efficiency and effectiveness of care by identifying harmful drug reactions or possible allergic reactions and facilitating preventive medicine.

For a patient, much of his/her data accumulates at a variety of different places and all of which are stored in silos. This can include their primary care physician's office, as well as other physician specialists, one or more pharmacies, and other locations, such as hospitals and emergency departments. According to Hayrinen *et al.* (2008) the primary organisational impact is that EHRs improve communication among healthcare professionals, through real time health information exchange (IoM 1999, Menachemi and Collum 2011)

wherever and whenever as opposed to relying on the slow processes of telephoning, faxing or writing pertinent information to each other. The ability to share information via EHRs can result in much more cost-effective and higher-quality care (Choi *et al.*2013). Dynamic information systems are vital for improving clinical processes, to transform the delivery of care (IoM 1999, Ball *et al.* 2003) and to have impact on productivity, efficiency and patient safety. Providers require up to date patient information in order to make informed decisions and provide seamless care (Benham-Hutchins and Effken 2010). The EPR technology offers not only computerised storing and sharing of patient health information between the various providers and the patient over time and space but also assist with managing increasingly complex care transitions across multiple settings (Nikula 2005, Yamamoto and Khan 2006, Hayrinen *et al.* 2008). Knowing exactly which medications regimens patients can use can assist physicians to avoid drug interactions (Wang *et al.* 2003, Chaudry *et al.* 2006), manage side effects and more effectively direct the patient's treatment. Wang *et al.* (2003) highlighted significant improvement to guideline adherence. Information and knowledge sharing, coordination and close cooperation between health care professionals improve patient management, quality of service, and safety (Wang *et al.* 2003, Bates and Gawada 2003, Bennett and Glaziou 2003, Malloch 2007, Kukafka *et al.* 2007, Ford *et al.* 2009, Platt 2009).

The availability of patients' long term health records, including information about medications, diagnoses, recent procedures, and recent laboratory tests, is critical to forming an appropriate plan of care. These benefits include improving the quality of care, reducing medical errors, and improving communication between healthcare professionals, as well as enhancing the readability, availability, and accessibility of information, and improving data quality (Ayatollahi *et al.* 2009). The electronic medical record system was found to improve the quality of data captured over handwritten records (Claret *et al.* 2011). The effects of EHRs on large diabetic patient populations have shown significant improvements in quality as measured through reduced hospitalisation

and reduced cost of care. This was attributed to the EHR enhancing coordination between healthcare providers (Patel *et al.* 2015). Kutney-Lee and Kelly (2011) suggest that the implementation of a basic EHR may result in improved and more efficient nursing care, better care coordination, and patient safety. All of these sources reflect an increase in quality and also lead to a reduction in the average cost of care

2.5   Barriers to Adoption

Despite the positive effects of Electronic Health Records use in medical and healthcare practices, the adoption rate of such systems is still low and meets resistance from healthcare professionals. Barriers to EHR adoption have been identified (Scholl *et al.* 2011, Takian *et al.* 2012, Unertl *et al.* 2012, Cheung *et al.* 2013). Hamid and Cline (2013) studied providers' acceptance factors and their perceived barriers to electronic health record adoption from 24 physicians and 20 advanced practice providers who were employed in acute care settings at a community healthcare system. The participants perceived lack of usefulness and concern about the effect of EHR on professional autonomy as barriers to their adoption of EHR. Physician resistance (Poon *et al.* 2004, Bates 2005; Kaplan and Harris-Salomone 2009) has been identified as one of the most common barriers associated to EHR adoption. Many studies have indicated that intent to use EHR was perceived usefulness. Perception of usefulness has been associated with the user's satisfaction with the EHR (Kaushal *et al.* 2009, Unertl *et al.* 2012,Takian 2012, Cheung et al 2013, Struik *et al.* 2014), particularly the concern about the potential for the EHR to complicate rather than enhance their work. The effect of the EHR on provider-patient relationship has also been indicated (Shank *et al.* 2012, Cheung *et al.* 2013). Some of the participants in the study by Shank *et al.* (2012) – a qualitative study to explore community behavioural health providers' perceived benefits and barriers of using electronic health records. The 32 participants comprised of psychiatrists, advanced practice registered nurses, and physician's assistants; psychologists; licensed mental health practitioners; and registered nurses. Data were collected using semi-

structured interviews. Themes identified were: quality of care, privacy and security, and delivery of services. Some of the professionals perceived that professional and client relationships would suffer with the use of EHR. This impact on quality care was attributed to the EHRs requiring the professional to divert their attention from clients to their computers. Workflow was disrupted during the clinical encounter. With Cheung *et al.*'s (2013) study the most frequently chosen responses included "not patient-friendly during consultations" (58/107, 54.2%) and "computer use is more time-consuming" (54/107, 50.5%). This negative perception regarding EHR usefulness identified the further need to clarify the role of EHR as a medium of workflow enhancement and productivity. According to Ajzen and Fishbein (1980) users who have positive attitudes about adopting EHRs are more likely to adopt.

2.5.1 Interference with Work Flow, Established Practice Routines and Interactions

A major concern among users is that EHR adoption will hamper productivity (Miller *et al.* 2005). Implementation of an EPR impacts workflow, policies, procedures, and interactions among individuals and groups. While clinicians may realise the EPR's ability to improve patient care, they may have concerns about control of their work, especially if workflows are being adversely affected (Ventres et al 2006; Claret *et al.*2011, Unertl *et al.*2012, Takian *et al.* 2012, Inokuchi *et al.* 2013). For example, Ventres *et al.* (2006) explored factors that influence how physicians use the EHR. This was a descriptive ethnographic study comprising 4 qualitative components: 80 hours of participant observation, individual interviews with 52 patients, videotaped reviews of 29 clinical encounters and five focus group interviews with physicians and computer advocates. Of the four thematic domains, perceptions of spatial (the effect of the physical presence and location of EHRs on interactions between physicians and patients) and relational (perceptions of physicians and patients about the EHR and how those perceptions affected its use) were identified. As EHRs are automated, the clinicians' perception of whether the computer in the

examination room was an obstacle, hindering workflow efficiency, disturbing patients and influencing how EHRs are used are valuable.

Claret *et al.* (2011) undertook a before-and-after observational study in the Emergency Department of a university hospital with an annual census of 60,000 patients and where EMR System is available for use 24 hours a day, 7 days a week, to replace the pen-and-paper system. All physicians who worked in the ED were asked to complete a satisfaction questionnaire which was administered after the "after" period and which measured the clinicians' satisfaction concerning computerisation in routine clinical use. The clinicians reported minimal satisfaction due to an increase in door-to-first medical contact (FMC) time induced by EMR and a lower triage capacity by the many interruptions due to the software. Decreased productivity, although this is most evident with initial implementation of the EMR program may negatively impact patient care time, satisfaction and unit crowding.

In their study of EPR implementation in a mental health hospital, Takian *et al.* (2012) observed redistribution of professional responsibility and degrees of job change as users attempted to inscribe their interests into EHR. Initially, there were complaints about extra burden of administrative job. The findings reinforces that EPR changes the way clinicians record, retrieve and use clinical data. The most commonly reported impediments to EHR use were time needed, ineffective templates, note quality, interference with patient interactions, and expense (Raglan *et al.* 2015). The application should improve the productivity of clinicians, rather than hinder it.

Inokuchi *et al.* (2013) undertook a quantitative study to examine the efficiency of EHR implementation, perceived barriers and expectations. Emergency Department Directors of 466 hospitals (accredited training institutions by the Japanese Association for Acute Medicine) were surveyed to identify current problems with EHR and the barriers to Emergency Department Information

System (EDIS) adoption in Japan. 215 hospitals completed the survey (response rate, 46.1%). For hospitals with EHRs, the most commonly cited barriers to EDIS implementation were potential adverse effects on workflow. The technological system will not be used if it interferes with the practitioner's workflow, changes the way they care for patients or places limitations on the way they practice. These studies (Ventres et al 2006, Claret *et al.*2011, Inokuchi *et al.* 2013) have shown that physicians will not use a product that interferes with their workflow, changes the way they care for patients or places limitations on the way they practice medicine.

In another study, Thorn *et al.* (2013) explored what factors affected physicians' use of a health information exchange. The authors collected data using unstructured interviews from fifteen emergency physicians in four urban emergency departments that had health information exchange access for four years. The physicians were purposely selected to get a sense of the issues. Thorn *et al.* (2013) report that health information exchange access rates in emergency departments (EDs) was low. The study identified several factors affecting the physicians' use of health information exchange, however, the most prevalent was that it was not user friendly and disrupted workflow.

Transition from using paper to using a computer was one of the main concerns identified (Ayatollahi *et al.* 2009, Takian *et al.* 2012, Ser *et al.* 2014). Tully *et al.* (2013) conducted nine focus groups to explore primary and secondary care doctors' experiences of the shared EMR. The authors focused on the creation, use and cross-sector transfer of data, information, knowledge and wisdom (DIKW model) about individual patients' prescribed medication. Their participants described a data and information overload, where it was difficult to get a general overview of what had happened over time, coupled with the frequent lack of knowledge being created and shared by other healthcare providers. Information was frustratingly abundant and the creation and use of knowledge was frustratingly rare. As the system was not fully interconnected,

complex and different information can be found leading to confusion and the workarounds (use of AppDos application) can impair patient safety. Even though health information exchange data accessed was sometimes available in hospital electronic medical record systems, yet information held on other hospitals was not available on the medical record for the current visit.

Taylor *et al.* (2013) explored nurses and patients reporting occurrence of communication with their physician using pre-post cohort design. 75 patient-nurse-physician triads were enrolled prior to the introduction of EMR and 123 triads after the introduction of EMR. One hundred per cent of patients and nurses completed the interview, and 196 (99%) of physicians completed the interview. It was found that a decrease in face-to-face communication between physicians and nurses and worsened overall agreement about the plan of care was associated with EMR implementation. Chan *et al.* (2010) pointed out that the inability to develop user ownership is a key reason why systems fail. Physicians and nurses expect information systems to support clinical processes without increasing workload or shifting work to other staff in order for the systems to be successful.

These findings illustrate that computer- based information systems such as the EPR are not just integrated into current practice but have a profound impact on organisation and work and practice. Assessing user (clinician) acceptance and identifying the reasons why they accept or reject a new information system is one method of evaluating clinical information systems. Ongoing evaluation and modification based on staff feedback is the key for continued use of the EPR.

As increasing attention is being given to the importance of communication in the delivery of high-quality healthcare, Taylor et al (2013) undertook a study to determine whether communication improved in a hospital setting following the introduction of an electronic medical record (EMR). Their findings were quite surprising, that EMR may hinder communication for hospitalised medical

patients. Although the percentage of nurses and patients reporting that communication with the physician had occurred did not change, there was significantly less face-to-face communication between physicians and nurses after EMR. The primary outcome of Total Agreement Score, reflecting a shared understanding of the plan of care for a given patient was decreased after the implementation of EMR. The findings from Taylor *et al.* (2013) suggest that the quality of communication may have worsened due to the use of EMR. The finding that EMR actually impaired communication by replacing face-to-face (or synchronous) communication with asynchronous communication is noteworthy. This study brings to attention the importance of preserving interpersonal communication in the setting of EMR even though the EMR system has been espoused to provide definite advantages through enhanced information sharing and that in the setting of EMR, efforts toward communication skills training and the modification of clinical workflows are necessary to facilitate quality communication.

Despite benefits of the various health information systems, there is a lack of studies that explore healthcare professionals' meaningful use the technology. In particular, little research attention has yet been given to the implications of information technology on inter-organisational continuity of care at the hospital–community interface. The study by Tully *et al.* (2013) attempted to do this. They highlighted some of the problems faced (in their study by doctors) when dealing with details about medicines as part of a shared EMR system. They cautioned that not all details in the system are of equal value to a healthcare professional at a given moment in time. Their findings illustrate that end user satisfaction is also influenced by system usability. They showed that the quantity of data and information in an EMR system can be one of the major challenges of applied health informatics. Technical solutions may be needed to address the need to access the relevant portions of the increasingly large and complex volume of data and information.

Disadvantages of EHR include increased documentation time, interruption in clinical workflow, system errors in patient care and additional interruptions in medical work (Tall *et al.* 2015, Takian *et al.* 2012, Raglan *et al.* 2015). Data entry (e.g typing text) is a significant barrier to EHR adoption and unfamiliarity with the various types of information technology or the benefits it may provide (Tully *et al.* 2013). Therefore having insufficient computer skills or lacking the basic knowledge and training necessary to use computers effectively (Ochieng and Hosoi 2005, Takian *et al.* 2012, Ayotollahi 2013) are barriers to EPR use. The studies by van der Meijden *et al.* (2003) and Takian *et al.* (2012) found computer experience to be the major predictor of acceptance. The extra time spent entering data into the EHR cuts into time with patients and can extend the length of the workday. A significant level of concentration and plethora of skills are needed. Skills are required to listen to patients' complaints, assess medical relevance, contemplate interventions and key in notes concurrently imply that EHRs are complex to use and inferred as time consuming. Added to these identified barriers to adoption of EHR were technical support and training (Kaushal *et al.* 2009, Takian *et al.* 2012, Struik *et al.*2014). These factors can impact on productivity or throughput—the number of services delivered in a given period of time. As productivity has implication for practice choices, studies that contribute to knowledge and understanding of users' views about EHR which may be dependent on their perception of whether the use/change affects their productivity and causing unintended consequences are valuable and significant.

The symbiotic relationship between the design and use must also be understood. Greenhalgh *et al.* (2008) who undertook a systematic literature review using a meta-narrative method highlighted the tensions and paradoxes in electronic patient record research as not only is the EHR technology complex but so are the human organisation and the workplace as complex. Technical issues have been identified as a barrier and thus lead to non-use of the system. Delpierre et al (2004) and Bleich and Slack (2009) exploring physician usage reveal that

physicians will be enthusiastic users if the electronic patient records are helpful in the care of their patients and if they do not impact on patient confidentiality (Wu and Strauss 2006). How the EPR will affect doctor-patient relationship, privacy and confidentiality issues still remain major concerns of healthcare workers. Other concerns include those relating to privacy and security of online information (Ochieng and Hosoi 2005, Chan *et al.* 2010). Concerns about general privacy and security were mentioned by all 32 (100%) participants in Shank *et al.* (2012) study. The participants indicated fear of data being compromised or shared in inappropriate ways or reaching the wrong person. Clients' reluctance to consent to electronic sharing, privacy regulations and other legal issues were perceived barriers. The participants mentioned privacy and security barriers more than they did privacy and security benefits. The participants in Shank *et al.*'s (2012) study were behavioural healthcare professionals (psychiatrists and psychologists). The majority of these participants characterised themselves as having a positive attitude toward electronic sharing, yet fewer than one in ten participants (32) in this study discussed privacy and security benefits. This could be explained by their expressed concern over behavioural health information which they perceived as different from medical information, therefore is more sensitive and the client more vulnerable. The subjectivity of behavioural health information makes electronic sharing a more complicated process (Ser *et al.* 2014). Walji *et al.* (2010) identified and compared the frequency and type of usability problems of a dental EHR by using three usability methods: user testing, interviews and open-ended surveys. They used secondary data as well as collected data from third and fourth year dental students, advanced graduate educational students (residents) and attending dentists (faculty). Data analysis revealed 24 themes which were grouped into three categories: EHR user interface, diagnostic terminology and clinical work domain and workflow.

2.5.2 Staff Attitudes

In relation to the EPR system, clinician attitude can make or break a clinical information system implementation and adoption. Ochieng and Hosoi (2005) undertook a quantitative study on the effect of three factors: information technology (IT) skills of healthcare workers, present status of computerisation in their organisations, and workers' attitudes on the diffusion of electronic medical records (EMRs) in the healthcare environment. Data were obtained from a self-questionnaire distributed to 390 healthcare workers across three hospitals in Japan. They found that diffusion of EMR was heavily influenced by attitudes of healthcare workers. A large majority of respondents across the institutions considered computers to be more beneficial for administrative functions than clinical functions (62.8% in Hosp 1; 59.7% in Hosp 2 and 38.4% in Hosp 3). The healthcare workers' attitudes result in their decision to desire to use or not to use a computerised system. In their study the staff in Hospital 1 and 2 demonstrated somewhat similar attitudes. Their findings demonstrated that attitude and present status of EHR can significantly influence adoption of EHR in clinical practice.

Various technology transfer theories such as the Technology Acceptance Model (TAM) (Davis 1993), the Task Technology Fit Model (TTF) (Goodhue 1995) and Rogers' Diffusion of Innovation Model (Rogers 2003) have been used by information system researchers in their pursuits to analyse user satisfaction, usage or adoption of the information systems implemented. TAM (Davis 1993) analyses individual behaviour and usage. Two key constructs: the Perceived Ease of Use (PEU) and Perceived Usefulness (PU) are hypothesised to indirectly influence user's intention to adopt the system of interest. The TTF Model evaluates 'the degree to which a technology assists an individual in performing his or her portfolio of tasks' (Goodhue 1995: 216). The area of focus is the user who is using the technology in the performance of his/her task. Rogers' Diffusion of Innovation Model (2003) focused on the five attributes of an innovation (relative advantage, complexity, trialability, compatibility and

observability) by the users as crucial factors in determining the adoption of a clinical information system. The extent to which the system meets a user's needs, and whether the user will use the system can be influenced by the usability of the system, the extent to which the system meets the user's expectations, and factors or characteristics specific to the individual. For example, in a study relating to online newspapers, Zhang and Dran (2000) drawing on the work of Herzberg (1987) revealed the essentiality of hygiene factors and the desirability of motivator factors. Hygiene factors might include technical aspects, navigation, privacy and security, surfing activity, impartiality, and information content. Motivators included enjoyment, cognitive outcomes, credibility, visual appearance, and user empowerment. Thus user satisfaction with EHRs technology which is strongly associated with perceptions of the system's usefulness, the level of technical support, staff attitude and environment of practice can influence EHR technology uptake.

Unless electronic patient records are aligned closely with people's attitudes and usability the risk is of slow uptake, being abandoned or not adopted at all is substantial. The material properties and functionality of the technology seem to be important determinants of uptake and use. These factors have repeatedly been identified as being important for the effective implementation of information technology systems in healthcare (Greenhalgh *et al.* 2010, Cresswell *et al.* 2012). These systems are expensive and must be acceptable to the users to be successful (Perry *et al.* 2013, Walji *et al.* 2014).

Electronic patient records do not merely store information but actively shape and constrain care. Even though the potential advantages of electronic access to healthcare providers are fairly well established, the introduction of EPRs can alter pre-existing workflows and introduce new types of cognitive challenges and unsafe workarounds. New and unanticipated sources of errors are beginning to emerge (Menon *et al.* 2014) such as changes in communication practices and patterns and an overdependence on technology (Brockstein *et al.* 2011, Tall *et*

al. 2015). Changes in communication practices and patterns and an overdependence on technology may also play a significant role in unintended errors. Menon *et al.* (2014) conducted a Web-based survey to elicit perceptions regarding the frequency and types of EHR-related serious safety events. 369 responses were received. The majority of the respondents (66%) worked for large hospitals and health systems with varying degrees of EHR adoption. More than half (53%) of the respondents reported at least one EHR-related serious safety event in the previous five years and 10% of respondents reported more than 20 events in the same time frame. The two most common types of EHR-related safety concerns identified by the respondents related to data display and open or incomplete patient orders. These were followed closely by failure to follow up on abnormal test results and wrong patient identification. Menon *et al.* (2014) attribute these to EHR workflow (63%), user familiarity with and training on the EHR (63%) and integration with existing systems (59%). Although the response rate for this study was low (15%), and by providing a list of potential EHR-related patient events could have biased the respondents, never-the-less, the findings raised awareness of how the introduction of EPRs can not only alter existing workflows and introduces new types of risks and implications for the organisation but the impact on time, accessibility and user satisfaction needs to be assessed as all these may play a significant role in unintended errors. Many of the studies to date were focused on measuring the intention of end users to use and accept the system, but people and technologies are linked in complex and dynamic networks. This implied that technology programmes should be studied at multidimensional levels: the macro level (for example, national policy, healthcare system, wider social norms, and expectations), the meso level, and the micro level (for example, particular experiences of patients and professionals). EPR system implementation in the clinical setting is not trivial and that research related to EPRs presents several methodologic challenges. Therefore it is more useful to study the process of socio-technical change than the implementation of a technology. Conceptualising electronic patient records dynamically, as components of a socio-technical network and employing user centred design

techniques might improve their chances of adoption and use (Greenhalgh *et al.* 2010, Cresswell *et al.* 2012, Takian *et al.* 2012).

2.5.3 The Tensions or Paradoxes

As much as electronic patient records can support both frontline and wider health professionals, the journey for the introduction of the EPR has been depicted as not been easy. There have also been reports of failed large scale ICT projects in healthcare (Cresswell *et al.* 2012, Takian *et al.* 2012). The EPR is seen as having a key role in the care model, however, also raises important practical, ethical, legal, clinical, technical, cultural, and financial challenges (Anderson and Walport 2010, Greenhalgh *et al.* 2010, Marckmann and Goodman 2006) that accompany its use.

The introduction of new technology often implies redistribution and not reduction of work (Star and Strauss 1999). There is also an exaggerated belief that the EHR will solve a lot and that an increased flow of information in itself will give improvement, however, implementation of EPRs might also have unanticipated consequences (Menon *et al.* 2014, Tall *et al.* 2011, Claret *et al.* 2011). There are dichotomies, for instance, poorly designed health information exchange systems disrupt workflow and increase the potential for errors, According to Thorn et al (2013), even when health information exchange systems are readily available, non-technical barriers such as restrictive access policies, impede use. In the study undertaken by Tully *et al.* (2013) there were some negative aspects to the creation and use of the details, particularly about medicines. Unfortunately, the shared electronic record did not provide a usable single source of data and information about the patient's prescribed medication. The data and information were available but they were just not together in the same place. Not only this, failure in the updating of the data in the medicine list due in part to a system anomaly had caused particular problems for the doctors. When data about all drug therapies were not always kept together, this frustratingly increased the risk of transferring errors. All data and information

are available to everyone with the authority to access the information, however, the information must be carefully summarised otherwise this could cause, for example, difficulties in tracking and understanding the patient's medication therapy. The United Kingdom (UK) study by Moore *et al.* (2011) also highlighted inaccuracies in the data available in the EMR, with 36% of records accessed containing an error in the medication listed.

2.5.4 Capital Investments - High start-up costs and high ongoing costs

Capital investments (Ochieng and Hosoi 2005, Cusack 2008, Jha *et al.* 2009, Christensen and Remler 2009, Menachemi and Collum 2011, Shank *et al.* 2012, Aoki *et al.*2014, Choi *et al.*2014) such as high upfront acquisition costs, ongoing maintenance and governance costs, as well as temporary losses due to disruptions to workflows and productivity when learning a new system were significant barriers for EHR adoption. Jha *et al.* (2009) reveal that the capital requirements are substantial and the positive effect on return on investment is unclear. The participants in Shank *et al.*'s (2012) study saw themselves as a minority group practice (behavioural health) and were worried that small group of practices would find the implementation of and use of EHR will be too costly in relation to the large overhead which electronic systems tend to bring into the overall expense of an office. These costs act contrary to the benefits provided by EHRs. For small to medium sized practices without large IT budgets, costs remain the biggest barrier to adoption (Rao *et al.* 2011). Among hospitals with EHRs, concerns over how the system will become outdated relatively quickly and concerns over future support with systems upgrade from the vendors is the commonly cited barrier to transitioning to EHR (Ochieng and Hosoi 2005, Aoki *et al.* 2014).

Slight *et al.* (2013) attribute the slow existence of EHRs in UK primary care and the hospitals for many decades to the inhibitory cost of EHRs and the uncertainty in relation to whether they can achieve a return on investment. To better understand the costs incurred during implementation and the factors that

can influence these costs, Slight *et al.* (2013) in their selected a range of diverse organisations across three different geographical areas in England that were at different stages of implementing three centrally procured applications, and did an evaluation of different forms of electronic health record (EHR) systems. They identified four main cost categories associated with the implementation of EHR systems. These are infrastructure (hardware and software), personnel (project management and training teams), estates/facilities (furniture and fittings) and other (consumables and training materials). It was felt that several factors impact on these costs leading to different hospitals selecting varying amounts and types of infrastructure, diverse training approaches for staff, and different software applications to integrate with the new system. The associated costs (Slight *et al.* 2013) of an EPR system not only include the actual purchase, installation, and maintenance of the system but also the potential for future loss of productivity and efficiency. Such phenomenon can impact organisational outcomes and become a barrier to adoption when such items as financial and operational performance, as well as satisfaction among patients and clinicians who use EHRs are considered. Choi *et al.* (2014) undertook a study on cost-benefit analysis of electronic medical record system at a tertiary care hospital provide some comfort in that an analysis based on an 8-year study showed EMR to be financially cost-effective. Choi *et al.*'s study supports the view of Handel and Hackman (2010) that although costs are a significant barrier to implementation, the savings realised after the implementation of such a system can be substantial.

2.5.5 Size of hospital/organisation and EHR implemented

Studies (Claret et al 2011, Thorn et al 2013, Encinosa and Jaeyong 2013, Aoki *et al.* 2014) suggest that EHRs have the potential to significantly improve the performance of hospitals, assisting physicians to manage patients with complex chronic conditions. In a study by Ginn *et al.* (2011) financial position was used to shed new light on the adoption of EHRs. Ginn *et al.* (2011) put forward a set of hypotheses that hospitals in better financial position with regard to liquidity, profitability, leverage, asset utilisation, and human resources efficiency will be

more likely to adopt EHRs. Acute care and short-term stay general hospitals were their focus. They suggest that the size of the hospital and its environmental context are significant issues and that hospitals adopt EHRs as a strategic move to better align themselves with their environment. Thus EHR adoption is not so much a financial decision as a strategic decision. Significant clinical outcomes may ensue from EPR adoption for larger hospitals, especially with a high acuity case mix and large numbers of patients with complex medical problems (Park and Lee 2014).

Elnahal *et al.* (2011) used logistic regression models to determine the frequency with which hospitals in each group adopted individual EHR functions and met meaningful use criteria, and factor analyses to examine adoption patterns in high- and low quality hospitals. High-quality hospitals were more likely to have all clinical decision support functions. High-quality hospitals were also more likely to have computerised physician order entry (CPOE) for medications compared with intermediate- and low-quality hospitals. Elnahal *et al.* (2011) found higher rates of adoption of key EHR functions among high-quality hospitals, suggesting that high quality and EHR adoption may be linked. This was also supported by Jha *et al.* (2008) and Menachemi *et al.* (2008). For hospitals seeking to improve care, focusing on specific electronic health record (EHR), functions, particularly order entry with clinical decision support, is likely a key part of achieving high-quality performance. These findings illustrate the difficulties of adopting and integrating technology into clinical practice and the slow and low rate of EHR adoption (Park and Lee 2014) despite the potential of the systems. Park and Lee (2014) highlight the need to support small hospitals in rural settings.

Jones *et al.* (2010) conducted a longitudinal study to estimate the relationship between quality improvement and electronic health record (EHR) adoption in US hospitals using primary survey data about hospital EHR capability. Seventeen measures of hospital process quality across three clinical conditions

that were common in both years of the Hospital Compare database were selected. Eight of these measures were for processes related to the treatment of acute myocardial infarction (AMI), four for processes related to the treatment of heart failure, and five for processes related to the treatment of pneumonia – three common clinical conditions. The dependent variables used for analysis were the three composite measures of hospital process quality for AM1, heart failure and pneumonia. To delineate between EHR systems that offer more advanced functionalities and those that do not the researchers used the 3-tiered framework (no EHR, basic EHR, and comprehensive EHR) for classifying EHR capability (Jha *et al.* 2009) based on the presence or absence of 24 EHR functionalities. Fisher exact test was used to adjust for baseline differences between hospitals with different EHR capabilities and hospitals were assigned indicators based on the quintiles of the propensity score distribution. The findings showed that hospitals that maintained a basic EHR realised significantly greater improvement in their heart failure quality scores (increased improvement, 2.6%). Hospitals that maintained a basic EHR experienced similar increases in AMI and pneumonia quality scores compared with hospitals that did not, and quality scores in hospitals with an advanced EHR did not improve significantly more or less than quality scores in hospitals without an EHR. Among hospitals that upgraded their basic EHR capability, AMI and heart failure quality scores improved significantly less compared with hospitals that maintained their basic EHR. Quality scores did not improve significantly more or less in hospitals that adopted a basic EHR and one that did not adopt an EHR. In the hospitals that newly adopted an advanced EHR, AMI and heart failure quality scores improved significantly less than in hospitals that did not adopt an EHR. Overall the findings were mixed and indicated small gains. In a recent study, Jha *et al.*(2009) highlight that between 8 percent and 12 percent of U.S. hospitals reported having a basic EHR, with fewer than 2 percent of hospitals possessing a more comprehensive system. The literature also indicated that larger or system-affiliated hospitals are more likely to have implemented an EHR system (Ford *et*

al. 2010). This can be explained by their easier access to the large financial resources required.

2.6 Reasons Why This Study is Necessary

The objective of this literature review was to identify, analyse, categorise and discuss the existing findings on EPR adoption and use in hospitals. To capture the existing knowledge on EPR adoption and use in hospitals it was significant to know which factors are seen as important in the literature. This could contribute to greater insight into the underlying patterns and complex relationships involved in EPR adoption and use, thus, assisting in identifying ways to facilitate successful EPR uptake. The intention of the literature review was to identify factors that determine progress and uptake of EPR in hospitals, however, the findings were mixed. There were many tensions and facilitators to EPR adoption. The majority of studies were from the US. Transferability to the English context may be an issue acknowledging the different healthcare system and socio-political context. The definitions of EPRs (Chapter 1, section 1.3.1) were many and varied and a range of different technologies and capabilities of components was examined. These were also explored in a variety of implementation settings. Most of the studies were focused on single small-scale implementation of EHR at successive stages.

The literature reviewed reflected that the implementation of the EPR system is a complex undertaking of successive stages and the uptake of EPR system in hospitals is still low. Its adoption is significantly associated with hospital size and affiliation. In spite of the significant benefits likely to flow from the adoption of EHRs, only a small percentage of hospitals have adopted them. Issues regarding adequate capital investment, user support and technology fit for the work processes are persistent factors in EPR adoption. In trying to explain the variations in its adoption, the use and types of EHRs are varied and are dispersed across many different clinical contexts. Different research paradigms (Hendy *et al.* 2007, Greenhalgh *et al.* 2008) with different ontological and

epistemological underpinnings (Weaver and Olson 2006) were used for the studies undertaken.

Hospitals are complex organisations, composed of highly varied structures, processes, have multiple objective and a varied workforce. In trying to understand EPR adoption and use, it is relevant to recognise that everything is connected: the EPR system itself (both hardware and software), the work processes, and everything related to these (e.g. social conditions) and the end users. Several authors such as Greengalgh *et al.* (2010), Tall *et al.* (2011), Cresswell *et al.* (2012), Takian *et al.* (2012) and Menon *et al.* (2014) indicate that an EHR implementation is not just a technical project and that existing work practices will change due to the new system. The crucial factors identified are the usability of the technology and alignment with work practices. This will require studies that really capture the extent to which the EPR system is used in patient care delivery. The findings support that distinguishing between technical availability and reliability, and the user-friendliness of the software is no longer adequate but that an EPR should be easy and efficient in use and provide the functionality required for healthcare professionals to deliver good care.

In United Kingdom, as in many other countries, the prevalence of long term conditions is increasing (Greenhalgh *et al.* 2010). Budget for service provision is falling (Greenhalgh *et al.* 2010). The public investment in an information technology infrastructure such as the EPR system in healthcare was premised on the assumption that EPRs use would enable healthcare delivery organisations to improve the quality and efficiency of care. Electronic medical records are becoming an integral part of healthcare delivery (Patel *et al.* 2015, Menon *et al.* 2014, Perry *et al.* 2014, Greenhalgh *et al.* 2010) and are essential to provide interoperability and enable the electronic movement of health related information among points of care in accordance to nationally recognised standards. In Wales, the electronic patent record system has been designed, pilot implemented and full advantage of the capabilities offered by the technology

should be taken to meet the needs of the healthcare sector. This is one of the most important considerations in clinicians' adoption and use of an EPR. In all the phases from design of the system, implementation and to adoption, the critical and predominant issue pertains to the usability of the system, to ensure that the human–computer interface is readily usable to avert complete failure upon deployment. The users of the EPR can significantly influence the eventual magnitude of impact of an EPR during system development, implementation and deployment. Therefore motivations, concerns and barriers for using a new system need to be identified, discussed and systematically targeted as early as possible. Few assessments of the impact of an EPR on clinical work have been reported in the literature.

A pilot implementation is an activity undertaken in the context of systems development and implementation to test a system in a realistic setting and thereby learn about the fit between the system and its organisational use situation and about changes necessary prior to full-scale deployment. The pilot implementation was conducted in the intended use environment, the EMAU, an unscheduled care unit and using real data and as part of the IHC project. The findings from the literature reviewed demonstrate the value in investigating the compatibility of the EPR with care practices. For this study I have decided to focus on the clinician user as the unit of analysis because the individual is most directly impacted by the EPR. Since the EPR impact is manifest through the clinician user of the system and not directly through the patients, it was deemed relevant to explore the impact of the EPR on clinician practice patterns rather than the impact on patients. The influence of the EPR on a patient is not independent of the clinician who is using the EPR and thus the undertaking of this impact study in the real clinical setting. Given the scale of investment required to implement an EPR system in a healthcare organisation it will be an expectation for all healthcare professionals involved in the care for their patients to use the system at adoption stages. 'Adoption' is conceptualised as the process of using the technology, from initial trying out to more embedded use. This can

be a decision taken by the healthcare professional to make full use of the EPR at the best course of action available (Rogers 1995).

Individual, technical and organisational factors such as systems of care, culture, clinical skills of providers, hospital resources, or patient characteristics may in part contribute to observed differences in achievement of performance measures and outcomes. However, given the high level of complexity and integration required of EPR systems and their rapid development and implementation, there remains significant untapped potential in how EPRs are currently adopted and used. In order to facilitate actual use of an EPR to support clinical practice, it is therefore important for more studies to explore on the usefulness of the EPR. With the current EPR deployment, it would seem appropriate now to explore the perceptions of end users. It is important that the design of the study consider the interrelatedness of the dimensions discussed in my literature review.

There is a paucity of information on the impact of implementation of EPR in the EMAU. There have been no studies providing insight into real user experiences with the EPR system in action in Wales. As the Welsh EPR system was pilot implemented in the EMAU and with plans to log roll the EPR system to all unscheduled care settings, here was an opportunity to learn about how end users appropriate and use the system; and how the system performs in a real environment for collective healthcare delivery. This stream of research exploring whether end-users will actively accept and use a new technology system before it is deployed or when it is introduced has been the focus of interest for many researchers

Theoretical frameworks provide a way of thinking about and looking at the subject matter and describe the underlying assumptions about the nature of the subject matter (Boonstra *et al.* 2014). Some of the studies reflected in the literature review utilised a theoretical framework, for example the Technology Acceptance Model (TAM) (Davis 1989), the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh *et al.* 2003) or the

sociotechnical approach (Takian *et al.* 2012, Cresswell et al 2012). The Technology Acceptance Model (TAM) (Davis 1989) is a tool for defining and testing the intentions of individual end-users to use information technology or explain actual use of IT. TAM is based on the Theory of Reasoned Action (TRA) and proposes that individuals' perceptions of a technology's usefulness and ease of use are key contributions to technology usage intentions. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.* 2003) advances the TAM model by incorporating 32 constructs from 8 models of human behaviour theory and uses constructs such as performance expectancy (PE), effort expectancy (EE), social influences (SI) and facilitating conditions (FI) as influencing intention to use and actual use of IT. This variable is considered as a proxy to actual use. In these quantitative studies, the nature of actual use received very limited attention.

The sociotechnical approach focuses on both on the social aspects of an EHR implementation and on the technical aspects of the system (Greenhalgh *et al.* 2010, Cresswell *et al.* 2012, Takian *et al.* 2012). These authors advocate a socio-technical approach and multi-dimensional level studies into technology programmes. This is a sociotechnical study, so measuring the intention to use a system or acceptance of the system would be limiting. It would be more beneficial to know the actual and nature of use, of whether or how the system is supporting user activities, patients' care needs and professionals' workflow. The pilot implementation offered the opportunity to contribute to an understanding of the actual use of the Welsh Individual Health Record (IHR) (national electronic patient record) by its end users in the place where work happens and extend the themes identified in the literature review. This study seeks to fill this gap and the use of a qualitative case study research to understand the users' perspectives would be more beneficial (Chapter 4).

2.7 Summary of Chapter

The number of EHR implementations in hospitals is growing, as well as the body of literature on this subject. In this chapter I have provided an overview of the existing literature with regard to the complex relationships involved in EHR implementation and the significant factors that should be considered to facilitate EHR adoption and use in hospitals. In this chapter (section 2.5) I have justified for why the study is necessary by taking into consideration that the EPR impact is manifest through the user of the system.

CHAPTER 3: THE THEORETICAL FRAMEWORK

3.1   Complex Adaptive System (CAS) theory

The literature review (Chapter 2) provided an insight that the adoption of the EPR technology into healthcare work practices is not without its problems. It would be misguided or naïve to assume that clinicians will simply take advantage of the apparent benefits afforded by the new technology or that the technology itself could bring about such changes. Analysis of literature review conveys that healthcare work is about co-production. This implies the existence of a human customer (patient), if not a human service provider (healthcare provider) and the many stakeholders. The EPR technology is an actor in the conduct of clinical work, showing relations between new technologies and the subjective, cultural and embodied aspects of working life. CAS theory aims to understand the structure and dynamics of complex systems. CASs are made up of interdependent agents (similar to the groups of professionals/stakeholders in the EMAU) that self-organise and co-evolve with their environment. Several divergent viewpoints (Nemeth *et al.* 2007, Ng *et al.* 2009, Greenhalgh *et al.* 2010, Talkian *et al.* 2012, Cresswell *et al.* 2012) have advocated for viewing healthcare not from a mechanistic approach but, instead from a systems engineering and human interaction perspectives. This study is focused upon linkages between people, the organisation (environment) and technology. Complex Adaptive Systems (CAS) theory was adopted as the theoretical lens at the data analysis stage (Chapter 4 and 9) rather than at the beginning of the research. My visits to the research site and the literature review have guided me to an appreciation of CAS thinking as a framework. As a lens, this theory can enable me to view and know more about the social landscapes on which the EPRs are used. Etymologically, complexity originates from the word 'complexus' which means 'entwined' or 'twisted together'. Complexity theory grew out of the observation that there are many phenomena that modern scientific analysis could not adequately describe or predict (Dooley and Van de Ven 1999). Complexity theory emerged as multi-disciplinary approaches to understand the behaviour of diverse, interconnected agents and processes from a

system-wide perspective. This theory has been assimilated into the public policy, information systems and strategic management under the pretext of organisational ecology (Plsek and Greenhalgh. 2001, Greenhalgh 2008). The main goal of complexity theory is thus to study the linkages or dynamic inter-related components, therefore, a useful lens within which to understand the use of the EPR technology by the multi-disciplinary team members within the Emergency Medical Assessment Unit. The employment of a healthcare ontology that is transdisciplinary (beyond a single disciplinary) and which considers healthcare systems as a complex adaptive system (CAS), requiring both integrative and adaptive approaches to deal with their complexity can provide a more insightful approach to understanding and managing system transitions in the workplace. Complexity theory can help to explain the way that agents, systems and environments interact and produce change.

3.2 Characteristics of Complex Adaptive Systems (CASs)

Complex adaptive systems can be characterised as living entities or organisms existing within a complex ecosystem (Kernick 2002). These living systems are not fixed but rather under conditions of continual change (Cilliers1998), grow, repair, adapt, reproduce and slowly evolve (Pascale *et al.* 2000, Kernick 2002). Interactions within a complex system produce largely unpredictable unpredictable change within the whole system or 'emergent behaviours' (Cilliers 1998, Burton 2002, Harkema 2003). The individual organisms within any ecosystem are independent and have their own identity, the living entities interact with the environment, coexist and are affected by it. Each agent is interdependent and linked to other components. The agents are dependent (Levin 1998) on each other for the maintenance of the whole system and therefore their survival. These agents are interacting in a dynamic way. Their interactions are typically complex, non-linear and are not easily controlled or predictable in detail. The complex patterns of interaction between the agents (Cilliers1998) can be likened to a web. These agents behave according to some set of rules, which require them to adjust their behaviour to that of other agents (Stacey 2003). As a

result of responses to these rules, orderly patterns of behaviour emerge in a process of self-organisation (Plsek 2001, Burton 2002, Englehardt and Simmons 2002). The behaviour of flocking birds and colony building termites had been cited as examples of such systems. Complex adaptive systems can be described using these terms of dynamical, non-linearity, simple rules, self-organising capacity, embedded co-evolutionary systems and emergent behaviours (Rouse 2000, Van Eijnatten *et al.* 2003).

3.3   Health Systems as Complex Adaptive Systems

Health systems can be understood as a complex service eco-system. These systems are composed of units or micro-systems or subsystems together with the agents (groups or individuals). For example the United Kingdom National Health Service (NHS) is a virtual system that exists within a net of corresponding and bigger systems, interacting globally, nationally and locally with the community at large and co-existing with the many subsystems like the hospitals, its various departments, general practices, community health centres, third sector organisations, schools and universities. The NHS is therefore not a single administration but a collection of bodies and organisms with vertical and horizontal connections. The systems are nested (Watts 2003) and **interconnected** (macro-meso -micro) (Folke and Folke, 1992). For instance, the NHS in Wales delivers services through seven Health Boards and three NHS Trusts in Wales. These variable components or building blocks, together with **diverse groups of people interact in a non-linear way** to achieve its goals and functions. The Emergency Medical Assessment Unit (EMAU) (which is the research site) can be perceived as one of these components (Nelson *et al.* 2008). In many ways the EMAU as a unit within an acute general hospital is at the intersection of many separate systems within its vicinity such as the Accident and Emergency (A&E) unit and other diagnostic units like Radiology and Haematology units. There are also links with the primary, secondary, tertiary care and community care services. Similar to the other units, the EMAU is a functional division or area of a hospital which delivers acute medical services

but yet is an interdependent unit which functions together with other units to enhance care delivery and improve patient outcomes. Each of these service units is dynamic and presents many challenges for effective communication as they are **open systems** with fuzzy and porous boundaries and consisting of several and diverse interactive agents (Cilliers 1998, Love and Burton 2005).

The healthcare system is an organisation of people, institutions and resources (human and non-human) aimed at providing healthcare services for a community and ensuring healthcare for all citizens. This comprises distributed activities of varying complexity at various organisational levels (macro, meso and micro) which are dependent upon many actors or agents (The Institute of Medicine 2000, Plsek and Greenhalgh 2001, Sweeney and Griffiths 2002, Crabtree 2003, Anderson *et al.* 2003). The human agents are the array of professionals operating within a non-linear network of professional disciplines (such as doctors, nurses, administrators, and allied health professionals). The agents though **complex and autonomous**, function in a net of relationships. The different professional groups, each with their own hierarchies, have differing rules, values and behaviours. These agents may be working towards the same organisational goal but as professional groups they possess different knowledge assets and different approaches to knowledge construction and dissemination. The primary loyalty of the professionals belongs to their profession rather than to the organisation (Shortell and Kaluzny 2000). Therefore they operate with different interests, complex delivery processes and with a diverse patient population and stakeholders to provide a vast array of treatment options bounded by rules and laws. These diverse agents provide increasingly specialised services to enhance care delivery and improve patient outcomes. They are key stakeholders and are dispersed around many geographical areas. These agents are connected to and interact through a complex web of relationships (Plsek andWilson 2001, Mitleton-Kelly 2007), with individuals (clinicians, patients and administrators), with organisations (General Practitioner practices) and nursing and medical processes and other functional units (radiology, haematology and laboratories.

Due to the many relationships the agents may have different or wide changing roles as CAS evolves and the environment changes. They are interconnected and their actions are dependent on local knowledge and characteristics of the other agents within or outside the system's boundaries. Non-linearity implies that a variety of behaviours are possible in response to a stimulus. Due to non-linear characteristics, small changes in one area can occasionally have large effects across the whole system. This makes it **difficult to predict the behaviour** of complex adaptive systems within various contexts in that one agent's actions affect the context for other elements (Hanson 1995).

The study of complex adaptive systems also describes how individuals and organisations interrelate, connect and change (Plsek and Wilson 2001, Tan *et al.* 2005). The movement of information between agents and between systems **emerging patterns** will in turn **feed back into the system** and further influence the interactions of other agents. Agents learn and change their behaviours accordingly as they experiment and gain experience, so system behaviour inherently changes over time. The behaviour is unpredictable resulting in surprising outcomes or **unanticipated consequences** (Hanson 1995). Such is the property of non-linearity (Rouse 2000, Styhre 2002, Ferlie 2007) and unpredictable (Anderson and McDaniel 2000, Reinhardt *et al.* 2004, Orr and Sankaran 2007) environment. As all systems are in fact comprised of subsystems, so every system is a "system of systems" (Hitchkins 2003: 80) it is relevant to recognise that there are multiple levels (micro, meso and macro) within systems when looking at the behaviour of a complex system as a whole. Not all can be attributed to the action of any one agent or elements of the system (Holland 1995). Macro phenomena emerge out of micro actions (Tang and Youmin 2006). So positive change can **start small, and snowball out to the rest** of the adapting system (Afek *et al.* 2009). To have an understanding of how parts at a micro-level in a complex system affect emergent behaviour and overall outcome at the macro-level (McKenzie and James 2004, Tang and Youmin 2006) our focus, therefore, has to move from the individual element of the

system to the complex structure of the system. At meso and macro levels large organisations and regulatory agencies can be involved (McDaniel and Driebe 2001). Complex adaptive systems such as our healthcare system have been described to possess these characteristics: 1) Large numbers of elements interacting in a dynamic way; 2) Rich non-linear interactions without a framework that controls the flow of information; 3) Complex, open systems are with positive and negative feedback loops; 4) Complex adaptive systems are under conditions of continual change; 5) Unpredictable change within the whole system; and 6) Complex patterns of interactions between the elements (Cilliers 1998: 3-5).

In the healthcare system, the people, technology, resources and clients are parts of the system. For example, the implementation of electronic patient record technology in the EMAU provided a window of opportunity to understand some of the processes through which healthcare work and the patient records are interwoven and how this computer-based technology is used and viewed by the professionals themselves. The causality of disease is complex (Plesk and Greenhalgh 2001, Tan *et al.* 2005) indicating that patient trajectories are unpredictable and create uncertainty for the healthcare professionals. Not only this, but for the patients the healthcare system can be visualised as complex with a large number of actors performing various tasks during any patient's trajectory. Proponents of CAS suggest that if health and social service providers are to meet changing demands and expectations from patients or users, the NHS has to be understood as an integrated whole. It means understanding the patterns of relationships among its agents (Cilliers1998, Stacey 1996, Wheatley 1992) instead of perceiving organisations as machines where parts can be dissembled and the component understood (Fuchs 2004, Ng *et al.* 2009), with the assumption that if each part was made to work better, then the whole would also work better. Such an approach makes an implicit assumption that the phenomena can be reduced in parts and the insight derived from the understanding of the parts will not change when the parts are re-assimilated with the whole. This

could be true if the parts are loosely coupled and weak connections but service systems involve diverse individuals who themselves are complex and adaptable. Therefore traditional theories consistent with reductionist or mechanistic approaches that assume cause and effect or linear linkages between separate details may fail to take into consideration the non-linearity and emerging traits characterising complex service systems (Badinelli 2000, Sawyer 2005, Tien 2008). These approaches will generate an objective feature of reality that does not capture the service interactions that a dynamic interpretation would yield.

When connections are strong, not only are parts to be understood on their own, but that their role as part-wholes in the whole system must be considered at the same time. When looking into service systems research it has been highlighted that the inner nature of service systems complexity, the dynamic interaction among numerous agents such as the behaviours in uncertain conditions and co-creation connected to resource integration (Vargo and Lusch 2008) have not always been captured in full. Systems thinking, that is adopting a wider perspective view can potentially offer a different set of insights (Ng *et al.* 2009). Theories to deal with patterns and principles are needed (Cilliers 2001). Complexity science can serve as a sense making tool (Edgren and Barnard 2012). For change success and sustainability, the CAS approach can offer a different steering logic and challenge taken for granted assumptions by prompting people to think in a less linear fashion to achieve a more complete picture of forces affecting the sharp end of practice.

3.4 The Emergency Medical Assessment Unit (EMAU) – A Microsystem

Before the development of EMAUs patients of all ages were accessing urgent or out-of-hours care via accident and emergency (A&E) departments. The surge in attendances, in particular by the presence of patients who do not need the services of a major acute hospital overwhelmed the A&E departments (Capewell 1996, Scott *et al.* 2009). These pressures were exacerbated by the changes in out-of-hours provision in primary care and workforce reconfiguration as a result

of implementation of the European Working Time Directive (EWTD) for clinical staff. This reduction in working hours and changes in shift patterns has been perceived to be inadequate to service the needs of patients, 24 hours a day, 7 days a week (24/7).

Then, acutely ill patients were often admitted and directed to wherever there was a free bed elsewhere in the hospital (Mather 1998). As the clinical condition of acute patients can deteriorate unpredictably at any time, The Royal College of Physicians' Acute Medicine Taskforce (2007) in their report entitled 'Acute medical care: The right person, in the right setting – first time' deemed such provision of care to be inefficient, unsafe and impractical for 24/7 acute medical care when medical and nursing staffing as well as the need for access to diagnostics were taken into consideration. There were also the political demands for shorter waiting times in accident and emergency (A&E) departments and improved efficiency in the admission and treatment of acute medical admissions. As a response the NHS Plans (DoH 2000), specifically recommends that assessment and admission wards to be established within National Health Service (NHS) district general hospitals (DGHs) across the United Kingdom (UK) to improve system performance and the patient experience. Delivering Emergency Care Services: An Integrated Approach for Delivering Unscheduled Care in Wales (WG 2008) identifies the EMAU as one of the multiple points of access where people can receive an assessment appropriate to their needs that will follow them through to the next stage of care. Hence, the development of EMAU was a political and strategic response to pressures on bed capacity in NHS medical wards (Capewell 1996, Hampton and Gray 1998, Wood 2000, NHS Modernisation Agency 2001) and founded on improving patient safety (AoMRC 2007, NICE 2007, NCEPOD 2007). Since its establishment, the EMAU has evolved and has become increasingly more complex (Vardaman *et al.* 2012). The evolvement of EMAU depicts self-organisation and adaptation as the NHS redirects its internal processes to become more responsive to bed

capacity. This has been the results of on-going system-wide adjustment to external demands and internal capabilities.

For this study, the EMAU selected is a microsystem, nested within a large acute district general hospital served by one of the Local Health Boards (LHBs) in Wales. Working within the EMAU are different professional groups who work together with a shared clinical purpose to provide care for a population of patients. As described by Wood (2000: 197) the setting's clinical purpose is to provide for:

> *... the assessment and initial treatment of*
> *acutely ill medical patients referred by their General*
> *Practitioner, local A&E [accident & emergency]*
> *department or emergency ambulance.*

The unit provides "front loaded" care to patients who present to, or from within hospital. The patients are admitted often out of hours and at weekends. They can be short stay patients, older patients, complex needs patients and ambulatory care patients with a range of undifferentiated acute illnesses requiring close supervision and monitoring. The patient's medical conditions can deteriorate unpredictably and requiring emergency or urgent specialist care (Royal College of Physicians 2007). The quality of the first 48 hours of acute medical care is an important determinant of clinical outcomes. The alignment to competent clinical decision making will guarantee the quality of acute medical care and a 'one stop shop' for certain clinical presentations (Alberti *et al.* 2005). As many patients with acute medical illness will complete their care within the EMAU, the patients should get access to a competent clinical decision maker as soon as possible so that those who require more specialist on-going care as guided by defined pathways will be streamed to the specialist bed base within the hospital network (DH 2006).

The EMAU selected for this qualitative case study is nested within a larger (Local Health Board) system. The District General Hospital (DGH), has more

than 3,400 staff and approximately 774 beds and serves a population of more than 600,000. It provides a comprehensive range of hospital services for inpatients, day cases and outpatients to support the entire catchment area that it serves (LHB information). The EMAU as a relatively new component has lots of interfaces with horizontally connected subsystems. It coexists with other microsystems, such as the accident and emergency department, critical care units, medical, surgical wards and diagnostic facilities to deliver integrated care. Interdependencies within the systems require essential components that include the clinicians and support staff working in partnership, information and technology, the specific care processes, and the behaviours that are required to provide integrated care to its patients (Batalden *et al.* 2007). These are to facilitate rapid access to specialist in-patient care in order to reduce unscheduled hospital admissions, provide patients with a safe supported recovery and the patients spending less time in the hospital system. The Unit's intention is to ensure that all patients can be confident that acute medical care is of the highest quality wherever and whenever it is needed. In August 2008, it was publicly reported that the EMAU has become the first to pilot the use of the individual health record (IHR) for patients admitted in an emergency (Western Mail 2008) The IHR has previously only been available to General Practitioners working for the out-of-hours service. The Implementation of the IHR was the first step towards such technology being integrated across the health service. Being an adopter gave the DGH the opportunity to influence the project and receive support from Informing Healthcare that would not be available later. If the pilot at the EMAU proves successful, the IHR will eventually be rolled out to other hospitals across Wales. The DGH expected the investment in the IHR to reap a number of benefits such as helping to speed up patient treatment and reduce potentially harmful medication mistakes in hospital, improving patient safety, quality of care, especially in the acute situation, better coordination and efficiency of care with faster patient throughput and fewer unnecessary hospital admissions. This illustrates why adopting a complex systems perspective for this study is useful and why it remained significant to understand the complex

aspects of the healthcare domain, the key challenges and the components of the healthcare value proposition from the healthcare providers' perspective.

Batalden and Mohr (1997) suggest that healthcare leaders and staff must understand the system's services, customer processes, inputs and suppliers as well as the different parts of the system in order to have a broad understanding of its involvement in implementing new innovations and integrating care. The CAS approach will strengthen the capacity to distinguish between a static, objective perspective of service systems and a dynamic, subjective one (Nemeth *et al.* 2007, Ng *et al.* 2009) and enable a richer understanding of reality. Therefore workplace studies exploring the adoption of electronic patient record through the lens of complexity theory can expose the relations between the electronic patient record, work and the healthcare professionals involved. Using a qualitative case study research and the Complex Adaptive System (CAS) which is agent based, micro, bottom-up approach lens can demonstrates how the EMAU as a messy, open, living complex adaptive microsystem (people, technology and environment) operates.

3.5   Reflexive Notes

This study explores how healthcare professionals and technology can play a key role in creating an environment where patient safety, efficiency and quality of care are top priorities. The focus is on healthcare professionals and IHR technology, an emerging application that was in early use in the EMAU. The EMAU environment is characterised by distributed, inter-dependent, episodic and non-linear work activities. The literature review (Chapter 2) which was undertaken on adoption of electronic health records (EHR) in healthcare organisations have revealed difficulties of integrating technology into clinical practice. The uptake of EHR technology in hospitals remained slow and low despite the potential of the systems. The difficult question is how to make these improvements. Questioning how and why have brought my attention to study the organisation as an integrated whole. By studying the intersection of the IHR

technology and work activities of clinicians in a complex environment such as the EMAU can help us better understand the care delivery process, workflow and interruptions that affect clinical work. The lens that we use to investigate any phenomenon has a profound effect on what we can see. These lenses, or mental models, dictate the variables of interest and the particular pattern of relationships that we notice. This study explores the use of the electronic patient record (the Welsh Individual Health Record) by multi-disciplinary team members within one emergency medical assessment unit in Wales. Studying a system as a whole can be a daunting task, not least using a new theory such as CAS theory. The Newtonian idea based on analysis, isolation, and the gathering of complete information about a phenomenon and of command and control and prediction and planning is incapable to deal with the complex interdependencies. Complexity theory suggests that the keys to understanding the system are contained in the patterns of relationships and interactions among the systems' agents (Anderson *et al.* 2005) and can provide an alternative lever in revealing the characteristics of complex adaptive systems (Cilliers 1998). A complexity science perspective used in combination with case study research can provide new insights of the system, of how organisations work (McDaniel and Driebe 2001, Waldrop 1992).

To date research into information systems and information communication technology have utilised theories of change, organisational culture, systems design, performance, user behaviour, leadership, networks, structure and agency, institutionalism and organisational ecology to inform our knowledge and understanding of the structure, processes, outcomes and experiences of healthcare information technology (HIT) implementations.

Why have we not seen more successful adoption of electronic patient records in healthcare? As none have been truly effective in explaining or helping to resolve the wide spread problem of EPR implementations, increasingly recent authors (Begun 2008, Greenhalgh *et al.* 2008, Takian *et al.* 2015, Cresswell *et al.* 2015)

are advocating for the application of complex adaptive systems theory to healthcare information technology. This is an exploratory study to explore the views and experiences of members of a multi-disciplinary team in relation to their use of the electronic patient record system that was implemented for work practices within the emergency medical assessment unit (EMAU). Adopting a CAS lens, contributes to different ways of thinking about the healthcare system (technology, multi-agents, patterns of interactions and ongoing adaptations) as a whole and can help in understanding the chaos (or entropy/unintended consequences) inherent in the NHS.

3.6   Summary of Chapter

This chapter has discussed complex adaptive systems theory and its characteristics and healthcare systems as CASs. The EMAU as a microsystem was provided and its role discussed to illustrate the complexity of healthcare work. The chapter has also provided the landscape to make the link for this study. Understanding the NHS as a CAS and acknowledging complexity in practice as well as taking into consideration the literature review (Chapter 2) findings, theories and suggestions proposed by recent scholars, I have justified for the adoption of CAS perspective for this study. CAS theory combined with case study research (Chapter 4-methodological considerations) can provide critical insights for understanding the views and experiences of members of a multi-disciplinary team in relation to their use of the electronic patient record system that was implemented for work practices within the emergency medical assessment unit (EMAU) and the NHS.

CHAPTER 4:   METHODOLOGICAL CONSIDERATIONS

4.1   Justification for Choice of Methodology

The first three chapters set the background. This chapter will explain the rationale for the qualitative case study approach employed to explore the multi-disciplinary team members' use of the electronic patient record system within one emergency medical assessment unit (EMAU) in Wales. The chapter will discuss the research process, including giving a justification for the choice of research methodology and the research design underpinning this study. The case study approach as used will then be described, including: the unit of analysis, the case selection process, the sampling process and how data were obtained and analysed.

On Wednesday 11th of March 2009, Professor Emeritus June Clarke, David Lloyd and I were participants at the Royal College of Nursing (RCN) conference entitled 'Moving technology into practice'. This was a conference to disseminate to the audience the developments in Wales, particularly the work of Informing Healthcare (now NWIS) for eHealth developments and the growing emphasis on nurse involvement in these developments at all levels. Our joint presentation focused on issues for considerations relating to the sharing of patient records, particularly on patients who may receive treatment in both England and Wales where different electronic records systems are being deployed which may not be able to share data and some of their significance for education and practice. David spoke about capturing nursing information through the use of a conceptual model whilst I discussed electronic patient record implementation and future directions. The challenges to clinicians, managers and to nursing education cannot be overestimated (Lloyd *et al.* 2009).

Prior to this conference, I was aware that the Welsh Individual Health Record that was envisioned had become available to General Practitioners working for out-of-hours service within a named Local Health Board in Wales. On the 18th of

August 2008, there was an announcement in the Western Mail that the Emergency Medical Assessment Unit within the same health board had become the first health board to pilot the use of the individual health record (IHR) for patients admitted in an emergency. The pilot implementation of the Individual Health Record in the EMAU sparked my interest as this was the first step towards such technology being integrated across the health service (primary and secondary care). It presented a prospect for an exploratory study into how the technological innovation is put in use by practitioners - a study in a natural setting and learning about the state of the art. There is a paucity of clinical research investigating issues particularly related to actual use of electronic patient records in emergency medicine. So valuable insights can be gained by exploring information technology related innovation in use in clinical practice, particularly in an environment which is highly pressurised, acute, emotional and often overburdened (Good and Driscoll 2015).

The research aim

The current study intends to explore the multi-disciplinary team members' use of the electronic patient record system within one emergency medical assessment unit (EMAU).

The research questions are:

- How will the multi-disciplinary team members' view the use of computers in healthcare?

- What kind of issues or factors motivated the multi-disciplinary team members to use the electronic patient record technology?

- What were the opportunities and barriers that influenced the multi-disciplinary team members' adoption of the electronic patient records?

- What policy interventions are required to maximise the benefits of IHRs and increase the healthcare professionals' use of the electronic patient record technology for quality improvement?

Information technology systems such as the electronic patient record technology have an applied orientation directed at improving practice (NHS Plan 2000, IoM 2000, WAG 2003, WAG 2014, WAG 2015). The underlying assumption underpinning the introduction of the Welsh Individual Health Record (IHR) system within the emergency medical assessment unit was driven by the promise of enhanced integration and availability of patient data, by the need to improve efficiency and cost-effectiveness. It was premised that improvements of information flow will translate into improved quality of care. The likelihood of achieving these precepts is dependent upon adoption of the IHR system, that the system will be used by the clinicians (users). In order to be able to work with an IHR system, these users must be capable of using the technology such as computers and have adequate knowledge and skills. Successful adoption is also influenced by capital investment (staff and resources) (Jha *et al.* 2009, Shank *et al.* 2012, Choi *et al.* 2014), clinician attitude (Ochieng and Hosoi 2005) and organisational culture (Brockstein *et al.* 2011). A 'fit' between the new technology with user (Davis 1993, Goodhue 1995, Bleich and Slack 2009, Unertl *et al.* 2012), organisation culture and workflow (Ventres *et al.* 2006, Claret *et al.* 2011, Takian *et al.* 2012, Inokuchi 2013) are also key factors as a system will only be used if it works without problems and that there exists adequate safeguards for patient privacy and confidentiality (Wu and Strauss 2006, Chan *et al.* 2010, Shank *et al.* 2012). The process of getting complex technology to work goes beyond technical development and installation per se. Its effective use is very much dependent upon its strategic exploitation by the organisation. The research aim and questions emerged from critical thinking about clinical practice and were considered to be relevant as an assessment through a literature review (Chapter 2, section 2.6) had revealed that interest in technological innovations, adoption and understanding the innovative behaviour in healthcare organisations remain low. The aim of this study was to explore the multi-disciplinary team members' use of the electronic patient record system within one emergency medical assessment unit (EMAU). This was an important and under-researched site for understanding how information technology, such

as the electronic patient records were used by the clinicians in the delivery of care. It was also the only site in all of Wales where I could have generated my data. It was the flagship and the pilot implementation site to test the Welsh EPR system in "real life" prior to full-scale deployment. As the pilot implementation was conducted in the intended use environment, that is an unscheduled care unit and using real data and as part of the IHC project, feedback from real-use experiences will provide a deeper understanding of how the system may support the users' work and what the users require from the system (Boehm 2000). Real-use experiences are necessary to learn about the fit between the system and its organisational use situation prior to full-scale deployment, especially in complex organisational settings where systems affect multiple interrelated stakeholder groups (Bossen 2007). As the literature review (Chapter 2) had highlighted that many efforts to introduce electronic patient records encountered adoption barriers, pilot implementations in this context are therefore, highly relevant to better understand how and what benefits might actually be attained through the end users.

4.2   Research Procedure

4.2.1   A Qualitative Case Study Approach

This study is focused on humans and their interaction with technology in a complex adaptive setting. I needed a research approach that can be used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context. Case studies are often discussed within the context of qualitative research and naturalistic inquiry. The purpose of a case study is the intensive study of a single case which may be an organisation, life, family or community (Bryman 2001: 55). The case study approach provides an empirical mode of inquiry for an in-depth and detailed examination of a phenomenon within a specific context (Yin 2003). It details a particular instance or instances that can be used to provide evidence or data for researchers (Maltby *et al.* 2010). The "distinctive need" for case study research arises "out of the desire to understand complex social phenomena" (Yin 2003:2). Qualitative case study research has

been employed in a number of disciplines: organisation, management as well as social studies (Denzin and Lincoln 2011) and with increasing interest within the information systems research community (Benbasat *et al.* 1987, Cresswell 2015). Benbasat *et al.* (1987) and Darke *et al.* (1998) highlighted that there are advantages and disadvantages associated with each research approach and that no approach is more appropriate than all others for all research purposes. The selection of an approach is influenced by the goals of the researcher and the nature of the research topic.

Case study research is an investigation and analysis of a single or collective case, intended to capture the complexity of the object of study (Stake 1995). The research approach can reveal the phenomena or relationships which are otherwise inaccessible. Stake (2000) identified three types of case studies:

• Intrinsic: The researcher has a genuine interest in the case and wants to generate a better understanding of it.

• Instrumental: A particular case is examined to provide information and insights on issues, or to refine a theory.

• Collective: Examined multiple cases to learn more about the phenomena, population or general condition.

Stake (2003) acknowledges that all authors and reports seldom fit neatly into such categories but they are useful for the purpose of explanation.

This study was more of an instrumental case study as the intention was to provide insight into an issue. Case studies are used to describe, explain and explore. In the contemplation of a qualitative case study research approach for this current study, I was drawn to the fact that there was no standard definition of a case study. I turned to the definitions and characteristics identified by these various authors (Yin 1984, 1994, Benbasat *et al.* 1987, Eisenhardt 1989, Darke *et al.*1998, De Vaus 2001). Taking into consideration the research aim and questions, these criteria (Table 3) were used as a checklist to judge the appropriateness of selecting this approach for the study.

Key Characteristics	Yes (√), No (X)
Phenomenon is examined in a natural setting.	√
Experiences of individuals and the contexts of actions are critical.	√
Data are collected by multiple means.	√
One or few entities.	√
The complexity of the unit is studied intensively.	√
Case studies are for exploration, hypothesis development, theory building, description. Research and theory at early formative stages.	√ (exploration and description)
No experimental controls or manipulations involved.	√
Set of independent and dependent variables not specified in advance.	√
Results derived depend heavily on the integrative powers of the researcher.	√
Changes in site selection and data collection methods could take place as the investigator develops new hypotheses.	Other sites not available.
Study of 'why' and 'how' questions –deal with operational links to be traced over time rather than with frequency or incidence.	√
Focus is on contemporary events or phenomenon.	√ IHR evolving area
Phenomenon is dynamic and not yet matured or settled.	√

Table 3: Key characteristics of case studies (adapted from Yin 1984, 1994, Benbasat *et al.* 1987, Eisenhardt 1989 and Darke *et al.*1998, De Vaus 2001)

In this **exploratory** study **the unit or case** to understand as a whole was the use of the EPR system by the multi-disciplinary team members and **the specific context** was the Emergency Medical Assessment Unit (EMAU) of a District General Hospital. As it was the first time, in Wales, that the issue of IHR adoption was being examined within the context of the emergency medical assessment unit, a case study research was perceived as a most appropriate approach to allow for the **effective tracing of phenomena over time**. The IHR technology is new, immensely complex and was introduced into a setting which is 'messy' rather than 'tame'. This idiographic research attempts to **understand a phenomenon in its context**. The case study approach can be used to provide a detailed investigation of this single unit, its groups and organisation in their pursuit of adopting the electronic patient record technology within a complex, context or setting, thus illuminating **a detailed understanding of phenomena**. I will be studying human, technological and organisational issues in a setting where I have **little control over variables**. In a situation such as this where

questions asked were about a contemporary set of events, over which the researcher has no control (Yin 1989), the case study allows the researcher to **examine the phenomenon in its natural setting and employ relevant methods of data collection** to provide **answers to the 'how' and 'why' question** associated with the study. Recognising and addressing the phenomenon of interest is important for the users and stakeholders of the EMAU as the literature review (Chapter 2) identified that the implementations of EPRs have not been straightforward, failed to achieve the hoped-–for benefits and in many cases implementations have failed as inputs were often transformed into unpredictable outputs. The qualitative case study approach can facilitate the exploration of people and the intricacies of organisational issues, of understanding culture, attitudes and behaviour (Kairuz *et al.* 2007, Kaplan 2001, Silverman 2000, Morse and Field 1996). The goal will be to familiarise the researcher to the health professionals' use of IHR system, their perceptions of the value of the innovation, the acceptability of the innovation as well as barriers toward innovation, hence, a case study research will be best able to reliably answer the research questions. The findings can provide an understanding of the use of the new innovation (IHR technology) through the eyes of the individual adopter /user (health professional). Case study research allows us to keep our eyes open and look carefully at individual cases: not in the hope of proving anything but rather in the hope of learning something practical (context-dependent knowledge). It is only through immersion in the messy details of the clinical workplace that we can expose the realities of cognitive work and elements such as stakeholder attitudes, organisational culture, standards and resources (Nemeth *et al.* 2007, Walsham 1993). The goal in case study research is to understand the boundaries of the case and the complexity of the behaviour patterns within the bounded system.

The implementation site, EMAU, is a particularly complex and dynamic healthcare environment. Technological change within organisations involves a complex set of interactions between the management process, technology and

organisation structure, therefore should not be interpreted as simply a matter of adapting to the impact of technology. Organisational characteristics should be given attention as they have important implications in the adoption process of an innovation and may well be reasons why full benefits of an innovation could not be realised. Understanding how the healthcare professionals in the EMAU use the IHR technology in the delivery of care is largely dependent upon understanding the organisation itself and its subsystems. The interpretivist or qualitative approach can pave a way for the researcher to understand the meaning of the technology to the individuals and their expectations around its use particularly with respect to their social, cultural, and work context from the participants' perspectives. This study is focused on a complex social phenomenon and in seeking to answer the research questions I will need to work with the users if to secure real life experiences. In the context of this study it is accepted that the technology and the workplace are complex in nature, therefore simple linear cause and effect relations become increasingly difficult to identify. I also believe that the users have previous knowledge acquired through their learning, an active process of part of their everyday work. In my role as a researcher my attempts are to understand the phenomenon through the meanings and accounts of these users according to their beliefs and value systems (Orlikowski and Baroudi 1991, Darke *et al.* 1998). Reality is therefore subjective and is socially constructed and interpreted by these users as social actors (Berger and Luckmann 1966). The strength of qualitative methodology is the study of human beings undertaking their everyday activities. The approach is mainly related to perceptions, social interactions, meaning and experience, therefore will be more appropriate for this study than the positivist perspective. The concept of Positivism is directly associated with the idea of objectivism (Wimmer and Dominck 2010, Cooper Wisker 2008, Schindler 2006, Buchanan 1998). As the positivistic worldview assumes a stable and predictable reality, the quantitative method will not be suitable to my research questions. The social world is not value free nor will the explanations be repeatable. According to this

position, the researcher's own beliefs have no value to influence the research study.

With this study, I was curious as to what happened to the IHR technology once it was implemented. I acknowledged that the IHR technology was part of the greater whole, however, my interests were in the relationships between human, social and organisational context (parts of the whole system) rather than strictly on the technology. The main thrust of this study was exploratory in which the researcher sought to illuminate and understand the multi-disciplinary team members' experience of using the individual health record technology in practice. Many studies (Jha *et al.* 2009, Boonstra and Broekhuis 2010, Greenhalgh *et al.* 2010, DesRoches *et al.* 2012) about the implementation of information communication technology and information systems have explained the low rate of adoption or failure of implementation through studying the people or the technology rather than the practice. Besides, most of these studies have been strongly influenced by scientific methods for understanding organisations where the analyses were focused on a small bit of the organisation such as the user or the technology in use and conclusions were then drawn as a whole. My interest was to explore a phenomenon in a real-life context and provide a clearer view of the phenomenon under study through explanation and descriptions (Stake 1995).

Empirical observations (Anderson *et al.* 2005) have drawn attention that many of the answers for understanding and improving health care delivery may be understood within the context of the organisation itself. Therefore a qualitative case study design can assist me in revealing new insights into the phenomena (Stake 1995, Yin 1994). Traditionally case studies bound the case and then study phenomenon within the boundary (Stake 1995, Yin 1994). The case study can be a powerful tool for increasing my understandings of what is going on between the people (multi-disciplinary team members) in the EMAU (an organisation) and the electronic patient record system. Case study research is an investigation

and analysis of a single or collective case. Its intention is to capture the complexity of the object of study (Stake 1995). As a study design, case study is defined by interest in individual cases rather than the methods of inquiry used. The selection of methods is informed by researcher and case intuition. Case study research makes use of naturally occurring sources of knowledge, such as people or observations of interactions that occur in the physical space (Stake, 1998).

The EMAU with its technology and users can provide for in-depth investigation and rich description of how insiders, users and inquirers view real life situations (Mellon 1990, Stake 1995, Patton 1997, Dowling 2007, Creswell, 2007, Denzin and Lincoln 2011). A qualitative case study is well suited for building a rich and deep understanding of any phenomenon about which little is yet known, or as applied to the evolving electronic patient record technology and its users, when existing research is confusing, contradictory and not moving forward (Barker *et al.* 2002). My case was the Emergency Medical Assessment Unit, located in an acute District General Hospital and the pilot implementation site for the national EPR system and the multi-disciplinary team members (users of the system).

There are several qualitative research methods which focus on understanding social phenomenon in their natural setting and cultural contexts (Myers 1998) such as action research, grounded theory research, phenomenological research, case study research and ethnography (Guba and Lincoln 1994, Creswell 2003, Denzin and Lincoln 2008). Case study research has been identified as a stand-alone qualitative approach (Denzin and Lincoln, 2011) and has a level of flexibility that is not readily offered by other qualitative approaches such as grounded theory or phenomenology. A case study research project, however, can provide data for building theory (Glaser and Strauss 1967) that contributes to existing knowledge by analysis from another perspective using the self as a research instrument. Grounded Theory is a method for the collection and analysis of qualitative data (Glaser and Strauss 1967, Straus and Corbin 1998). Orlikowski (1993) used grounded theory in early information systems (IS)

research because the method is useful in developing context-based, process oriented descriptions and explanations of phenomenon (Myers, 1997). Grounded theory provided a set of procedures for transcribing, coding and analysing data. In the method, conceptual properties and categories may be 'discovered' or generated from the qualitative data by following a number of guidelines and procedures. Analysis is kept to the data and provide for inductive discoveries about the phenomena under study. Grounded theory and its procedures are prescriptive, time-consuming and do not allow for method diffusion (Carter and Little 2007). Data analysis can be a particularly lengthy process. It could be argued that Grounded theory introduces the necessary rigour into the interpretive process. As a good deal of attention must be given to these procedures, the researcher cannot choose to by-pass this level of attention. Although the researcher can benefit in specific ways from the guidance provided by methodologies such as Grounded theory for example, the use of these methods without a full understanding of them or of their conjunction can be problematic. To fully understand grounded theory will require training followed by practical use of the method. The method is more prescriptive than others, however, the overall strategy is for formulating, articulating, analysing and evaluating their method. Grounded theory is directed to theory building from specific samples of data (Maltby 2010). So for this study, grounded theory was deemed less suitable when compared to the case study approach as this study was not attempting to generate theory out of data. The 'time' factor for the programme of study, the researcher's full time occupation and the difficulty of access to participants were also taken into consideration. Grounded theory can perhaps be identified as the next best alternative for this research. Each research approach has its raison d'etre and characteristic features, therefore which research methods are applicable are dependent on the questions asked (Carter and Little 2007).

Quantitative methodologies can be used with case study research. The researchers employ surveys, experiments and statistical analysis to test hypotheses and produce replicable finding. This study is not focused on evaluating the cause and effect and relationships amongst particular variables

(Mason 1996, Easterby- Smith *et al.* 2006). It is focused on investigating predefined phenomena, with no explicit control or manipulation of variables, testing of hypotheses or capturing information arrived at by means of statistical procedures or other means of quantification. Recent studies on electronic health record implementations (Greenhalgh *et al.* 2008, Takian *et al.* 2015, Cresswell *et al.* 2015) seemed to advocate and confirmed the suitability of adopting such an approach.

4.3   Selection of Case

Case studies can involve single or multiple cases (Marelli 2007, Meyer 2011). The selected case study site(s) should allow the researcher access to the group of individuals, the organisation, the processes or whatever else constitutes the chosen unit of analysis for the study. Access is therefore a central consideration. The selected case needs to be not only interesting but also hospitable to the inquiry if they are to be informative and answer the research questions. My selection of the case study site was heavily influenced by Informing Healthcare: Transforming Healthcare strategy (WAG 2003). The pilot implementation is conducted in the intended use environment, which is the EMAU, an unscheduled care unit and using real data and as part of the IHC project. This was a typical single case study, selected as it was at the leading edge of change, being the flagship for the Welsh Government's pilot implementation of the IHR system in Wales. The EMAU was the first unit in the secondary care setting receiving the new technology, to enable clinicians in secondary care to view the GP record, where the IHR was made available – a first in Wales. The deployment of the IHR technology which is new and complex raises human, organisational and societal issues which are multifaceted and are of academic and practical interests from a range of disciplines. The EMAU with its technology and users can provide for in-depth investigation and rich description of how insiders, users and inquirers view real life situation (Mellon 1990, Stake 1995, Patton 1997, Dowling 2007, Creswell, 2007; Denzin and Lincoln, 2011). It is well suited for inductively building a rich, deep understanding of any phenomenon about which

little is yet known, such as the evolving IHR technology and its users, to gain a new perspective on things about which much is already known or to gain in depth information that may be difficult to convey quantitatively (Strauss and Corbin 1990). The case was chosen because of its uniqueness, which was of genuine interest to the researcher wanting to gain an understanding of the clinicians' responses to new technology. In a purposive sample, typicality, variety, accessibility, and opportunity for learning are important selection factors (Stake 2005). A case study research allows a combination of data collection methods such as interviews, observation and use of documentary evidence (a detailed discussion will be found in section 4.5). It was this capability of handling a range of evidence (Collis and Hussey 2009) which made the case study a particularly appropriate approach to use for this study, enabling the researcher to analyse information conveyed through language and behaviour in natural settings and capture expressive information not conveyed in quantitative data.

4.3.1   Seeking Research Approval from Ethical Committees

Once the case study site was selected, how to gain access to the group of individuals and the organisation became a central consideration. A systematic approach to gaining approval (DoH 2000, WAG 2009) is imperative for any research endeavour. Permission for the study to be undertaken was initially sought from the School of Nursing and Midwifery Studies Research Review and Ethics Screening Committee, Cardiff University which gave a scientific view and undertook an ethics screening.

Before I could access participants, permission was also sought from the Local Health Board Research and Development Committee, where the participants for the study were located. Approval was also sought from the All Wales NHS Research Ethics Committee. The process of application for approval required the completion of relevant application documents using the Integrated Research Application System (IRAS) Version 3 .4. This was a daunting task for the novice researcher as the system was not easy to navigate initially. Information about the

study was provided and a copy of the research proposal accompanied each application.

Problem one was encountered with the Research and Development Risk Assessment Committee (LREC). This committee was the primary gatekeeper who had jurisdiction over whether the organisation will participate in the study. Where interpretive cases are concerned, interviews are arguably the primary data source. It is through the interviews that the researcher can best access the participants' views and interpretations of actions and events (Walsham 1995). For this study, the data was to be collected by me and it was planned that the interview will be no more than sixty minutes in length, however, this length of time was rejected when the proposed study was reviewed by the Health Board Research Risk Review Committee at their meeting on the 7th April 2010. The Committee felt that in relation to staff time, an hour for each interview was too long and should be reviewed. Despite two written clarifications to the Committee to plead for the proposed hour or at least 30 to 45 minutes in interview time, approval for the study was only granted (06 September 2010) on the basis that each interview be fifteen minutes long. The annual postgraduate study review panel was not happy with the fifteen minutes interview, so on the 25th of January 2011, with guidance and assistance of the academic supervisor, the Research Risk Review Committee was approached again to reconsider an increase of the time in relation to staff participation in interview. This was a stressful and anxious phase as approval was yet to be gained from the All Wale Research Ethics Committee (MREC) which was scheduled for the 10th of February 2011. This example illustrated the power differentials that can occur between researchers and formal gatekeepers. Approval not granted by LREC would impact on MREC not giving support to the project. Fortunately this was not the case as on the 9th of February 2011, the Research Risk Review Committee agreed to give a favourable opinion, on the basis that individual staff agrees to the requested interview time. Time was paramount when the research

project was for fulfilment of the higher degree programme. All relevant approvals were finally obtained prior to the launch of the study (Table 4).

Scrutiny Committee	Approval date
Research Review and Ethics Screening Committee, Cardiff University	05 / 03 / 2010
Local Health Board Research and Development Scientific Committee	06 / 09 / 2010
Local Health Board Research Risk Review Committee	09 / 02/ 2011
All Wales Research Ethics Committee	10 /02 / 2011

Table 4: Approval Committees

4.3.2   Negotiating Access to the Case Study Site

Primary access refers to the ability to get into the organisational system and to be allowed to undertake research (Brannick and Coglan 2007). Access negotiation is the process of dialogue between a researcher and the people in a target organisation (research site) to enable the researcher to gain entry into the organisation for the purpose of data collecting data. Access negotiation also applies to gaining the cooperation of participants in the field. It was relevant for me to know the case study site well and to work cooperatively with them. Gaining and maintaining access to participants and the research field in which they are located could not be taken lightly. The securing of entry into the organisations where the fieldwork will be conducted can be a challenging and time consuming task. It can be one of the pitfalls to successful research (Johl and Renganathan 2010) because when access to an organisation is denied the researcher is also effectively prevented from approaching the potential participants (Shenton and Hayter 2004). So the negotiation of access for this study started early in September 2009 before submitting applications for ethical approval and was iterative.

The process of negotiation involved a series of stages. The amount of time spent for gaining access to research sites and participants can vary accordingly. As

most qualitative research approaches require researchers to develop, maintain and terminate relationships with research participants and site, getting close to the object of study (Gummesson 2000) is a necessity and it was hoped that not only was the selected case be not only interesting but also hospitable to the inquiry (Crowe *et al.* 2011). The researcher is the research instrument, so having knowledge of the research field and becoming acquainted to the multiple levels that are hierarchically related to the research participants can be useful for facilitating entrée.

I was an outsider to the organisation and have to bear in mind that no researcher has an automatic right of access to any organisation (Bell 1999). So prior to making that first contact to negotiate access for the research, it was necessary to anticipate complexity, the risks and obstacles that can jeopardise its success. I had to acquaint myself to the case site as there was no room for complacency, accepting that access was by no means guaranteed. To assist with the process a research proposal was written. The proposal took into consideration several key factors. These comprised familiarisation with the literature, the aim of the study, the selection of a valid approach, identifying the benefits and feasibility of the study, the type of data needed, the time and resources required, who the participants will be and the degree of my involvement as the researcher. Using hospitals as a research site meant that key figures that I should be approaching (primary level gatekeepers) have to be identified as they are the individuals who can act as sponsors for the research, to authorise and connect me with key personnel in the field (intermediate level gatekeepers). The research proposal is a key document that has to be attached with the introductory letter as this first contact is normally the most significant because at this point collaboration either begins or ends.

To gain initial entry, I used a personal approach to secure an informal appointment with a gatekeeper at executive level. Bearing in mind that telephone calls to busy individuals will not be the best mode to present all information

effectively, contact was made via email communication. Email communication was used as it was quicker, more direct, tends to be less formal and the research proposal can be attached with it. Email communication may also be an attractive way to create interest for a follow up meeting. Obtaining executive level support in advance can act serve as an "ice-breaker" and afford the investigator a foothold in the organisation (Shenton and Hayter 2004). First meeting is a two way process offering the researcher and the executive manager an opportunity to discuss the feasibility of the study and mutual benefits in a collaborative way. It can foster the researcher to gain the access that is desired as well as ease the path to meeting key personnel (gatekeepers) at different levels of the organisation to build up a network of contacts to secure support for the study (Table6).

Dates of visit to research site	Reason for visit
09 September 2009	Discussed the study and the intention to use Unit as the research site.
14 September 2009	Viewed the IHR in action.
15 October 2009	Met with Senior Managers (gatekeepers) and discussed the study.
29 March 2011	Met with new Senior Nurse and discussed the study and gained assistance with the recruitment of participants.

Table 5: Negotiating access to the Emergency Medical Assessment Unit

Access agreements have to be negotiated separately and formally with the Research and Development Unit. As NHS organisations are charged with the responsibility for ensuring that all research undertaken within their sites are scrutinised and approved by the Local Research Ethics Committee (LREC), the process for access application has become more rigorous and time consuming. This involved completion of documents and email exchanges. It can no longer be taken for granted that access to research site and participants will be automatically granted even though the project has received ethical approval. For this project access agreement was applied and gained in April 2011.

4.4   Sample and Sampling Method

The focus of the study is to achieve an understanding of how the health professionals interact with the IHR system in the course of conducting their work. The major purpose, then, is to learn about how users appropriate and use the system and how the system performs in a real environment. Experiences from these activities are fed into the finalisation of the technical development of the system and into preparing full-scale organisational deployment. Organisations are social settings within which human voices have always had a place. In most organisations, the largest information repository resides in the heads of the people who work there (Coiera 2004) and consequently, the value of any clinical technology system can only be reviewed with reference to the social context in which it is used and those who use it (Coiera 2000). This study employed purposive sampling. Purposive sampling is when some people from a pre-specified group or events of particular interest to the researcher are purposely sought out and sampled (Seale *et al.* 2004, Watson *et al.* 2008).

A purposive sample facilitates the selection of participants who display a specific feature or characteristic necessary for the research outcomes (Silverman, 2008).

As the study sought to produce a sample that is information-rich (Patton 2002), only the individuals who could inform the research enquiry (Streubert 1995) are to be invited. These informants are 'richer' than others, in terms of knowledge of the phenomena concerned and that these people are more likely to provide insight and understanding of the experience (Cohen 2002) for the researcher. In this case, only the healthcare professionals who have been involved and used the IHR technology in the EMAU were to be invited to participate.

Having gained ethical approval from the All Wales Ethics Committee (MREC), I visited the case site to launch the study but to discover that the IHR technology has been withdrawn. Despite maintaining an on-going physical access to the

research site during the period of seeking access and approval for the study, there has been no discussion that this was going to happen. This was a huge disappointment despite reassurances that talks are continuing with the other contracted General Practitioner (GP) systems providers in Wales. It became apparent that sampling was going to be problematic. The initial decision was not to pursue work at the site. It was heading towards not having a project after all. The setbacks experienced have illustrated how undertaking research is a complex, an unpredictable and uncontrolled process. Having gained official permission from all relevant committees to conduct the research does not mean your project is safe as problems may emerge at any time (Matthiesen and Richter 2007). Not only is the use of a case study approach not without limitations (De Vaus 2001, Lee 1999, Darke *et al.* 1998, Benbasat 1987, Yin 1984) but also the necessity to recognise the rapid pace of change in organisations and technologies as complex and problematic. Healthcare organisations and technologies are constantly in a state of flux so the subject of today is not necessary the subject of tomorrow, affecting phases of research work. This situation was totally out of my control. Time was of the essence and as there was no other clinical setting within the vicinity to approach as a new research site it was decided to undertake the study retrospectively. Mishaps can happen at any stage of the research journey and it was up to me to prevent it becoming a disastrous consequence as much time has been invested. The clinical unit was the first in Wales to pilot the IHR technology that was envisioned to be rolled out. The unit presented as an early case study of the IHR technology innovation, therefore it was still valuable to capture the views of the healthcare professionals. Rather than as imagined, the clinicians would have used the IHR technology and would be able to provide an account.

In a case study it is 'the case' which is the object of interest, therefore I attempted to interview all who had used the EPR within the case study site. So a purposive sampling strategy was adopted to identify the participants for the inquiry. This involved recruiting multi-disciplinary members who were

employees of the Local Health board, have been involved with the IHR technology and care processes within the EMAU and were willing to participate in the study. Snow ball sampling, sometimes known as network mapping (Watson *et al.* 2008) was used to identify healthcare managers and professional staff to explore views from differing levels in the system of work. As qualitative researchers tend to study naturally occurring populations or events, the rules of qualitative sampling are less rigid (Holloway and Wheeler 1996) unlike the random and probabilistic samplings required for quantitative methods which is reliant on statistical sampling procedures and seeks generalisation of findings. Morse (1991), however, recommends that it is still important to pay attention to sampling strategy to meet the trustworthiness of the study. The sampling must be both appropriate and adequate. The participants should be able to provide enough data to develop a full and rich description of the phenomenon (Morse 1991). For this case study research, the sample used was a retrospective sample and it was past a year on after the EPR system was 'pulled out' when they were interviewed. The case was the EMAU in one District General Hospital where the EPR was pilot implemented. As there were no other cases they were the only sample I could access and exhaust. Pilot implementations were conducted to learn about how a system may support its users in their work and, thereby, to create information and insight about how to improve the system, adapt the organisation, and capture the benefits of introducing the system in the organisation. Real-use experiences were necessary in order for organisational consequences and opportunities of the system to emerge and particularly in complex organisational settings where systems affect multiple interrelated stakeholder groups (Bossen 2007).

> *"It is the lived experience that presents to the individual*
> *what is it true and real in her life".* (Carpenter 1995:44)

No other option was available. This was the study's limitation with criticism levelled at validity, reliability, and trustworthiness of the study. The clinicians and professionals were used to reflection in and on practice. To enrich the researcher's interpretation of data, I did not only rely on multiple participants but

used a heterogenous group comprising of doctors, nurses and managers as well as seeking multiple forms of data (triangulation) (Section 4.5.2) to allow for the validation of each data source (Golden 1992).

The recruitment of participants was an active role for the researcher (Muchinsky, 2003). As opposed to being detached, it required careful planning and judicious use of both the case participants' and the researcher's time. I needed contact information so I could explain the project with particular emphasis on its implications to participants, deliver the participant information letter (Appendix 2) and arrange interviews. Generally intermediate gatekeepers' assistance and cooperation was sought to negotiate participant agreements. For me, these intermediate level gatekeepers were the first port of call and they were helpful to provide names of potential participants, introduced me around the EMAU and to some of the staff working in the unit. As a start, having access to some names and roles of individuals was necessary to aid and connect me (the researcher) to the appropriate people. These individuals can be key informants for the study. Securing intermediate gatekeepers' assistance can advance the progress of the research as they act as a conduit for access between the researchers and the participants (De Laine 2000) and can be both advantageous and disadvantageous.

Purposive sampling in qualitative research requires researchers to seek out and select "information rich" cases, such as individuals that provide the greatest insight into the research question. Intermediate gatekeepers know who among the healthcare professionals within their unit will have the knowledge to help the researcher. They are in formal authority positions and have the power to give whatever assistance that is needed if they are comfortable with the research and perceived opportunities for public relations. They have informal relationships with the participants and at the same time protect participants (Rossman and Rallis 2003). So it was about gaining the trust and acceptance of the intermediate gatekeepers and participants. The individual participants have to be

convinced to contribute data or to be interviewed as in the case for this study. It is crucial to realise that without them there is no study.

The recruitment of participants occurred in two stages. The first stage commenced in February 2011, after I had gained all ethical and site access approvals (Chapter 4.3.1 and 4.3.2). This involved travelling and making several opportunistic visits to the EMAU to provide potential participants with detailed information about the study and to invite participation. Letters of invitation and participant information sheets (Appendix 1) were distributed to consultants, unit managers, doctors and nurses working in the unit. These activities took place over three weeks and the visits were spread out in the mornings, afternoons and evenings to try to capture a range of health professionals. To assist me in selecting research participants, where staff encountered snow balled a name, I would follow up the individual to discuss the study. Snowball or chain referral sampling (Biernacki and Waldorf 1981) is a variation of purposive sampling. Morse (1991) calls this nominated sampling. With those who spontaneously volunteered to participate on the day of my visit, their details were taken and an appointment date and time agreed. Over the three weeks period a total of 18 potential participants were approached and nine agreed to be interviewed (Table 6). These were made up of five female and four male participants, aged between 30 to late 50 years, holding different roles and working within the unit as nurse managers, advanced nurse practitioner or have been involved in informatics roles with the IHR technology implementation on that unit.

Designation	Yes to interview	No to Interview	No Response	Reason
Consultant		•		Not involved with IHR
Consultant		•		No reason given
Senior registrar			•	
Unit /Ward Manager	•			

Deputy Manager (Night)	•			
Deputy Manager	•			
Deputy Manager	•			
Deputy Manager	•			
Advanced Nurse Practitioner (Day)	•			
Advanced Nurse Practitioner (Night) x 4		•		Not involved with IHR
Staff Nurse			•	No reason given
Pharmacist		•		No reason given
Informatics Manager	•			
Information Governance Manager	•			
I T Trainer	•			

Table 6: Potential participants and designations invited

The number of participants in qualitative research can vary substantially. A review of major studies which used qualitative methods revealed sample sizes which ranged from one (Kirkman 1997) to ninety five (Benner 1985, Darbyshire 1994, Streubert 1995). Morse and Field (1996) conveyed that thirty interviews are regarded as appropriate and adequate. DePaulo (2000), in a paper designed to guide market research using qualitative methods calculated the number of customer needs uncovered by focus groups and in-depth interviews using quantitative methods. DePaulo (2000) confirmed that few additional needs were uncovered after thirty in-depth interviews. Carpenter (1995) suggested sample size should be small so that each experience can be examined in depth, however, Silverman (1999:105) highlights that the choice of sampling in qualitative research is neither 'statistical' nor 'personal'. For this study sampling was guided by the research aim. The study was focused on the individual experiences rather than making the results generalised (Marshall *et al* 2013). In qualitative research, the interest is not the 'average view'. Therefore sample size is not

predetermined by rigid rules as with a quantitative study. The sample size with a qualitative study tends to be small due to the intensive and prolonged contact with participants and with a large volume of verbal data that must be transcribed and analysed (LoBiondo-Wood and Haber 1994). Therefore sampling will be guided by when the narratives become repetitive and no new data is revealed or the pool of people to interview is exhausted. Cohen's (2002) suggestion that sample size has to be considered against time scale for the study was also borne in mind. The limits or boundaries of the case are a defining factor of case study methodology (Stake 1995, Merriam 2009, Yin 2009). Research samples are bounded by the number of people involved in 'the case'. In this case study the researcher wanted to learn about how the EPR system had supported its users in their work. Therefore to capture the insight about how the system was used, the sample has to be able to provide real-use feedback.

It was initially considered that the sample size be large enough to reflect the characteristics of a heterogenous population (Holloway and Wheeler 1996) of healthcare professionals, however, the doctors and pharmacists were unrepresented (Table 6). To counter risk of bias with over or under representations (LoBiondo-Wood and Haber 2002), a second stage recruitment for potential participants holding these roles was undertaken. Obtaining and corroborating data from several sources will provide a broad overview of the subject area and reduce the disadvantages integral in the use of any single source or method (Long and Johnson 2000).

The consultants and doctors from the EMAU had not volunteered for the study despite contacts from the researcher personally, via email and telephone communications and through their departmental secretary as they had requested. The two consultants later responded stating that they had not used the IHR technology and wished not to be interviewed. There was one physician who had not responded despite three follow up email communications. These were names that were snowballed to me, those who had used the IHR and who were still

working in the unit. Having no response from them meant that the sample was exhausted as due to the withdrawal of the IHR system from the unit in the previous year, the current group of doctors working in the EMAU would not have been exposed to the IHR system, therefore would not have fulfilled the criteria for the study. At this stage it was decided to follow up those doctors who were still working within the Health Board, who have previously worked in the EMAU and had used the IHR system. The head of informatics of the hospital was contacted and a list of 12 potential participants was provided. These individuals were traced and invited to participate in the study with the exception of four doctors who had moved away from the participating organisation (Table 7). Contacting these physicians was not without difficulties due to compliance to the Health Board's information governance policy and the constraints of the bleep system. These physicians can only be traced by their bleep numbers. They did not have offices or direct telephone numbers. Physicians 1 and 2 were very cooperative and volunteered their email addresses to enable negotiation of interview appointments and for the participant information sheet to be despatched to them.

Designation	Yes	No	No Response	Mode of contact
Physician 1	●			Bleeped Email
Physician 2	●			Bleeped Email
Physician 3		●		Bleeped but unable to assist.
Physician 4			●	Bleeped Telephoned via secretary Letter & information sheet via secretary
Physician 5			●	Bleeped Telephoned via secretary Letter & information sheet via secretary
Physician 6			●	Bleeped Telephoned via secretary

				Letter & information sheet via secretary
Physician 7			•	Bleeped
				Tel. via secretary
				Letter & information sheet via secretary
Physician 8		•		Telephoned
				No reason given

Table 7: Second stage recruitment of physicians

As the pharmacist was persistently highlighted/snow balled as the staff member who had made extensive use of the IHR system, contact was made again by telephone and email communication to invite participation from the individual and department. A face to face meeting was arranged to discuss the study. On the ground that more detailed information was required, a synopsis of the research protocol was sent to the manager of the individual as requested. The department and the individual declined their participation stating that the study was of no interest to them.

Recruiting healthcare providers into research studies is particularly challenging because of providers' time and workload constraints, lack of interest in the research topic, sensitiveness of the research topic or ambivalence about the value and applicability of the research (Asch *et al.* 2000, Hummers-Pradier *et al.* 2008). Informant recruitment and participation are essential elements in the successful execution of research studies involving human subjects, however, this element often presents substantial challenges to researchers and can result in study delays. It is a laborious endeavour as I have found out and successfully recruiting even small numbers of clinicians required considerable perseverance and resourcefulness. For this study a total 11 interviews were secured. All participants were still working within the Health Board.

4.5   Data Collection Method

The research case study, though inherently challenging, can yield powerful insights if carefully conceptualised, thoughtfully undertaken and reported. In order to develop a thorough understanding of the case, interviews, documents and informal observations were used to provide contextual richness. The use of multiple sources of data (data triangulation) has also been advocated as a way of increasing the comprehensiveness and internal validity of any single study (i.e. the extent to which the method is appropriate to answer the research question) (Denzin 1978, Stake 1998, Barbour 2001, Mason 2002, Patton 2002). The underlying assumption is that data collected in different ways should lead to similar conclusions and approaching the same issue from different angles can help develop a holistic picture of the phenomenon. Lincoln (1995) and Mays and Pope (1995) propose that the triangulation of methods can reinforce authenticity and relevance as well as credibility, repeatability and transferability of the findings, however, Atkinson *et al.* (2003: 146) caution that triangulation should not be regarded as a 'procedural guarantee of methodological rigour and adequacy'. Stake (1995) on the other hand views the role of the case study researcher not as the discoverer of an external reality but as the builder of a clearer view of the phenomenon under study through explanation and with emphasis on 'thick' description. The purpose of case study research, in Stake's (1994) view is not to represent the world, but to represent the case.

Qualitative interviews were planned as the primary method of data collection. Interviews are more appropriate to collect the complex information about particular aspects of the subject as opposed to the use of survey techniques. It can be a powerful way to gain insight into people's issues through understanding the experience of the individuals (May 2008). Riessman (1993) advocates the use of an interview guide consisting of broad topics based upon the research questions. Good questions in qualitative interviews should be open ended, neutral, sensitive, and clear to the interviewee (Patton, 1997). A list of questions in the form of an interview schedule (Appendix2) was prepared and used to

guide the interview conversations. Earlier in the research process, a literature review (Chapter 2) was conducted. This review established what research has been previously conducted and led to refined, insightful questions about the problem. Guided by the literature review consideration was given to the types of questions that can be asked during an interview such as those based on behaviour or experience, on opinion or value, on feeling, on knowledge, and sensory experience. For example factors under the technical dimension relate to the design of the technology itself. Technical issues can play an important part in influencing adoption behaviour of users as they can lead to significant levels of frustration. Therefore questions that capture the users' views of computer use in healthcare can explore the user attitudes, beliefs, values and expectations of the technology (individual, organisational, political perspectives). Questions exploring the use of the EPR system can provide insight into the role of individuals and integration of the system into existing work practices (cognitive, affective and behavioural). As successful use of the EPR is highly dependent on the proficiency of the users and activities in relation to EPRs, questions exploring factors that influence and hinder use of the system can reveal the dynamics of the human, organisational and technical factors so as to provide a holistic overview of the issues, as well as an understanding of emerging risks and the potential consequences. This is to take into consideration that despite their benefits, EPRs also introduce new risks that can lead to serious safety events (Tall *et al.* 2011 Menon *et al.* 2014). Overall, the questions seek to determine how the system will impact the users on job performance (increase productivity, make work easier, accomplish tasks more quickly) and practice style (improve knowledge for patient management, improve quality of care delivery), to have knowledge of the compatibility of the EPR with existing clinical practices, prior experiences and healthcare professionals' values. Care was taken not to pre-structure the direction of enquiry within the researcher's own frame of reference. This was significant, taking into consideration criteria such as rigour, credibility and relevance. The interview schedule was to provide a starting point and the basis of interaction between the theoretical issues being

studied and the data being collected - to probe and explore within the inquiry areas. Attention was focused on areas of particular significance for the goals of the research (Lofland and Lofland 1984).

Interviews are essential sources of information for case study research (Yin 1994: 84). They are purely accounts which are elicited and performed, and the data have to be used and understood as an 'account' (Atkinson and Silverman 1997). The selection of data collection method to use very often lies with the one that is most likely to elicit the required data (Ritchie and Spencer 2003). In the context of this study, semi-structured in-depth interviews was suitable to explore the perceptions, opinions, meaning, definitions of situations, attitudes and constructions of reality (Punch 2005). Analyses of behaviour in qualitative studies involve discussions of how people experience and feel events in their lives (Beins 2004). So interviews were appropriate methods of data generation as the questions to be addressed involve the gathering of memories, opinions and impressions (Jones 1990, Rhodes and Brown 2005, Blaxter et. al. 2006, Holloway and Wheeler 2010). Atkinson and Silverman (1997: 304) suggest the interview is a 'prime means of data collection' and this remains the most frequently selected method when using qualitative approaches (McCance *et al.* 2001, Gill *et al.* 2008). At the most basic level, interviews are conversations (Kvale 1996) to understand the participant's experience and world from their point of view (Denzin and Lincoln 2005).

Holloway and Wheeler (1996), Wisker (2001) and Dawson (2006) highlight the types of interviews used in social research as: structured interview, the semi-structured, open ended interview and the unstructured interview. Unstructured interviews can be difficult to manage and to participate in due to the lack of predetermined questions which is unhelpful to the participants (Gill *et al.* 2008). For this study, qualitative interviewing using open ended questions were posed to facilitate in-depth discussions with participants within their natural surroundings and to allow for individual variations. This is a very useful method

for collecting data which would likely not be accessible using techniques such as observation or questionnaires (Blaxter *et al.* 2006) or where significant 'depth' is required, or where virtually nothing is known about the subject area, or a different perspective of a known subject area is required (Gill *et al.* 2008). According to Gorman and Clayton (2005) interviews using open-ended questions may lead to unexpected insights. They enable the researcher to explore and to understand why individuals or organisation behave in the way that they do, something that most quantitative research cannot really answer.

4.5.1   The Practical Issues

Qualitative research occurs in the real world context. This was the moment of entering into the actual lives of people in the organisation. Given the complex nature of qualitative inquiry, it is reasonable to expect novice researchers to feel some trepidation at the onset of negotiating the field. Patton (2002: 35) warns that qualitative research is "time consuming, intimate, and intense". Qualitative interviewing required that I establish access to and make contact with potential participants. Fieldwork served as a means to establish a network of contacts (Reeves 2010), however, the process of getting started and negotiating participation can be daunting and not an easy task. I was worried about undertaking this role as a qualitative researcher, of how I will manage this within a full time teaching job, how I would cope with the interviews and if I will have participants. These considerations of the relationship between the researcher, the research and the researched constantly crossed my mind. According to Atkinson *et al.* (2003), in real world research, undertaking qualitative research can be hard work as it involves an active and emotional engagement with a number of emotion-generating situations (Dickson-Swift *et al.* 2007) such as the research process, research site and the participants. Negotiating medical and pharmacy staff I found was harder than was expected.

The first interview commenced at the end of May 2011 and the last interview was completed in mid-August 2011. I was sensitive to the fact that health

professionals working within the Emergency Medical Assessment Unit are normally very busy and pressured and was grateful for their participation. When arranging the interviews, the time they could offer was respected. Most of the interviews were conducted face-to-face by the researcher with the participants at their convenience, during their working days: weekdays – during the night, morning, afternoon and evening. By asking the participants to grant access to their world, thoughts and feelings, I made certain that the rights of the individuals were protected to ensure they were not harmed, had informed consent and were awarded dignity and self-respect (Crouchman and Dawson 1995). Following Cresswell's (2002) guidance and standards to attain 'informed consent', the study was explained to the participants verbally as well as in writing. Accordingly cover letters explaining the purpose and scope of the study, voluntary participation, assurance of confidentiality, anonymity and information on how to establish contact were provided (Appendix 1) during first meeting and again prior to any interviews.

Cresswell (2002) advocates that signatures from both the participants and researcher illustrate agreement to the provisions as laid down by the researcher. The consent form (Appendix 3) was designed with this in mind and written consent was obtained prior the interview. Participation in the study was voluntary. No one was coerced to participate. The participants were free to choose whether to collaborate in the research activity or not. The participants were also informed that they are allowed to withdraw from the study at any time and with no repercussions. As all interviews were to be recorded using a quality digital recorder to guarantee a good recording, permission was also obtained to record the interview. Recordings have the advantage of capturing the data more faithfully than hurriedly written notes; as well as to decrease any misuse or misunderstanding of participants' answers or information. This was to aid in correctly quoting participants' words because it is easy to lose phrases and words used by the participants.

Safeguarding of confidentiality that includes anonymity towards the participant (Wiles *et al.* 2006) was fundamental in this information sharing relationship. Most of the interviews took place within the organisation's formal setting such as the participant's office, an empty office and in one instance in the seating area of an outpatients' clinic. This was the participant's choice. All participants were assured that they will not be identified, that all their responses will remain anonymous and the data recorded will be securely protected. As a routine a quiet room was requested on site within the EMAU for practicality, however, when I turned up for the interview it was to find that it was often not possible to secure a quiet environment.

The individual participants have to be convinced to contribute data or to be interviewed as in the case for this study. The researcher needs to behave in a certain way to access data such as being able to establish rapport with the participants. Gaining their trust and acceptance played a big role as without them there will be no study.

As the interviewer I have to adapt quickly to the surrounding, personality and mood of the person being interviewed, be knowledgeable about the topic, and be able to relate to the participants in terms of language and using vocabulary normally used within the sector being studied. I have to appear experienced or skilled, knowing when it is necessary to probe deeper, get the participant to elaborate, or broaden the topic of discussion. Above all, as the interviewer I had to be in control but yet not really in control in a surrounding which was not 'my patch'.

The Emergency Medical Assessment Unit was a very busy site, and the health professionals working there were very busy people. Gatekeepers have to be approached as gaining access was not a single event but part of an ongoing process that had to be revisited over the course of the fieldwork (Duke 2002). There were a couple of times when interviews have to be rearranged, interview

times delayed, interrupted or cut short due to the busy nature of the clinical setting. What the participants were concerned about was to be out there with their patients. The participants can give or withhold information. At the same time, a considerable part of the research process was struggling to reconcile with the rigor in carrying out research, the objectivity in research and the neutrality of the researcher.

Even with the presence of the interview schedule, the actual interviews were discursive. The use of question rejoinders such as 'that's interesting, can you explain that a little bit more' or 'just what or how do you mean' enabled the participants to provide accounts of events, their views and significant experiences of using the IHR system in their work. As the aims of qualitative research are to address questions concerned with developing an understanding of the experience dimensions of humans' lives and social worlds, this method of gathering data may prove to be much richer than surveys that are based on preconceived questions (Gerrish and Lacey 2006). With qualitative research, the findings are conveyed as textual descriptions. They should also position the findings in context (Popay *et al.* 1998), so as to illustrate the real world of the participants and their lived experiences. According to Kvale (1996) a good interview question should contribute thematically to knowledge production and dynamically to promoting a good interview interaction. The qualitative interviews provided a number of contextual factors relating to the use of the IHR technology.

Qualitative interviews can be recorded in various ways: notes written in context, notes written in retrospect, and audio taped (Britten1995). Audio taping requires transcription, which is time consuming and can be expensive whilst hand written notes may cause loss of detail. For this study all the interviews were recorded using digital recording equipment as this enabled me to focus on the conversation.

How researchers experience and think about fieldwork such as 'the multiple relationships between the researcher self, the field and the people of the field' was highlighted by Coffey (1999). The accounts I have presented demonstrate not only the practical challenges associated with the relationship between researchers, formal and informal gatekeepers and participants, but also some of the emotional and ethical dilemmas that researchers face. In the field every decision was fraught with ramifications and consequences that made them difficult. Field work required a lot of rapid learning. How we (researchers) make sense of the world and our interactions with others is an emotional labour. Coffey's (1999) statement made me aware that these emotions are subjective to the researcher but have implications for thinking of the rigor of the research and in terms of creating space for discussion of these feelings or issues amongst the research community. This aspect of emotional labour may influence our interpretations of participant's lives, the data we have collected and perhaps our professional and personal identity.

4.5.2   Documents and Informal Observations

In addition to interviews other forms of field data such as policy documents, evaluation reports, and publications were also secured for analysis. The intention of using documents as resources for data triangulation is to enable the researcher to support 'inferences' drawn from one set of data against data from another source (Atkinson *et al.* 2003, Hammersley and Atkinson 1995, 2007).

A research journal was also maintained of informal observations as observation data can be drawn upon to produce useful background knowledge for the research. Observation was adopted to understand a phenomenon by entering the community or social system involved. Observation is a complex research method to collect data and requires the researcher to play a number of roles. Observation, according to Gorman and Clayton (2005: 40) involves the systematic recording of observable phenomena or behaviour in a natural setting and can be a covert or overt activity (Becker and Greer 1982). Non-participant observation was adopted for this study. This involved the researcher observing

and staying separate from the activities being observed. When conducting my observations, initially I used my field visits to observe anything but everything as I do not know the research site. To observe the everyday life of the insiders (McKechnie and McKenzie 2001), I fluctuated between being a 'complete observer' and 'observer-as-participant' (Gold 1958). Adopting the complete observer (Gold 1958) or non-participation role (Spradley1980) or as an unobtrusive observer (Gorman and Clayton 2005) I was able to be present at the scene without interacting with the insiders, thus remaining detached which initially may be an important starting point for establishing future observations but has its limitations in the quest to understand insiders. The 14th of September 2009 was the first and last time that I was to observe the EPR system being demonstrated to a team of visitors to the EMAU. During the conduct of the study there was no opportunity to observe the participants using the EPR system to do their work or used with the patients as the system was 'pulled out' following the limited duration of the pilot implementation. The role of the complete observer and observer-as-participant were the only permitted ways to capture data about events in a natural setting as I did not have access to observe care or clinician-patient engagements. The observer-as-participant role arose when I was conducting interviews. I would report to the unit early and observe what was going on. For example, during one afternoon, I seated myself in the patient seating and observed adults of varied ages waiting to receive care. It has to be acknowledged that such brief encounters with insiders limit the opportunities for gaining knowledge of total situations. In this role, the researcher was able to maintain a balance between being an insider and an outsider and to interpret the data from a detached perspective. Observation requires the researcher's use of the five senses. The collection of detailed field notes is the key to successful non-participant observation. To secure rich and in-depth information I planned frequent visits the research site at varied times to observe and to meet insiders (conduct interviews: end of May 2011 – mid August 2011) by spreading these activities across the day (morning, afternoon and evening) and different days of the week.

The observation process was in divided stages (Spradley 1980, Adler and Adler 1984). Being an outsider to the organisation, initially broad scope observation to get an overview of the setting was undertaken and as understanding of the insider and the environment grew the observations became progressively narrower and until attention was directed deeper into the elements of the setting. My observations started from when I first entered the research site and ended with the last interview (September 2009 – mid August 2011). Notes were made detailing what I saw, who was/were involved, where and when. Adler and Adler (1994) suggested that observations present validity issues and should be made systematically and repeatedly over varying conditions even though the researcher may not be interested in generalising their findings. For instance I observed the layout of the unit, the physical places where patients and staff occupy, what activities were occurring and the atmosphere of the environment across the different times of the day and week. I was observing for a realistic span of tasks handled by the clinicians and unit, the services that were provided, the diverse backgrounds and workloads, the collaborations which may depict who and what are interrelated or involved in the use of the system and technological environment. Observation as data collection method can be an intrusion of an individual's privacy. Issues involving informed consent and invasion of privacy are paramount here. This highlights a more general point of the importance of avoiding the temptation to collect as much data as possible. It would be helpful to provide a rich description of the participants and environment, however, the level of detail may not always be feasible, for instance within a small unit where the participants would be easily identified. It is an ethical responsibility of the researcher to preserve anonymity in the final write-up and in the research journal. To prevent the identification of the participants in this study, I took considerable care in how the identities were described. This was to ensure that the EMAU members were not able to identify the participants.

4.6   Data Analysis

This research did not seek to generate numerical data or present clear cut hypotheses; the aim was to produce factual descriptions derived from the EMAU Data were collected and having transcribed the interview data for each interviewee I began to ask analytic questions of the data I had generated. Thematic analysis was adopted to identify, analyse and report patterns (themes) within data. As a tool, thematic analysis has the potential to provide a rich and detailed, yet complex account of data (Braun and Clarke 2006). It can assist the researcher to reflect reality, to untangle or unravel the facade of 'reality' and report experiences, meanings and the reality of the participants.

The prime aim is to describe and interpret what is happening with the multi-disciplinary team members and the Individual Health Record System in that particular healthcare setting. To assist me to think of the data, manage and analyse the data I was also guided by the principles of 'Framework Analysis' (Ritchie and Spencer 1993).   Although Ritchie and Spencer's five stages Framework Analysis (1993) was developed for qualitative data analysis in applied social policy research, it offered a means of thinking about the data, of organising data to ensure that links with the verbatim data are retained (Ritchie and Spencer 2003). Framework Analysis provided a flexible structure to assist with the organisation of data in ways that enabled the development of useful, interesting and defensible ideas and interpretation.

- **Familiarisation with the transcripts**

The object of analysing qualitative data is to determine the categories, relationships and assumptions that inform the participants' views of the world in general and of the topic in particular (McCracken 1998). This required that I immersed myself in the details of the interview to form an impression of the key ideas and recurrent themes emerging from the data. Coffey and Atkinson (1996) caution against seeing the process of analysis as a distinct stage or the end stage, but an iterative process of reflexive activity that informs data collection, writing and further data collection. Taking the advice of Coffey and Atkinson (1996),

the process of data analysis commenced during the data collection. I transcribed each interview as soon as it was finished as Lofland and Lofland (1995) suggest not delaying the transcribing until all interviews are done. During the transcribing I became familiarised with each interview transcript, thinking and reflecting upon the emerging themes. The notes were then read and re-read, again going through the data, annotating it and identifying objects of interests (coding the data). It is a process of defining what the data is all about. Codes were created as the data were studied.

- **Developing a thematic framework**

Coding has a significant role in qualitative data analysis. According to Basit (2003), coding allows the researcher to communicate with the data to facilitate the comprehension of the emerging phenomena. Inductive and deductive thematic analysis to interpret the raw data from interview transcripts and documents were incorporated. A deductive process of top-down coding based on a priori themes identified in the literature review was used as guidance for initial codes. An inductive, bottom-up coding based on key themes emerging from the raw data was not excluded as the data driven approach may be considered to have greater validity because they are more flexible and open to the discovery of theories or ideas that is 'grounded' in data.

A theme may only be revealed from explicit expressions within the data. As a way to identify the theme, I paid particular attention to regular recurrence within the data. I used particular phrases, incidents, interesting or unfamiliar terms used by the participants (in vivo codes) to inform the development of a thematic framework. Complexity theory as a lens was then employed to make visible the subtle dynamics between IHR technology, the health professionals and the factors that determined the uptake of the technology within the complex work environment. A rich, closely knitted account that strongly approximates the reality it represents was significant to provide a detailed understanding of the organisational context and the way the IHR technology was used in practice.

Where a theme was identified, all possible data that supported or related to it was linked together in this way. Objectivity was required at this point in order to minimise the risk of researcher bias. Where a theme was identified, all possible data that supported or related to it was linked together.

- **Indexing data**

Miles and Huberman (1994) highlight that data reduction is not something separate from analysis, but that it is part of analysis. Data were coded and recoded into elementary parts, and then regrouped into categories. This involved me working with the data, arranging it, dividing it into manageable units, assembling it and searching for patterns, establishing what is important, what is to be learned and determining what will be reported. This involved the systematic application of codes to the data set and labelling key issues and concepts that emerge across a set of data. The data from individual transcripts were annotated in accordance with the thematic framework. This required making judgements as to the meaning and significance of the data. All the analytic choices such as which chunks to code, which bits to pull out, which patterns best summarise a number of chunks and which evolving story to tell had to be decided. In view of this, care was taken to treat evidence fairly, produce compelling analytic conclusions and to rule out alternative interpretations.

- **Devising a series of thematic charts**

In devising the thematic charts, evidence of the main themes was compared between individual transcripts to allow the full pattern across a set of data to be explored and reviewed. I used the e original research questions and emerging themes from the data as headings to reorganise data and to summarise it according to thematic content.

- **Mapping and interpreting data**

Mapping and interpreting data required that the themes and sub-themes were drawn together to look for associations, provide explanations and highlight key

characteristics and ideas that take into account the original research questions and unanticipated analytic findings. At these stages of analysis I moved away from the particular (chunks or line by line) to the general patterns within those codes to search for emerging themes that were important to the description of the phenomena (Daly *et al.* 1997). Based on data reduction and interpretation, decontextualisation and recontextualisation (Miles and Huberman 1994, Wolcott 1964, Coffey and Atkinson 1996) the accounts of the emergent themes should demonstrate movement from the descriptive (recapitulating what the participant says or does) to the interpretative (making an attempt to identify what it all means). Verbatim quotations were used to illustrate the findings when providing in-depth insight into the range of phenomena, their social context and the associations between issues. As purposive sampling was used to achieve range and diversity among sample members, the views, circumstances and experiences of all participants in this study were explored within the analytical framework. The quotes used were taken from across the sample to enable a full rather than biased (partial or selective) review of the data collected. The intention was to convey the voice of the participants - established in and driven by the participants own accounts. This is to ensure that the interpretations are plausible and the account that is offered to the reader is persuasive.

For this study the data were coded and themes were identified by the researcher who is a novice and discussed with academic supervisors who are experienced in qualitative data analysis. The software package Atlas.ti 7, was used to help with the process of analysing the data and to generate an audit trail, however, it was borne in mind that whichever software is selected, it is not without limitations. The software does not remove the need for thought. The choice of themes remains the responsibility of the researcher. A good qualitative research is when the research participants' subjective meanings, actions and social contexts as understood by them are illuminated (Fossey *et al.* 2002). Unlike quantitative studies, qualitative research makes no claim of the generalisability of findings to a specified larger population in a probabilistic sense. So in the undertaking of

this qualitative study, the challenge was to produce plausible, robust research where rigor and credibility are also demonstrated.

According to Robson (2002), the use of CAQDAS (Computer Assisted-Analysis of Qualitative Data) with software packages, for example QSR NUD*IST TM (Quality Solutions and Research, Non-numerical Unstructured Data, Indexing, Searching and Theorising), Nvivo and Atlas.ti are tools that can help with the process of analysing large amounts of data. Although the amount of data for this study was not large, the software package, Atlas.ti 7 was used to assist with the organisation and retrieval of data with the potential to improve the rigour. This is to take into consideration that the trustworthiness of qualitative studies is related to authenticity in the representation of views and that the methodological processes has to be visible. There is also the commitment to both the Research Ethics and Research and Development Committees, of analysis and providing an audit trail (Robson 2002).

4.7   A Retrospective Case

Cases, or aspects of a case may be retrospective (Hyett *et al.* 2014), however, using a retrospective sample lent to criticism that as data were collected after the significant events have already occurred, the participants may not be able to recall after the lapse of time creating a recall bias. For this case study, the participants recruited were managers, physicians, and nurses working at the 'coalface' of providing care. They made up the major groups of multi-disciplinary members making or contributing to policy development, engaging in providing treatment and managing care needs of the patients on admission to and until when they leave EMAU. Their work revolved around information and the utilisation of the IHR system was dependent upon them (as users) who will adopt or reject the use of the system. Therefore how these various actors perceived the IHR system and its impact on work, how they managed and what they viewed as needs and barriers to use were valuable. These participants have views on these issues. It was the responsibility of the researcher to promote the

rigor and credibility of the study. Prior to the interview the researcher showed them a picture illustrating the EPR screen to assist recall. The intention of the study is to understand the world from the perspectives of the participants. There could be no benchmark nor can it be replicated.

For example, steps were taken to promote credibility. Prior to the first data collection dialogues taking place, preliminary visits were made to familiarise with the culture of the participating organisation. Engagement between the researcher and the participants helped to establish relationship of trust between the parties. This can help to achieve an adequate understanding of an organisation. At the same time it was necessary to pay particular attention that professional judgements are not influenced as a result of the immersion (Lincoln and Guba 1985, Silverman 2001).

To help ensure honesty in participants when contributing data, particular attention was taken to ensure that each person who was approached was given opportunities to refuse to participate in the project. This was to ensure that the data collection sessions involved only those who are genuinely willing to take part and prepared to offer data freely. Participants were encouraged to be frank from the outset the interview. Prior to the opening of the interview, this researcher briefly explained the IHR and showed them a picture to assist recall. During the interview, the researcher included iterative questioning and use of probes to elicit detailed data or returning to matters previously raised by the participant to extract related data through rephrased questions.

Member checks were not undertaken by the researcher, however, checks relating to the accuracy of the data were undertaken through the following means. Triangulating via data sources was used. Here individual viewpoints and experiences can be verified against other participants' and ultimately a rich insight of the phenomena under scrutiny may be constructed based on the contributions of a range of people. Exploitation of opportunities to check out bits

of information across participants (Van Maanen 1990) was undertaken. For example this researcher compared information described by one individual with those of others in a comparable position or those responsible for the management and delivery of the service/project.

Random sampling of individuals can serve to negate charges of researcher bias in the selection of participants, so that unknown influences (Preece 1994) are distributed evenly within the sample. During the second stage of participant recruitment (Chapter 4. 4) I used the list of names provided by the training department which they have extracted from their training record. Sampling for this study was purposeful but as I do not know who these individuals were, this would have negated the charge of researcher bias.

A range of documents was also employed as source material. For example, documents that were created corporately by the participating organisation as well as those that were produced externally (official publications by NWIS relating to the participating organisation) were elicited and examined. These supporting data provided a background and verified particular details that participants have supplied.

The degree to which the project's findings are congruent with those of past studies can be assessed through the researcher's relation of the findings to an existing body of knowledge (Silverman 2001). Thick description of the phenomenon under scrutiny, verbatim quotes which were transcribed from the interviews recorded together with the provision of contextual information will also assist the end user of the research to compare the instances described with those that they have seen emerged in their situations (transferability). For example, the researcher has provided the boundaries for the case study to assist with transferability such as the context of the research site, the type of system, the number and type of participants who contributed to the data, the data

collection method employed, and when the data were collected. Such contextual information forms a key factor in qualitative research.

To address the criteria of dependability and confirmability, I have taken the steps to reduce researcher bias by providing detailed description for each stage of the research process to help ensure as far as possible that the study's findings are the result of the experiences and ideas of the participants, rather than the characteristics and preferences of the researcher.

4.8 CAS as A Theoretical Framework

I have made several visits to the field. I remembered that first afternoon I entered the EMAU to meet a nurse with whom I have had an arrangement. As I walked past the sitting area, I saw a young man, barely 20 years in age, lying on his side across three chairs with disposable vomit bowl. One could see the pallor on his face, he was wretching, looked very weak and unwell. A healthcare assistant walked over to help him as he half leant forward to vomit. She held the bowl for him as he tried to raise himself to lean forward properly. This was a 20 people seating area and it was full. No curtains or screen to provide him privacy. They were all sitting there ...waiting... what they are waiting for? I was not ill. I was not like any one of those visitors, nor accompanying any of them, however, I had to take my turn too even though I had an appointed time. I stood and stood by the doctors' station. No one spoke to me. All around me seemed disorderly. I saw two patients who were very breathless and I can see their agitation, two female elderly patients were lying on trolleys parked just by the entrance and a couple of doctors sat at their station discussing something. I saw a couple of nurses darting from around the corner but they did not stop. One of the receptionists was walking back and forth from the desk to the triage area, probably to pass on information to a nurse or doctor. One patient looked exhausted with pain but no one went out to him. Finally I managed to have my conversation with the participant, I apologised for turning up at the wrong moment. She interpreted that I was apologising for holding up her time. I was

informed 'the unit is always like that'. 'You have not seen the worst'. Somehow to the participant, under the surface of the apparent hustle bustle, there was order - not of quiet or calm ambience. Of course hospitals are always busy but what is beneath the surface? The more I looked around I started seeing visible activities which are the participant's work, what they do and how they do it.

I was struggling to find a theoretical framework to help explain what I was seeing. I remembered having a conversation with my supervisor about the 'chaotic' world out there. Oh, I said 'everything is so complex'. It was at this juncture I was drawn to systems and complex adaptive systems theory thinking. What I was observing were connections, relationships and patterns of interaction creating the structure beneath the visible activity (Sanders 1998).

Healthcare organisations are complex adaptive systems (Crabtree 2003, McDaniel and Driebe 2001, Plsek and Wilson 2001). Relationships in complex adaptive systems are critical, generally nonlinear, and lead to unpredictable dynamics. Thus understanding the patterns of relationships among its agents (Cilliers1998, Stacey 2003; Wheatley 1992) helps in the understanding of the system as an integrated whole. Anderson *et al.* (2005) advocate a change regarding what we view as foreground and what we view as background in healthcare delivery as this may illuminate our understanding of what is beneath the surface. A case study design, used in conjunction with Complex Adaptive Systems Theory as a lens provides a method for studying systems and may provide useful maps of the system. This can assist in revealing new insights of the phenomena (Stake 1995, Yin 1994).

Studies that were undertaken into the implementation of information communication technology in organisations were mostly guided by traditional disciplinary (organisational, information systems, behavioural and management) theories which viewed organisations as machine-like with replaceable parts (Fuchs 2004, Ng *et al.* 2009). The foci were on functions and roles that were

carried out by people as these theories assumed that the organisation is stable if each part is doing its job. The parts are replaceable with little damage to operations and results are predictable and replicable. Much of healthcare practice is still trapped in this paradigm of predictable, linear causality and by mindsets that seek accountability through top-down command and control.

Complexity science on the other hand, has explored and articulated a contrasting world of understanding, helping to explain complex dynamic phenomena in a widely diverse range of settings using insights and concepts like non-linearity, edge of chaos, self-organisation, emergence and coevolution. A complex system is not composed just by the sum of its components, but also by the intricate relationships between these components and conducting a study where the analytical method breaks up a system destroys what it seeks to understand (Cilliers 1998, Burton 2002, Harkema 2003). In acknowledging that today's healthcare organisations are complex systems (Plsek and Greenhalgh 2001, Crabtree 2003, Anderson *et al.* 2003), the use of machine model of organisations will be inadequate to capture the dynamics of today's organisations (Takian *et al.* 2012, Plsek and Greenhalgh 2001, Plsek and Wilson 2001, McDaniel and Driebe 2001). Healthcare organisations are recognised as social systems sustained by "a never ending process of change, which creates new order" through self-organisation, self-creation, and creativity (Merry1995: 33). Complex Adaptive Systems Theory can provide insights for studying healthcare organisations as integrated wholes. Complexity theory suggests that keys to understanding the system (Anderson *et al.*2005) are contained in patterns of relationships and interactions among the system's agents. It will enable observations of the interaction between the components of a system, taking into consideration that complexity is manifested at the level of the system itself (Cilliers 1998). So observing what is happening in its context is a key to understanding the patterns of relationships among its agents (Plsek and Greenhalgh 2001, Cilliers 1998).

By using complex adaptive systems theory as a lens, I can examine the interdependencies and interactions among the elements, be sensitive to dimensions of relationships, focus on nonlinearities, look for and examine the unexpected events, focus on the processes and events, recognise dynamics, describe patterns and events and shifting foreground and background as the key to understanding the system (Anderson *et al.* 2005, McDaniel 2004). The domains of complexity and systems, complexity and change, and complexity and agency provide lenses through which to examine and view differently the world of messy and unpredictable change which corresponds with much of the experience in the healthcare environment. They will help to describe and interpret the realities with which the participants grapple as work.

Managing change such as adoption of the electronic patient record system in a healthcare environment has been reported as problematic, in both conception and execution. Traditional mechanistic ways of exploring may have its usefulness, however, can oversimplify issues and prove less than useful. CAS framework challenges the linear way of understanding and interpreting problems and enables a reinterpretation of existing systems and problems faced within them. Complexity generates insights that help with looking at complex problems in a more realistic and holistic way, thereby supporting more useful intuitions and actions.

CAS concepts was particularly useful in reframing what was previously seen as 'messy realities' towards a more realistic understanding, thus allowing old concepts to be understood in different ways. The concepts can be used individually or in combination, to reflect on an individual phenomenon, the overall system, or specific sub-systems.

For this study, the use of multiple lenses: participant interviews, observation and documentary analysis can provide critical insights, and understanding of the multi-disciplinary team members' mental model (ideas) can provide meaning on

how they use the electronic patient record system within their place of work. The EMAU as a case provides opportunities for learning about a system, the EPR technology when it is employed over a period of time, for a realistic span of tasks, by diverse groups of users with diverse workloads, working in collaboration with the multiple, interrelated organisational units and in a technological environment with realistic hardware, network bandwidth, and data load. This meant having to adopt new mental maps to shake loose some of my fundamental beliefs held about the world. As the research is open to more than one way of looking at situations, it will lead to more useful knowledge as CAS theory enables a new way of looking at problems - induction and deduction.

Certain concepts may appear to be 'old hat', but complexity science requires them to be understood in different ways. It has assisted me to see so many of the important elements of those realities which increasingly beg for attention and explanation. For example, with this study CAS concepts have provided a very useful basis for reviewing reform efforts and in trying to understand why a particular change initiative was unsuccessful as well highlighting new possibilities for understanding the kinds of systems that manifest messy realities and the behaviour of actors. It allowed for understanding different aspects of 'messy realities' which may not otherwise be well understood or systematically investigated.

4.9   Summary of Chapter

In this chapter I have discussed the methodology and have provided justification for undertaking a qualitative case study and why I have ruled out other methods such as grounded theory. I have explained how the research was done, the methods of data collection, materials used, subjects interviewed, or places visited. I have provided an account of how and when the research was undertaken, including the emotional labour and tenacity required. The relationships between data and theory were discussed (Section 4.8). CAS theory was useful in assisting me with selecting, interpreting and analysing data. It has also proved valuable in assisting with generating ideas and insights which helped

me to see complex problems in a more realistic and holistic manner, thereby supporting more useful intuitions and actions.

CHAPTER 5: THE FINDINGS AND DISCUSSIONS

The basic goal of qualitative data analysis is to develop an understanding that answers the research aim and questions. All the interviews (11) were audiotaped and transcribed verbatim by this researcher. Data were analysed and thematically coded (Chapter 4: 4.6) guided by Framework Analysis (Ritchie and Spencer 1993). This was done through an iterative process which is not linear. Commonalities and differences were noted, along with saliencies in data such as patterns across experiences and perspectives in the development of the overarching themes. Three broad themes were categorised. Each category consisted of multiple sub-themes (Table: 8).

Table 8: THEMES AND SUB-THEMES
5.1 Theme: Managing the dynamic context of the EMAU • The EMAU: The environment • The Day to day demands • 'All sorts Really' • The gaps and uncertainties
6. Theme: Patient Safety • Clinical work as decision-making • The IHR as a container for information • Medication reconciliation • IHR bridging the intersection of care • IHR enhancing patient-professional relationship

7. Theme: Issues with adoption of the IHR

- User interaction with computer

- Automation reducing the inefficiencies

- 'Consent please'

- Detachment from General Practitioners (GPs)

- General practitioners not signed up

- Legacy systems

Verbatim quotes from the participants were compiled under each theme in order to identify quotes most illuminative of the participant's views. The results were reviewed for their relevance to the key characteristics of CAS.

This is the first of three chapters that present and discusses the study's findings, to describe and explain the use of the electronic patient records by members of the multi-disciplinary team within one emergency medical assessment unit (EMAU).

5.1 Managing the Dynamic Context of the EMAU

5.1.1 The EMAU: The environment

The emergency medical assessment unit (EMAU) in this large acute District General Hospital (pseudonym Welsh Town Hospital) was opened in 2004. The unit provides services to a large catchment area covering the population served by Welsh Town hospital and has facilities to manage ambulatory patients on a daily basis. The unit works collaboratively with Accident and Emergency (A&E) Unit and General Practice, recognising the interfaces between primary care, Emergency Medicine and Acute Medicine (secondary care).

Within this unit there exists a diverse group of healthcare professionals. To meet the growing demand of adult patients who present with a wide range of medical

conditions and requiring urgent or emergency assessment for medical conditions are two acute care consultants supported by an associate specialist, one staff grade and two junior doctors. One of the acute care consultants is the medical lead. The ward manager is the clinical nurse lead and she manages a team of deputy ward managers, an advance nurse practitioner, qualified nurses, healthcare support workers and the receptionists (administrative work). Collectively the nursing team comprises over 60 staff. The paramedics as well as the porters, all function as teams in a spirit of service in all operations.

Drawing on observational data, the EMAU is made up of different areas: The TRIAGE area, Trolley Area and the Observation Ward. The TRIAGE area is staffed by a triage nurse and a healthcare support worker that aims to provide rapid assessment of patients brought in by ambulance as referral to the Unit by General Practitioners and those who self- presented to the Unit.

The Trolley Area has 15 trolleys (with two trolleys able to provide cardiac monitoring) where patients are accommodated for assessment and monitoring, until admission or discharge back to the community. This area is normally staffed with a team of qualified nurses and healthcare support worker or nursing auxiliary, the Advance Nurse Practitioner, on-call medical doctors and the Consultant (Physician of the day).

The Observation Ward has twenty four beds which are allocated for patients with either same day discharge or admission of no longer than 72 hours (these are patients normally defined as 'observe'). There are also beds for highly acute patients that need continuous monitoring whilst waiting for high dependency units or acute medical wards. The EMAU Acute Care Physicians, together with an 'obs team' (one House Officer and one Senior Registrar) take responsibility for the care and management for these 'observe' patients. There is also a Sitting Area and according to deputy manager (DMF2) can have anything up to 20 patients sitting there as well by the afternoon.

The EMAU receives referrals from both General Practitioners (GPs) and the A&E unit, and has an average daily throughput of 45 patients with 49% from the Emergency Unit, 49% from General Practice and 2% covering nursing homes and outpatient clinics. The unit runs twenty four hours a day and seven days a week and responds to various demands for patient treatment and care. Patients will arrive in a dedicated designed waiting area and are examined either in an outpatient type consultation room or in an acute area (15 assessment trolleys). Emergency medical patients referred to the hospital by their General practitioner will be admitted to the 24 short stay medical assessment beds. The unit is concerned with the immediate and early specialist management of adult patients who present with a wide range of medical conditions and requiring urgent or emergency care. The majority of these patients are elderly, many with a number of co-morbidities, frailties and dementia. There is commitment to improving patient outcomes, patient/staff safety and increasing patient/staff satisfaction. Improvement in all aspects of care and service delivery is a vital cornerstone. The focus is to facilitate the rapid assessment of patients from admission to an early discharge and to prevent any unwarranted medical admissions and readmissions. Their aim is to make their services best meet the needs of the particular subpopulations they serve.

In April 2008, Informing Healthcare, the then Welsh NHS IT agency (now NHS Wales Information Services) made an announcement to pilot an extension of the IHR technology in the EMAU due to the perceived benefits identified following successful implementation and use by the General Practitioner(GP) Out of Hours (OoH) services of the said Local Health Board. Welsh Town Hospital was to be the first place in Wales where the IHR went live for clinical use in its EMAU. The Welsh Town IHR product was created by a company called GraphNet which has not been chosen for the production of the national IHR. According to the Local Health Board, the national IHR (computer-based or electronic patient records) was scheduled to be developed and provisionally rolled out in the

course of 2009. Welsh Town Hospital was to pilot implement the IHR. The unit worked together with the Welsh Assembly Government's Informing Healthcare Programme to host the pilot implementation of the Individual Health Record system. The collaboration also involved the NHS Wales Business Service Centre, Graphnet, Adastra and six GP system suppliers to develop and host this Individual Health Record solution. Access to the records will only be possible if a GP consents to medical records being passed on and their patients have not opted out of the system. The patient's information will be uploaded to a central database /repository. To ensure that patient data can be accessed by the healthcare professional, Graphnet (a systems vendor) using their G-Extract software extracted patient information from all GP systems. The data is then converted and stored into XML via the Graphnet Messaging Service (http://www.ehi.co.uk/news/primary care/3186 Accessed 21April 2012). Adastra embedded the portlet (web-component like servlets or pluggable user interface) into computer work system, building in an access tab, an access control popup and access transaction logs. This enabled the clinicians in EMAU to log in to view a composite page (an Individual Health Record). For the first time, large numbers of GP records can be shared electronically within a unique information governance framework. 503,192 records (83% of the population served) were made available to support quality, efficient care. The IHR can only be accessed in the EMAU by authorised clinicians who are expected to gain patient consent at the time of contact (except if the patient is unconscious). The pilot implementation of the IHR technology was to assist health professionals with their practice. The IHR does not create or capture new information about patients; it only copies items of data that already exist in GP practices and makes it available to secondary healthcare practitioners to access as 'read only'. Updating the IHR each day depends on interoperability between the source data holding systems in the GP practice and at the EMAU department in the hospital. The information will be used for 'live clinical care' and can be accessed by healthcare practitioners via Graphnet portal access software which is embedded into the Computer Work Station (CWS) (Local Health Board Data).

The healthcare professionals, the new technology and resources in the EMAU are all part of a microsystem that provides identifiable services to subpopulations of patients. It is a complex environment typified of diverse groups with competing interests, yet all fully interdependent as involvement of all members of the microsystem is essential to deliver services as the whole of the practice can only be as good as the individual components. Effective microsystems are devised with the individual (patient) at the centre of their service.

5.1.2   The Day to Day Demands

The EMAU is an exceedingly complex unit and the clinicians working there need to respond to a lot of different demands. They have to deal with the intricacy and messiness of the large number of different and interdependent elements (structural), the ambiguity in goals and scope (LeRouge *et al.* 2007). Participant NM 1, a clinical nurse lead and unit manager provided a long account of the role of managing the Unit. This account provided a valuable insight into the micro-processes of coordination work to facilitate the smooth operation of the EMAU:

> *I've got to manage the area. I deal with their ehm*
> *I deal with the operation management er on a day to*
> *day basis. Ehm I do work Monday to Friday. I got ehm*
> *other Band sixes for my deputies ehm but then again*
> *with regard to clinical nurse lead I do liaise with ehm*
> *let's say for example with new initiatives with new*
> *consultants coming in I tend to liaise with my own*
> *consultants here. Since it is an MAU we do have our*
> *acute care physicians. Er we do have ehm three of them*
> *and ehm out of the three consultants we do have the*
> *clinical medical, nurse leads because according to the*
> *Royal College of Physicians ehm to be an MAU ehm*
> *the ideas is for the MAU to have a single person er to*
> *be in charge of the whole area, both on the medical and*
> *nursing side. So I do the nursing side. Ehm apart from the*
> *operational management if there is any change management*
> *ehm in terms of let's say for example having to implement*
> *anything like a protocol pathway so I am the one who actually*
> *liaise with with my staff to communicate with them through*

meetings. I attend er I also ehm I also organise my own team meetings here er with my band sixes and with my staff if there is any if there is any change if there is any issue I deal with complaints ehm anything that we encounter on a day to day basis running the area ehm poorly patients from A&E to the MAU, and also from MAU to other area and from MAU to the community. I liaise with also with the community services like ehm particularly rapid response, ehm you might have heard of CRPT now er frail team which is led by ehm er one of the ehm consultant named ...(name of consultant). Er basically the aim of the community services is as much as possible if they can help people from coming into the hospital ...So those are the things. Ehm but I do liaising with the community people, senior nurses in the community... And also with the with the staffing as well if there is any issue like ehm staffing problem ehm I do deal with that as well. They get reported to me. Ehm and I do I do ehm particularly 50% of my time or 50% of my full time hours would be allocated to clinical which I do. I do clinical work.

(NM1)

This clinical nurse lead has depicted the EMAU one of the many nodes within a healthcare network, relatively self-contained and with adequate complexity. The complexity of the unit is further articulated by another nurse manager, participant NM2. This participant illustrated how busy the Unit can be and how the clinicians have to undertake a plethora of tasks in an atmosphere of pressure through the following extract:

...there's quite a lot of things going on like post take ward rounds it is not just one team of doctors doing it. There's probably three teams of doctors doing the post take ward round in just one hour, so you have to to go through one of those post take ward rounds and sometimes they want this information, they want that information and makes thing a little bit er busy really and at the same time you are admitting patients because he comes in whilst you are doing the post take ward round. So I feel that those are the things the MAU is busy at times. And it is not really expecting patients coming to us, A&E [Accident and Emergency Unit) also have patients coming to us. In view of we are trying to prevent the breaking time as well. And everything then, if you are doing the post take ward round we have to be discharging patients home, making sure he is safe to go home, making sure all the next of kin have been informed and all the appropriate treatments have

been carried out before they go home. It is just too many
things going on in just one moment of time really. [NM 2]

The same pace of work is also reflected by a deputy manager, participant DMF1 who mainly does night shifts:

> *One particular night – ehm normally when we*
> *come in I'll go and take the handover for all the*
> *patients from the staff nurse at our triage area.*
> *There usually will be about ten but there can be*
> *15 whilst the doctors will be waiting for beds to*
> *be allocated (inaudible). The ward is divided up*
> *between the 6-10 staff nurses and we tend to keep*
> *going more or less until 6 o'clock in the morning*
> *when we start again ready for the day staff. So we*
> *don't have an awful lot of time , patients coming*
> *in and out, be moving and humping patients from*
> *MAU to the wards and from the ward and having*
> *patients in and out all night.* (DMF 1)

The EMAU was always busy when I dropped in. One afternoon a young patient was vomiting and lying across three seats in the seating section. All beds were full. Just like all the other days I have been there, new patients were admitted – requiring immediate care. Throughput of about 60 patients per day I was told. Turnaround is high. Patients arrived, seen and treated, were warded, referred or discharged home and the beds were filled again. [Observation - Wednesday 10/08/11]

On another visit I had an appointment to interview participant DMF 1. It was late evening (2100hours). I managed to have a very quick exchange with her when I entered the ward but it was not until 2230 hours that we managed to have a conversation. The doctors, nurses and care assistants, moving in and out as they work through the evening, acting out agreements between themselves and others, working according to habits and pre-existing accepted patterns of activity I would assume. I felt I should not be there.[Observation]

The EMAU has been represented as a developing, dynamic model of a healthcare system as a complex adaptive system. The extracts of participants NM1, NM2 and DFM1 revealed that the EMAU is a complex social system where many people (agents) work together. For these clinicians in management roles (NM1, DMF1, DMM1, DMM2 and DMF2), they also have responsibilities for the staffing and smooth running of the unit. They have to ensure effective use of limited resources, to reconcile all the patients' needs with the available healthcare resources and improvements in performance in relation to standards and outcomes. The setting is heterogeneous in nature. They have to meet and respond to numerous complex stressors to a great degree such as patients arriving in any order, at any time and without prior warning. All these participants' accounts revealed indicators of high complexity such as lots of activities in process, many people sitting or moving about the unit and from place to place, no idle periods as everyone is trying to find out what is going on so as to expedite workflow through the unit. The roles of these EMAU clinicians are complex as they are expected to interact with different players (agents), to successfully manage large patient loads with speed and efficiency in managing patient flow.

Strauss (1997) showed how healthcare work is accomplished through complex interactions with several actors and structures. The interactions involved patients, healthcare professionals, their own profession and the values of the profession, the organisational setting for the work and the constant changes (internal and external drivers) within the health care system as a whole. The diversity of system interactions forms part of the work of clinicians in EMAU, a view provided by participant MR1 who is a medical registrar:

> *OK I was the medical registrar on call and be*
> *responsible together with the different consultants*
> *on call for all the admissions to the hospital either*
> *through the A & E or directly from the GP and so*
> *we as part of the team assess the patients that were*
> *coming in.(MR1)*

Another medical registrar, participant MR2 reveals that clinicians working in the EMAU have to undertake shift rotations to keep this hub for acute medical care operating twenty four hours per day and seven days a week.

> *Er in MAU I would have been medical registrar on*
> *call er depending on which shift patterns I was on call*
> *days, evenings or nights… (MR2)*

The following two extracts from the nurse manager, participant NM2 and the deputy manager DFM2 highlight the importance of workflow through the EMAU to ensure high quality service is provided:

> *…it's typically making sure the operation is smooth*
> *and that post take rounds[handovers from a junior*
> *doctor to a consultant], transferring of patients are*
> *all done on time and that er er making sure that there*
> *is allocated nurses in the Unit and all procedures are*
> *done according to, according to the standard really. (NM2)*

> *You know my role really is to make sure this flow,*
> *the patient come through the admission process, they*
> *are seen by triage, seen by the doctor and then they*
> *are discharge home or ehm if a consultant is to be*
> *involved to ensure that happens. Er supervise*
> *junior staff, make sure that they are working to*
> *standards that we like, make sure they are maintaining*
> *flow is well, ehm managerial stuff, investigations*
> *of complaints, ensure that , just ensure that the ward*
> *is running smoothly really overall….more or less my*
> *role is to make sure everything is managed. Flow is*
> *maintained and high standard of care given and make*
> *sure we got accurate information. (DMF2)*

Besides being portrayed as a dynamic and complex environment, the patients admitted are of varying levels of acuity. In the views of participants NM1 and DFM2, the EMAU is also an unpredictable environment. The roles of the EMAU clinicians are multifaceted. The provision of optimal care and the smooth functioning of the unit are dependent on the effectiveness of timely

communication within and between healthcare teams such as primary and secondary care practitioners (general practitioners in the community and the health professionals in acute hospitals), between multi-disciplinary members working within the same setting, between patients and their families and allied health professionals

The emerging picture presented from these clinicians' discussions of their roles and work is one that is focused on improving the patients' process time, improving the flow of patient and interacting with intra and interdepartmental activities. The participants' accounts so far depict healthcare as a prime example of interdependence build around an array of health professionals. The delivery of care in the EMAU occurs in a complex environment and it is about collaborative work. It is complex in the sense that multiple healthcare professionals are involved in the provision of care to patients. These healthcare professionals are physicians and nurses from different bands (levels), healthcare support workers, physiotherapists, administration staff and pharmacists. The roles of these EMAU clinicians are complex as well. According to participant DMM 1, the clinicians with roles as managers do not only manage the healthcare staff but they are expected to successfully manage large patient loads with speed and efficiency in managing patient flow. This is articulated by the following extract:

> *Basically my role is er I am a deputy
> manager. In the absence of the manager,
> I take charge of the unit, so I take charge
> of the MAU and outside triage area. So I
> run the unit smoothly as much as possible
> and then at the same time I look on the*

staffing in the morning and really I am a
manager at the same time when it comes
to the role. (DMM 1)

According to participant DMF1, a nurse manager who mostly covers the EMAU at night, the work in EMAU requires its staff to be adaptable, as supported by this extract:

...ehm at the moment I do the occasional
Day....and ehm so I supervise team nurses
at night, sort out their problems, sort out the
unit, don't usually have a group of patients
that is specifically allocated to me. I help out
wherever I am needed and trying to keep
things organised. (DMF 1)

 The work of these EMAU doctors and nurses evolved around seeing patients, liaising with others and assuring sustainability. Everything has to be managed, flow must be maintained and a high standard of care must be provided. These clinicians have to function as flexible team members, all working towards achieving the four-hour policy targets (Department of Health 2002). Each of them brings to bear their specialised expertise and efforts as they operate in a chain or network configuration. Everybody appears to be 'juggling', striving to make sure things run smoothly amidst the pressures and constraints placed on the unit. These clinicians (agents) illustrate that they do not only function at the interface of primary and secondary care but that the delivery of patient care is dependent on team working and collaboration. The notion of understanding the system and the roles of everyone working in the system to support collaborative activities is significant (Batalden and Mohr 1997). The participants in this study are aware of what various components of the system do and how they are linked to contribute to the care of patients.

The production of efficient workflow and quality care for the patients involves assembling scheduling, monitoring and coordinating all the processes. For the nurses managing the EMAU they also have responsibilities for the staffing and

smooth running of the unit. They also have to ensure effective use of limited resources to reconcile all the patients' needs with the available healthcare resources and improvements in performance in relation to standards and outcomes. EMAU work is collaborative work in the sense that it is dependent on the importance of relationships. The relationship between the contributions of each healthcare professional has to be coordinated and articulated over the course of a patient's stay in the hospital. Thus an articulation task in one perspective is a production task in another. The work of articulating the tasks was often compounded by the patients arriving at the same time. A lack of cohesive coordination (Belbin 1993) of the unit functions as those described by the research participants can be the creation of chaos or entropy and impact on the quality of care, the safety and satisfaction of its patients and costs to the hospital. It is critical that the flow be efficient (Asplin *et al.* 2003) so as not to be a barrier to patients receiving timely care. Nugus *et al.* (2010: 2002) in an ethnographic case study of integration of care in an emergency department depict integrated care as "managing the patient trajectory in the porous, shifting and negotiable boundaries of health services". Patients expect their care experience to be seamless. According to Curry and Ham (2010), coordination of care is one way of achieving integration. At the micro level, the nurses and doctors as managers of the patient's journey through the EMAU have to create the environment (IoM 2004) in which they can provide quality and safe care to patients as well as conditions that enable self – organising (Edgren and Barnard 2012).

5.1.3 'All Sorts Really'

In the following extract, Participant DMF1 explained the processes involved in the receiving of patient into EMAU illustrating the inter-intra boundary nature of their work and the chain of communication:

> *When they come in? Ehm it depends. We take*
> *patients straight from the GP surgery and we*
> *take patients straight from A&E. Patients*
> *from the GP the GP will ring through to bed*

management. They will send a proforma to
our ward clerk at the reception saying what
the patient coming in and their basic details,
the telephone address and date of birth so
they can order the old notes. Ehm when the
patient comes the ward clerk will go through
their basic details, their address, date of birth
to make sure that they are all correct and then
we take them in our triage area and do their
basic observations, blood tests and ECG and
then we wait to see [your own doctor]. The
A&E patients obviously paperwork will have
been started so we just bring them in and then
just do our own pcr record . They don't do them
in accident and emergency. (DMF1)

The principal aim of the EMAU is to provide a high quality service for those patients referred by their General Practitioner (GP) and the Accident and Emergency (A&E) Unit to the directorate of adult medicine. The bed management team screens and accept referrals from General Practitioners. These are then telephoned or faxed through to EMAU reception desk with each proforma detailing the patient's details. When the patient arrives to the Unit, a staff member would greet the patient with the aim to commence assessment within 10 minutes. All patients referred to EMAU undergo the Triage system. This is a system of prioritising patients according to their clinical condition and not times of arrival. It is formal process of early assessment of patients which is undertaken by a specially trained nurse who could be an Advanced Nurse Practitioner. The aim of prioritising patients is to ensure that the patients receive timely, appropriate attention and with the requisite degree of urgency (George *et al.* 1993). Upon arrival of each patent in the Unit, a Patient Care Record is normally completed. During this process, the initial investigations such as vital signs taking, electrocardiograph (ECG) recording and bloods taking can be initiated by the qualified nurse (Local Health Board Data). This process is articulated by participant ANP, an advanced nurse practitioner who stated:

…my role is one of assessment and diagnosis
and treatment of the acutely unwell medical
patient. I work (ehm) across the border of

nursing and medicine but my medical
assessment is very similar to that the doctors
use. I use my nursing background to help
assess patients but I mainly follow medical
model and I have independent prescribing
and I prescribe for patients as a member of
the medical emergency team. (ANP)

When managing workflow in EMAU, three interdependent components of patient processing have to be considered. These are patient input, throughput and output (Asplin *et al.* 2003). Patient throughput is the time it takes to provide care for the patient, from the moment of the patient's first point of contact with the service and health professionals (Bazzoli 2003). The patient's first point of contact with the health professionals within this setting will usually be at the point of initial assessment. At this juncture an accurate patient history will be undertaken and an assessment conducted to assist with identifying needs, diagnosis and treatment (Wood 2000). The patients admitted to EMAU will be examined by the Medical On-Call doctors and/ Advance Nurse Practitioner to establish a plan of treatment. According to Wood (2000) and Bazzoli (2003) patient throughput comprises of the patient registration, triage time, assessment, laboratory investigations, radiographic examinations, diagnosis and treatment. These processes were mentioned by one of the participants (ANP) who further emphasised that …*when you see a medical patient, they are not a minor patient.* Participant, ANP provided more clarity to the above statement with this extract:

ehm medical assessment patients usually you see
about 3-4 in a day, each member of the team.
Because of the quite long gambit of investigations –
you wait for chest x'rays, you've got collection of
bloods, all sort of things before a diagnosis is made.

It is without doubt that the EMAU is a challenging environment in which to work (Harrison and Daly 2001). To achieve a goal involves a series of communication which involves various people asking questions, collecting questions and surfacing information. In the context of care integration, the

participant's experience confirms a high level of diversity and interdependence among health system stakeholder groups.

When discussing EMAU workload, the doctors and nurses drew attention to the varied health statuses or condition of the patients impacting on patient throughput. 'All sorts really' was used by participant MR1, a medical registrar when reflecting on the diversity of patients who accessed EMAU service:

> *OK – ehm – all sorts really. There weren't any*
> *restrictions all general medical ehm patients*
> *coming through with a huge variety of conditions*
> *[laughs]. I mean you see people who came in with*
> *----strokes, people coming in with diabetic emergencies,*
> *pneumonia, asthma, COPD exacerbations, people*
> *coming in with chest pains, people coming in with*
> *diarrhoea, vomiting, urinary* infections*, cellulitis. I*
> *mean a very wide variety.* (MR1)

The view that diverse groups of patients are admitted to EMAU was further supported by another participant, MR2, also a medical registrar:

> *...I see a wide range of unselected patients so*
> *would have a anything medical that came through*
> *the door.* (MR2)

These extracts provided by participants ANP, MR1 and MR2 illustrate that patients admitted to EMAU are of varying medical conditions and levels of acuity. There are patients who are experiencing greater medical needs and complex health conditions. There are the patients who require specialist and intensive care and those who require short term treatments, such as those who require haematological investigations. For example, participant DFM 1 commented that not all patients are always very ill:

> *No, no. A lot of the patients now we have got a new*
> *system at the front and they come in, they sometimes*
> *only need their bloods done. We can discharge the*
> *patients within four hours now. They have their*
> *bloods.* (DMF1)

Whatever their health conditions, these patients have presented themselves to EMAU so that they can receive prompt, safe and effective treatment that relieves

their symptoms. They expect the health professionals attending to them to address the underlying causes of their illness and to do the right thing for them. These patients want care that is aimed at getting them better, quickly and safely. With EMAU, the agents have elementary rules. The patient's treatment and care have to be coordinated based on their needs (Hall 2006). These narrations revealed that not only is the system complex, with its multiple interfaces but so too are the patients.

5.1.4 The Gaps and Uncertainties

Care transitions whether it is from home to hospital or vice versa present as critical junctures (Hannigan and Evans 2013) that can impact the patient's health outcomes, experience of care, and cost. Patient engagement (Varcarolis *et al.* 2006) and holistic patient assessment are central to the provision of high quality care. As highlighted, when a patient enters the EMAU (Chapter 5:5.1.3) the healthcare team must determine the reason for admission, the patient's health status, diagnosis and plan of care. Patient assessment is integral to the care and is an iterative process. The intention of the health professional is to secure the relevant health information from the patient to determine the nature of the patient's complaint. The information that is obtained is the cornerstone from which a comprehensive and effective treatment and management plan can be developed. The completeness of the assessment is based upon patient-clinician partnership in which the insights of both parties are used to direct delivery of optimal and individual care. Effective patient-clinician communication is an important element of this partnership and the key to learning about the patient's condition. So every patient on admission to the EMAU is assessed by the doctors, nurses and other allied professionals as appropriate. The aim of assessment is to determine the patient's current health status and health history so as to create or update a proactive plan of care. Obtaining an accurate patient history is an important step to assist with identifying needs, diagnosis and treatment, otherwise providing the right care at the right time may fail to happen. The significance is that once treatment is initiated and following Consultant

review by the Medical Consultant on call for the day, a decision will be taken as to either treat and then discharge the patient or transfer or admit the patient to an appropriate area of care - a medical speciality.

According to the participants, the task of obtaining an accurate patient history is often ridden with difficulties. Meeting the needs for the patients in EMAU has become an extremely complex and non-linear process. For example one of the medical registrars, participants MR1 commented that:

> *Ehm a lot of patients we see ehm either come*
> *in in a confused state or potentially they don't*
> *necessarily remember a lot about their medical*
> *history and drug history in particular...(*MR1)

Medical registrar, participant MR2 supports the notion that an increasing number of patients seen have cognitive impairment:

> *20% of patients coming into the hospital quite*
> *easily have some sort of cognitive impairment*
> *or the illness they are presenting would mean*
> *they cannot give you a definitive history.* (MR2)

The cognitive status of the patients was also raised by the deputy nurse manager, participant DMM1:

> *Right sometimes when the patient comes in, there*
> *are difficult patients, confused patients, they*
> *don't know who their next of kin, not all the time*
> *they come in with their relatives.* (DMM1)

Needs assessment is a paramount element in care coordination but often the doctors and nurses in EMAU have to cope with the information gaps and the uncertainties that complexity produces. Apart from the cognitive impairment raised by the extracts above, the deputy nurse manager, participant DMF1 further unraveled some of the complexities that they experience:

> *Yes they are ehm even if the patients come in quite*
> *normal, sensible ehm and then by midnight can be*
> *completely confused and disorientated and if you've*
> *got an idea of alcohol background you could prepare*

for that, you can treat them to prevent another episode
happening, ehm and patients obviously with drug
addiction who won't necessary mention when they come
in, become agitated and anxious , leaving the ward
and coming back and those sort of behaviours you can
predict you prevent them, rectify first. I think you
just need you do need to know those sort of things even
if that is not particularly the problem the patient has
actually came in with.[DMF1)

Here the participant is referring to the non-availability of previously collected information having implications for patient safety and system efficiency. The extract reinforces the dynamic contexts of delivering care to meet the needs of the patients and the flexible planning required in ensuring adaptive response. Patients admitted to EMAUs are medical emergencies. These admissions are not planned. The patients arrive at the unit at short notice because of a perceived clinical need (NHS Connecting for Health 2010). The patients should be accorded care that is focused around their needs. The care should be sustainable, safe and of high-quality, however, achieving coordination is dependent on intense communication and information processing activities (Xiao 2005). This period can prove to be a critical juncture (Hannigan and Evans 2013) for the patient, yet, the EMAU participants have highlighted that communication patterns are difficult as not all patients who access EMAU services are cognitively aware or able to provide the necessary information at the point of care. Participant MR 2, the medical registrar further elaborated this by stating:

I have been on call four days this week
of the patients I saw almost a fifth were
unable to give any decent history either
through dementia, learning difficulties, or
whatever it may be er the illness itself. (MR 2)

The participants' extracts provide the notion that the elderly patients represent a percentage of the EMAU's service users to be transferred between the hospital units. Not only are these patients more likely to present with chronic illness, multiple medical comorbidities but that they have been received by the EMAU

clinicians suffering from cognitive and functional impairments that limit their ability to communicate their current and pre-existing problems.

Breakdown in communication between the patient and care provider results in missing information which can expose the patients to additional delays and processes as well as hinder health professionals' work (Stiell *et al.* 2003,Tucker 2004), potentially decreasing both productivity and quality of care (Coleman 2003, Coleman and Berenson 2004). For the patients it could mean increase wait times or it may cause the patient's condition to deteriorate. According to Smith and Feied (2002) clinical decision-making is a complex process made even more so in a clinical environment such as EMAU where rules cannot drive clinical decisions due to the logic of partial-set-membership or fuzzy logic. Care delivery systems are necessary to achieve both the care and the clinical management components of professional practice, however, these factors make the transition of care for patients and getting work done by the health professionals a challenging process that is prone to errors.

Participant MR 2 further exemplifies the situational awareness and the need to learn from others who have expertise, to develop resilience and open mindset for adaptive response:

> *,,,patients are admitted over a defined period in (name of hospital), it is 24 hours, in (name of research site hospital) we used to have a split day of twelve hours at a time, ehm so any patients admitted in that period is seen by the consultant and with the junior doctor that has seen the patient usually or sometimes without and it is just a way of reviewing all of the patients to make sure that correct management is in place, correct investigations have been ordered or if felt that if not the correct path or and diagnosis is incorrect then changing what has been done so far to try and make investigation, management of patient as good as it could possibly be. (MR 2)*

The key issue here is that EMAU work entails considerable uncertainty about diagnoses as well as about how to treat patients. This makes it essential to understand the patient's situation and to discuss information and intuitions with other healthcare staff before making decisions on what to do (Xiao, 2005), clearly accentuating the distributed nature of health care work. It is about building situational awareness and connecting all the dots (O'Sullivan *et al.* 2013).

Reflecting on the extracts from the study participants, the EMAU clinician's work is not confined to the management of a single patient with a single isolated clinical problem. The patients can present with long term, chronic conditions and with more than one clinical problem. So they are simultaneously dealing with patients with varying needs and problems, and with other health care professionals and organisational units. In addition all these patients have to be assessed from several perspectives before a plan of treatment and care can be designed that will be in the patient's best interest. Certain cases may be challenging as determined by the experience and knowledge of the clinician and require conferring with specialist colleague/s to obtain advice on certain aspects of patient care. There are also differing mental models and frameworks for dealing with clinical problems such as clinical guidelines, protocols or pathways. Encounters of gaps and uncertainties create ambiguities placing a huge toll on the clinicians to be perceptive to threats in the patient's condition before they emerge. The clinicians have to recognise and intervene to prevent them in the first place.

Martínez-García and Hernández-Lemus (2013) comment that information channels may vary drastically among different types of complex systems and the ability to self-organise may lead to better control of complex systems dynamics. Driven by non-linear interactions it must recognise what parts of the system do together that they would not do by themselves, individually if to avoid or minimise the impact of human error. The process of clinical decision-making

undertaken by the EMAU doctors and nurses is characterised by their need to work together and be intuitive, to be able to spot the totality of emergent patterns before they are fully defined. EMAU work has to take into consideration the presence of cooperation between their components. Transitions in care for patients in EMAU are pivotal moments, especially where decisions have magnified importance. "All sorts" of patients do access the services provided by EMAU. These clinicians will need to ensure that patient care does not break down during care transitions. What information is communicated and the timeliness are significant to the clinicians who have to manage the health problems of the patient so as to bring the chaos back into some form of order for the patient. Early intervention reduces and/or delays the demand for more critical interventions or services. Incomplete information at the point of care can escalate to inadequate care and adverse events. According to Cilliers (1998) no single agents know the system as a whole. Understanding interconnections (Cilliers 1998) and dimensions of relationships (Anderson *et al.* 2011) such as situated awareness, mindfulness, quantity and quality of connections have to be understood and necessary if to understand the system (Batalden and Mohr 1997). As in every complex system, cultural works have to be seen in the context of the environment in which they were produced and consumed.

5.2   Summary of Chapter

The processes that each patient goes through in the EMAU should be simple, that is registration, assessment of the individual which may involve a series of testing encounters to assist with diagnosis and treatment and then discharge back to the community or to a medical specialty as an inpatient. This description of the function of the EMAU using a mechanical approach seems easy. For one moment it would make any reader think that the EMAU has a simple function which is to assess and treat these ill patients in a timely manner and then discharge them home or to a hospital bed if they need further treatment. So the mental picture of this function: assessment, treatment, sent home or admitted to a medical specialty for further management of their condition will be repeated

for the number of patients that the EMAU receives per day, per week, per month and over the year. This sounded simple, however, on examining the work of the EMAU in more depth it presents a more complicated and complex scenario. The EMAU as presented in Chapter 2 is the front door of the hospital which is always open, never closed, offering a 24/7 service to anyone and everyone who is referred by their General Practitioners, from Out-of-Hours Services, the Outpatients clinics or the Accident and Emergency (A&E) Unit within the hospital because they require specialist management of their conditions. By just describing the processes without including the context does not reflect the 'real world' context of the EMAU.

When the system and processes are examined more closely through the frontline clinicians' perspectives there emerge a more complex image of interconnected domains of work and functions such as task interdependence and managing uncertainties which characterised the work and function of these frontline staff. The EMAU is a system where the individual patient, the clinicians or frontline staff, the clinical decision-making and the practice setting are all intertwined.

The unscheduled visit of each individual patient can be described as unique in the sense that some cases are simple and others often complicated and complex. The description is of the frontline staff having to initiate a series of unplanned responses and interventions to deliver quality services often under difficult circumstances. The complexity frame of reference offered a view of the interactions among the system components and the situational awareness (SA) and interconnectivity in this given system. The study has revealed that there are various factors acting together that can produce obstacles that can hinder the healthcare professionals' performance (Chisholm *et al.* 2000, Jeanmonod *et al.* 2010, Rivera-Rodriguez *et al.* 2010). In particular, cognitively impaired patients who are unable to provide health information are especially vulnerable to information gaps leading to the care of these patients a challenging process that is prone to errors. The interdependencies and interactions among the elements

provided critical insights for understanding the culture of the EMAU and its system properties. The EMAU may appear to be disorderly but beneath the apparent disorder there is order. As a complex adaptive system, it acts by self-organising to respond to its underlying environment to change that environment.

CHAPTER 6: PATIENT SAFETY

Healthcare services are provided to patients in an environment with complex interactions (Chapter 5). The quality and safety of patient care is determined by the work environment in which the doctors and nurses provide care to patients. The doctors and nurses in this study perceived multiple and complex work environment factors that influence healthcare professional and patient outcomes. Patient-centred care is considered to be inter-related with both quality and safety (IoM 2001). The process of planning and providing for successful delivery of patient care from admission to patient discharge whether it is from the hospital to the home or a transfer to another healthcare agency involves dual situation awareness between the clinician and the patient. The previous chapter has highlighted a number of interdependent elements and factors impacting on the work of EMAU clinicians and which could hinder the health professionals' performance. The delivering of patient-centred care in EMAU involves team work. This requires everyone to be aware of what members are doing (Pew 1995). So the clinicians have to know what is going on around them (Endsley 2000). In an environment which is changing rapidly, where clinicians are presented with surprises for which they are unprepared or confronted with adaptive problems to solve (Heifetz 2009), sense-making becomes central (Weick 1995). Proponents of electronic patient record (EPR) systems assert that they hold the promise of improving the safety, quality, and efficiency of healthcare in hospitals (Slight *et al.* 2014, Rothman *et al.* 2013, House of Commons 2007). To support the clinicians in EMAU, the organisation has provided them access to the Individual Health Record (IHR) system

This chapter reports the findings on what the EMAU doctors and nurses do with the IHR technology in the context of patient care. What is beneath the surface? What connections, relationships, and patterns of interaction are creating the structure beneath the visible activity (Sanders1998:70)?

6.1   Clinical Work as Decision-Making

The EMAU is an environment of uncontrolled patient volume. In the course of their work, EMAU practitioners make an unusually high number of decisions (Croskerry 2002). The patients were often not known to them. They must be seen within a four hour window of time. The practitioner's interaction with the patient commences as soon as the patient is admitted. The clinical encounters are of variable acuity. The thinking and behaviour of the practitioners are largely driven by a search for a working diagnosis, often tightly coupled to treatment, and the goal of admission or safe discharge. Participant ANP perceived the usefulness of the IHR and information within it as relevant to assist clinical decision –making:

> *I can't see how extra information will
> hinder, so I think (ehm) there is always
> a positive side to increase knowledge and
> information, the more information on the
> patient the more likely we are to arrive at
> the correct decision –making. (Ehm) you've
> got to have the (ehm) knowledge to diagnose
> thoroughly and I think using the computer
> system helps.* (ANP)

ANP is an independent prescriber. She works closely with the emergency medicine team, taking responsibility for the required clinical management of the patients. Meaningful and critical information are needed in a care process as many important decisions are made in the course of taking the history of the patient's presenting illness and past medical history. Information is seen as useful data or subjective knowledge which is necessary to initiate treatment and prescribe drugs for the patient.   Shared decision-making which is actively encouraged in the doctor/nurse – patient encounter creates a need for cross-boundary data and information sharing (Dawes *et al.* 2004). Both parties require information to build a consensus about the preferred treatment.

The high throughput, diverse and acuity of patients, limited access to past medical records, and overcrowding all combine to make the EMAU a complex practice environment with a high potential for medical error (Yu and Green 2009). Transitions in care from one provider to another especially for the patient with mental impairment, is a high-risk episode in patient safety and medicolegal consequences (Table 9). The data from Table 9 were a sample taken from the huge spreadsheet of data collected to review why the health professionals were accessing the IHR as part of the monitoring process.

11	confusion	15	patient confused and not communicating
12	confusion, no past medical history available	19	dementia
13	Confusion, not communicating.	20	dementia
14	pt very confused. Unable to give consent.	21	dementia - patient not able to give consent

Table 9: Random sample of data of patient (coded) unable to cooperate (Local Health Board)

A key issue in EMAU care is the timely and efficiently functioning of these care processes. In the following extract, participant DMF2 was articulating about checking the patient's details and how the IHR assisted with ensuring that the right treatment is given to right patent. Clinical decision making has to be a cornerstone of high-quality care.

> *That we've got the information of patient right:*
> *the name, the address, date of birth. I always*
> *make double check and double check because*
> *some people come in and they don't know who*
> *they are. They are very confused and it does to*
> *make sure we've got everything that we need.*
> *(DMF 2)*

New patients arriving patients as well as to those waiting for treatment, tests, procedures or for available beds (Trzeciak and Rivers 2003) affect the organisational operations of complex healthcare delivery processes (Mitleton Kelly 2003, Vigden and Wang 2009) requiring tactical and operational decision-

making (Hulshof *et al.* 2012). In the practice environment, strategic decisions are translated to facilitate operational healthcare delivery process. Most of these decisions are concerned with the allocation and distribution of resources aligned to the individual patient level in a timely and efficient manner. Demands (professional bodies, consumers of care, government and hospitals) for increased professional accountability (NMC 2015, BMA, Francis Report 2013) require accuracy, efficacy, and expediency of clinical decision making. The extract from Participant DMF 2 illustrates the connection between patient progress and dynamic management and use of information. The EPR has a prominent role in managing care by monitoring clinical events and providing real-time decision support. Everything a healthcare professional does with a patient involves the seeking and use of information. Information is necessary for correct decisions-making and timely healthcare delivery services.

These nurse managers have been observed to spend a lot of their time pursuing information-related activities about the patients, conferring with relatives about medications, relationships with co-workers on post-take rounds and on the telephone to the patient's general practitioner to find out current status of events in making patient-care decisions. All these types of knowledge, as well as nurses' knowledge about the moment-to-moment status of their patients, are used to inform their decision making regarding how and when to deliver care. These strategies include thinking ahead, acting proactively and making decisions for the management of workflow and care delivery. "Stacking" (Ebright *et al.* 2003) is the invisible, decision-making work of practitioners. Stacking results in decisions about what care is needed, what care is possible, and when and how to deliver this care to an assigned group of patients. The mental list of the tasks/activities directs the practitioner's first work-related behaviour. Each new observation and receipt of information from minute to minute is a continuous re-ordering of the priorities of the activities in the list, highlighting an iterative pattern of information seeking–sharing–seeking. The EMAU practitioners often encounter complex situations. For example, the nurse manager NM2 was called

to see to a female, elderly patient who has been admitted from a nursing home. A scribbled note accompanied the patient. Participant NM2 and the attending physician had to determine the patient's condition and history. This drove the information that has to be collected and assembled to answer the problem.

Olson and Eoyang (2001) highlight three conditions that determine the path and outcome of self-organising in teams. These are significant differences, transforming exchange and containers. For example differences such as style, background, experience and outlook can contribute towards dynamic interactions and creative growth. Transforming exchanges on the other hand are the interactions between entities, people, systems, or other resources that create change. Containers can be a physical artefact such as the IHR system. To participants ANP, NM 2, DMF2, the IHR system served as dynamic information structures (IoM 2001) to assist them to create safe care for the patients. The IHR system exists to collect and provide the required information by providing the clinicians with a decision tool for tactical decision-making. One of the key questions in a care process continuum is how to know, or to predict the next steps to take. According to data from the Local Health Board, the IHR was viewed as a valuable source of information and has helped to inform their practitioners' clinical decisions, particularly to the older patients and those with a chronic disease. This is highly significant taking into consideration the recognised impact of complex elderly care on unscheduled care settings and the desire to avoid unnecessary admissions. The IHR improved the operational process as exemplified by the effect on the speed of admission, transfer or discharge thus enhancing efficiency within the EMAU. Therefore the IHR has a significant role in the care process.

6.2 The IHR as A Container for Information

The extract from participant MR 2, a medical registrar illustrates that the healthcare organisation that he belongs to and the environment that he practice in is a subset of nonlinear dynamical systems, which is pervaded with uncertainties (Anderson *et al.*2005). He is part of a system which exists and

evolves to serve societal needs (Hsiao 2003). Even the work of delivering care is self-paced, discretionary, and nonlinear. Like participants ANP and DMF 2 above, clinical practice entails coping with complexity and in particular, coping with the gaps (Cook andWoods 1994) that complexity spawns.

> *For instance the patient with dementia ehm*
> *who weren't able to give their history and*
> *sometimes those patients who have been*
> *brought in by ambulance and not all their*
> *medications brought with them and no one*
> *accompanying them. So you don't know*
> *what their medical history is. So in those*
> *sort of circumstances it was invaluable.*
> *Ehm I also use it to check that the patient*
> *hasn't miss anything ehm sometimes they*
> *forget…what they consider to be trivial but*
> *actually could be key to the history they are*
> *presenting. Ehm so you know if for some*
> *reasons I felt the patient have not given me*
> *everything ehm then I would check to see on*
> *the GP record to see if there is something*
> *they would have missed out.* (MR 2)

The work patterns across EMAU revealed the challenges that these clinicians encounter while delivering care. For example, the Local Health Board data highlight the impact of the 'complex elderly' patients who access their services and that this group accounted for 36% of admissions. Routine data collected by the Health Board suggest that 45% of access to the IHR by the multi-disciplinary team members in EMAU were for this age group, those aged 75 years and older.

Another example provided by participant NM2 was the loss of information that sometimes accompanies transfers of patients from one facility to another.

> *Well in all honesty I think patients coming*
> *from a nursing home or quite elderly er who*
> *really can't tell you any any sort of information*
> *about themselves. Those sort of things are the*
> *sort of patients that we normally, oh well often*
> *that I access the IHR but sometimes patients*
> *like with chest pain that comes and that patient*
> *cannot remember sort of terminologies if it is*

aortic heart of aortic fibrillation they have in
the past or if they have any stent whatever and
that is actually to find out I can access the IHR
and look for those. (NM2)

Some of the patients arrived with notes from their General practitioner. Any inconsistency in the patient's history might arouse suspicion that something is missing in the history and is a case of data in the world triggering awareness of a potential gap. Cilliers (2000) suggests that it is necessary to understand the nature of the interactions between the elements if one is to understand complex systems. Interaction is a significant concept in this context as the behaviour of the system is determined by the nature of these interactions.

Ehm (pause) and even sometimes for the
patients that come in that were unable to
speak to you will still look for background
information like alcohol problem or a drug
addiction problem they wouldn't necessarily
mention to you , ehm those who have outpatient
treatments here and in (City) because we
haven't got access to their (City) tests and
results on out computer systems but the GPs
have records of all that as well so patients
who have been looked after in the two areas
you can (thinking and saying aloud what's
the word) – that's it get it altogether.(DFM 1)

Complex systems involve many gaps or discontinuities between people, stages, and processes (Cook and Woods 1994). As illustrated by participant DFM1's account, gaps are readily seen when they are aligned with organisational and institutional boundaries that mark changes in different roles of professionals, or formal divisions of labour, or responsibility or authority (Cook *et al.* 2000). For example, gaps can be the loss of coherence in a plan of care that manifests due to workflow, interruptions, distractions poor communication or documents of transfers for patients in care transitions. These gap driven activities are so intimately woven into the fabric of technical work that they appear within the processes of care. As such, much of the practitioners' expertise in action revolves

around gaps. These interactions can be nonlinear: small inputs may have large effects and vice versa (Anderson *et al.*2005, Plsek 2001).

Hripcsak *et al.* (2007) highlight that knowing the patient's longitudinal health condition will assist the clinicians in developing an appropriate plan of care for that individual. Coordinating care for the patient involves complex exchanges of information between health care professionals and patients; and at times with their families, within and across teams of health care professionals and settings. The communication can take several forms such as in person, over the phone, and in writing, on paper or electronically.

Clinical reasoning and decision-making enable the healthcare professionals to analyse information relevant to patient care. The healthcare professionals constantly organise and reorganise the priorities and tasks of care to accommodate patients. Expert practice requires not only psychomotor and affective skills, but complex thinking processes such as making inferences and synthesising information to choose a course of action. These practitioners are operating on the frontline or at the sharp end. Gaps themselves mark the areas of vulnerability (Cook andWoods 1994). Everything, it seems, is connected to everything else, and every thread of action and cause is intrinsically hazardous.

From the health informatics perspective, the IHR/EPR system provides a means to traverse the gaps, thus creating a fruitful means of pursuing robust improvements in patient safety. The EPR has the potential to transform how the business of healthcare is done when viewed as a repository or container for patient health data. EPRs are being used widely in hospitals and healthcare services throughout the world to improve communication, centralise and consolidate patient data, and improve efficiency (Lee *et al.* 2013, Rothman *et al.* 2013, Creswick *et al.* 2011). According to the participants, the IHR enabled them to access patient information that the General Practitioner had acquired and created during the patient's transition through the primary and secondary

healthcare systems. Here, participant DMF1 mentioned that the IHR provides a fuller background of the patient, offering the professional some degree of control in situations of uncertainty. Normally the patient themselves are the 'containers' of their own health information. They are expected to provide healthcare providers with their health information on admission, however, extracts from the participants and Local Health Board data have highlight that this can no longer be an expectation due to patient's cognitive impairment or status on admission.

> *Oh definitely help our practice because you can easily as I've told you earlier on, you can easily log in and look for the patient information and then you can collaborate. It then helps with the diagnosis, it helps with the treatment and then you can easily, oh, this patient has come in previously with this, probably these symptom is related to the previous medical problem he's got. And then you can easily see all the medications at the same time. Perhaps the symptom is related to the medication that the GP has just been started sometimes. Especially with the BP (blood pressure) tablet and then the   patient came in the thin air collapse, BP is low and then you had looked into the computer you found out the GP has started three days ago with new BP tablet and then you can easily relate the case of the patient to the information that is available through the computer.*
>
> (DMM 1)

EPRs use information technology to manage, store, and instantly make available clinical information (Bodenheimer and Grumbach 2003). The data are objective notes about the patients and when they are analysed and compiled, the intelligence that the EPR provides can be used as reference for clinical diagnosis It has the potential to personalise care, improve population-based care and increase patient involvement (Ventres and Frankel 2010). EPRs serve to improve the coordination of care as patients move from inpatient to outpatient settings and transition back and forth between subspecialist and primary care offices (Bates 2005).

The IHR has advantages over the paper records in terms of legibility, speedy access and timely information (Ben-Assuli *et al.* 2012, Hamid and Cline 2013) helping the clinician manage their patients. The participants have provided accounts that the IHR has enabled them to selectively gather specific data or information about their patient. Hilligoss (2012) describes this activity of targeting specific segments of the patient health record as "doing a chart biopsy". According to Hilligoss (2012) this activity helps the clinicians in the process of building an understanding of a patient by providing a broader sense of the patient and contributing to the care of that patient.   Participant DMF1 demonstrates how the IHR can provide the social history of patients who presented to the EMAU with dementia or in a collapsed state:

> *Ehm, obviously patients with Dementia because*
> *you can get the social history as well, the GPs keep*
> *a record of that or used to have a record of that.*
> *Ehm patients from nursing homes very often don't*
> *always have anybody with them and really speaking*
> *very precarious because only the GP knows that*
> *patient. You can get background information.*
> *Patients who come in collapsed and unresponsive*
> *and can't talk to you, these are the patients you can't*
> *get information from. Everybody really.* (DMF1)

To these participants, the IHR technology promotes their ability to remain aware of everything that is happening at the same time and to integrate that sense of awareness into what they are doing at that moment. The extracts reflect that the EMAU setting would expect its clinicians to be situation aware. Situation awareness relates to the health professional's ability to quickly detect, integrate and interpret data gathered from the environment (Smith and Hancock, 1995, McMillan 1994). The concept of situation awareness has been applied to different circumstances and workforces. It has been used with personnel functioning, in circumstances, positions or settings where quick decisions under stress are required. The view is that situational awareness is both a process of assessing the situation and the resulting knowledge or awareness of the situation.

Situational awareness and interconnectivity with the patients, clinicians, the environment and the IHR technology are important factors in the complex, dynamic and unpredictable healthcare environment (Fioratou *et al.* 2010). In relational term, Greenhalgh *et al.* (2008) point out that the IHR has become an active player in an ever-dynamic network of people and technologies within a changing and often unstable environment. The nurses and doctors used the IHR but differently according to the deputy nurse manager:

> *The doctors use it a lot, obviously for taking history*
> *but nurses have used it I think in a different way, they*
> *use it as a background and social ehm information*
> *gadget which can give us a whole picture of your*
> *patient, not that little bit of information that they*
> *that they give you on admission but when people,*
> *they are not well, someone will tell what happens*
> *in 25 years ago, and they just don't want to and*
> *they don't longer think everything is relevant but*
> *if you can have access to find the whole picture*
> *you can get the best care hopefully for the patient.* (DMF1)

According to the Local Health Board data the IHR has taken time to embed into the clinician's daily work processes and the most frequently accessed data items within the IHR are diagnoses and medicines.

The IHR technology helps facilitate information between providers in a timely manner. The movement of patients through the acute medical assessment wards is rapid (Cameron *et al.* 2000). This complexity is even more so when faced with multiple admissions all with multifaceted acute care needs, together with the demands on the staff's time to coordinate rapid patient transition. Most of the accounts provided by the participants were related to perceiving the IHR as a repository for data. The types of information sought were historical information, in particular information about previous hospital admissions, past medical history, current medication history and laboratory investigations and their results. These information gaps can be attributed to a number of factors such as patient journey among providers, institutions and fragmentation of the overall healthcare system and patients who are especially susceptible to having

information gaps. Information gaps could adversely harm patients and the health care system. Incomplete or piecemeal information regarding previous admissions to hospitals, medical assessments, investigation results and medication list could produce substandard decisions and poor patient outcomes leading to longer stay in the EMAU, overcrowding of the unit and patient dissatisfaction. According to Berg, (1998) the IHR is becoming part of the socio-technical network. Technology such as electronic patient record is the start of this connectivity as this participant suggests:

> *Anyway that can help us is when we can have a clearer medical history they have got so we can know how to nurse them and we will know what medication they are on if they can't give us the information really. Normally though we can get that you know but there are times that I say that people don't , even though they come into hospital they don't know what's wrong with them and they don't know their medical history, a lot of patients – do they? They don't know why they are on the medication they are on (laughs). (DMF2)*

Within the health system duty of care and accountability (DH 2007, Donaldson 2002, DoH 1997, 1998) are linked to every healthcare professional who have a role in delivering care. Patient safety is of significant interest for the healthcare system as patients have a right to receive care without suffering harm. The patient is identified to be at the core of any healthcare situation, is part of the healthcare environment and part of the task. The IHR technology can be viewed as guiding the healthcare professionals through the healthcare maze (fragmentations). Here the deputy manager DMF2 describes how the IHR is used for cross-checking of information for patient safety, to ensure they have the right patient and in managing workflow:

> *We check with them [patient], checking with relatives, we check on the computer. We check their details against what we have on the computer, er like next of kin, ehm address, GP and all. It's really to manage flow to make sure everything goes smoothly. There's so many patients come*

through here just to make sure we are
treating the right patient. (DMF 2)

Safety controls can reduce risks significantly and avoiding potential losses to the organisation. During care transitions, patients can be subjected to suboptimal care and risks as the healthcare systems have often encountered shortcomings (gaps) in the way that essential information are communicated. This is attributed to the settings working in silos and 'islands' of information. The IHR also helps to speed up the admission/transfer or discharge of patients. The Local Health Board User Survey suggest that the IHR improved operational processes, thus enhancing the efficiency within EMAU.

In the following extract the medical registrar has illustrated the fragmented knowledge across care settings. The reference here is related to the losses of information accompanying transfers of patients from one agency to another or when the patient is discharged home (Cook and Woods 2000). Information communication technology such as the IHR can help bridge the 'gap', enabling access to information to produce better assessments of patients.

> *I think generally I think they [IHR]are really important*
> *ehm because there's so much information particularly*
> *now with healthcare being so specialised and people*
> *are being seen in different centres and you can't rely*
> *on paper notes and and it is very important that you*
> *get information about patients particularly being seen*
> *in other centres and and yea it just makes assessment*
> *of patients much more efficient on the whole as long*
> *as the system works well.* (MR 1)

Often the safety and quality in patient care are compromised by information gaps and access to crucial patient data at the point of care (Stiell *et al.* 2003). This view was also brought up by participant DMF1 in her discussion on how the IHR has contributed to the way she works in EMAU and patient safety:

> *Quite a lot when we had access because like I said,*
> *everything felt safer because you know more what*
> *you are dealing with in in the patient and you had*
> *the background information because people don't*

always tell you , don't always tell you the truth and when you are speaking to them face to face and in terms of patients who are very confused and couldn't tell you the truth even if they, if they wanted to. So it will be all better if you could get information you can tell that patient you just had in is allergic to penicillin even though there is nothing written down in our documentation. According to his GP stuff it doesn't necessarily get transferred from GP to hospital. (DMF1)

Where we see systems of interconnected elements and dimensions involving adaptive agents, we are more likely to see complex relationships and processes (Anderson *et al.* 2005, Plsek 2001, Plsek and Greenhalgh 2001, Cilliers 2000). , According to Healey and McKee (2002) the EMAU a "one stop" unit where patients can be seen by the team of specialists within one single visit. Therefore it is even more important that safe, appropriate and relevant care is delivered. The essence of professional caring is complex, multidimensional and focused on who the provider is, what the provider knows, what the provider does and how the provider acts and interacts with the patients and families. The quality of that interaction has measured outcomes for quality, safety, satisfaction and cost (Prudent Healthcare 2014).

6.3   Medication Reconciliation

Medication errors in hospitals are a huge and increasing problem although the true scale is unknown (1oM 2000). Cannon and Edmondson (2001) define medication errors as failures- as deviations that thwart expected and desired results. Therefore medication errors (failures) can be interpreted as a breakdown in the treatment process which may cause or has the potential to cause harm to patients. The treatment process or medication use process is collectively, the prescribing, compounding, dispensing, drug administration, and monitoring processes, which are carried out after the decision for treatment has been made by the doctor. Edmondson (2004) explained that failures can be large or small, avoidable and unavoidable errors or uncertain actions. Medication errors can occur at every stage of the medication use process and are a threat to patient

safety. A closer examination of the literature revealed that medical errors can occur through acts of ignorance, deficiency in knowledge or accident due to departing from or failing to achieve what should be done. A medical failure can be due to an error of omission (failure to act correctly) or an error of commission (acted incorrectly) relating to what is generally known as "the five rights": the right drug, right dose, right route, right time, and right patient. Poor oral or sloppy and illegible written communications can also lead to errors.

Medication errors can have a large impact on patient safety and account for prolonged hospitalisations, extra medical interventions, morbidity and even death. It is preventable and strategies need to be in place to minimise mistakes and improve patient safety as medical errors cause unnecessary burden to both patients and hospitals. These failures can be Human Factor problems, which develop as a result of human error, work environment and work process problems ranging from technical errors, interruptions, work around standard procedures to breakdown in communication. Prescribing errors are the most frequently occurring type, followed by drug administration errors and dispensing errors (Bates *et al.* 1997, Song *et al.* 2008). The IOM (2000) drew attention to fatalities caused by medical errors and therefore improving patient safety is a high priority for hospitals and its frontline staff. As human failures are inevitable, improving the system seems to be the prudent approach to avoiding medication errors.

In the EMAU, medication errors may develop due to a multitude of interacting influences. When the clinicians were asked to discuss how the IHR technology has helped or hindered them in the achievement of their organisational goals, almost all of the participants focused their discussions on the value of the IHR as a repository for medication data.

According to participant ANP, the benefits of the IHR are:

> *Again (ehm) having to (ehm) see or make earlier*
> *assessments of patients that present to us, then*
> *knowing that they've got an accurate health*

information sheet (ehm) on the computer, if
there is their drug information, one of the
major things really, (ehm) medication that
has been issued, (ehm) previous diagnosis.(ANP)

Accurate up-to-date data is crucial for decision making and to help the professionals to construct certainty in their clinical work (Harvey 1996). For example the nurse manager of the unit, participant NM 1 articulated that:

It [the IHR]was actually helpful. I find well personally I find it helpful ehm one, because as soon as we've got a patient ehm as soon as we've get the consent from them and they agree we can access them on the computer, we can actually ehm er they are outpatients who are elderly who have forgotten to bring their prescription we can access it ehm online by computer instead of phoning the GP, wait for the 9 o'clock or half past nine until they open or at least they are there and ehm at the same time there has been problem with some elderly patient who live on their own may be bringing in an old prescription, which when you look at it oh this is 2010 but this is not what I need, oh you know. So you have to wait for a relative to go and fetch it. So with their IHR you can easily access it. You can access their er back medical history as well because it is all on there and er it is very good because you don't have to when you are completing some of the documents that we need on admission you can just copy it and then you can just see okay I can just write it down. Ehm the that's why I find it helpful er personally and ehm we as nurses and all working in in this profession we can liaise with one another and I can highlight to the doctor, oh doctor this patient actually came in say for example having to fast track somebody oh this patient came in with ehm let's say for example giddiness and then I can see on the prescription but sometimes they would say I am taking a yellow tablet which is like this which I don't know they have started me on it and then when you look at it and oh ya she has been started on a beta blocker probably that is the reason why she felt giddy might be a reaction because she has been only ehm on it for two days. Then I can take to my to my er senior then to one of the doctors on call, doctor this is what I can gathered from the IHR, well they can access it anyway themselves, but at least you can flag it and the doctor already has got this ehm er what you call this ehm they got the idea from the knowledge that you already derived. (NM 1)

The nurse manager has highlighted how being able to access real time information is essential for guiding efforts to prevent medical errors or adverse medical events. The extract above illustrated that medication reconciliation requires joint effort and failure on the part of the patient to bring in their prescription can cascade a series of complex processes of communication involving the relatives or carers and even the general practitioner. The extract also reflects the healthcare quality diligently pursued as controlling the right medication is just as important in the management of medicines. In a busy EMAU with patient acuity and speed of patient movements through the unit, 'chasing and rooting' for essential information can be time consuming, create distractions and detract from the clinician's ability to focus on direct care. Time is a valuable commodity which the healthcare professionals do not have enough of.

"To Err is Human" (IoM 2000) brought into focus the fact that many errors, such as medication-based mistakes like adverse drug events due to allergies or drug interactions could be prevented if the right information is available at the right time and shared with the team: According to this participant DMF2, the IHR was useful for checking of medications when in doubt because it has implications for effectiveness of treatment protocols:

> *Yes (laughs). Why are you taking that? I don't know.*
> *It (the IHR) will be beneficial in that way for me to go back to*
> *check why they are on [name of drug] because they've*
> *got high blood pressure or you know because they are*
> *like 'no I haven't got no medical history but medication*
> *by [name of drug]. Why are you on that?* (DMF 2)

Participant MR1 reflected that in healthcare clinical knowledge such as health status and medications prescribed are crucial in the clinical process of making a diagnosis, especially when there is clinical uncertainty about effective treatment mechanisms:

> *Ehm a lot of patients we see ehm either come in*
> *in a confused state or potentially they don't*
> *necessarily remember a lot about their medical*

history and drug history in particular and in in
that situation it was really valuable to be able to
act get that information, particularly if the patient
comes through A& E and weren't referred by their
GP, then you don't necessary have that information
and ehm often drugs can be the cause of an illness
or you know it is very important to know what the
patients are taking ehm a lot of what we do is
obviously manipulating different drugs and it
meant you could actually start the process particularly
at night ehm whereas if you didn't have that
information it will be quite limited and you have
to contact the GP surgery during opening hours to
* get that information, and apart from drugs the other*
thing is the past medical history which can be very
relevant to a patient, particularly if they are confused
* and not necessary able to tell you that so to be able*
to access that ehm which is really valuable. (MR1)

In this extract the medical registrar is highlighting that expert practice requires complex thinking processes such as making inferences and synthesising information to choose a course of action. Therefore information retrieval on medication use compose a significant aspect of the health professionals' clinical work, considering that medication has an effect on treatment decisions and even more so when patients are admitted in critical situations. The need to rapidly determine whether any medication the patient is taking has contributed to the EMAU admission or whether there is presence of any medication that may contraindicate treatment options is paramount for patient safety.

Accurate up-to-date data is crucial for decision making. The IHR was embraced as a tool to assist with decision-making and medicine reconciliation. The IHR technology should not only give data but also provides some answers, thus removing some of the uncertainty of the unknown and unpredictability. For example the extracts provided by participants NM1, DFM2 and MR1 illustrated how healthcare professionals have to be continuously aware of what they need to do next in the context of the patient assignment and during their shift in relation to the work of the unit. In this context, decisions such as what is the most

important thing to do for this patient, in this given situation and what are the next steps to pursue have to be addressed. The strength in a complex organisation is derived from how different components coordinate and fulfil their tasks for proper functioning (Greenhalgh and Plsek 2001).

Drug-related visits and potentially inappropriate medication use especially in the elderly are not only the concerns of the doctors but the nurse practitioners as well. These following extract depicts the vulnerability to adverse events:

> *(ehm) We had some time ago a patient who*
> *was semi-comatose and had taken an overdose*
> *(ehm) of medication and the family, (ehm) were*
> *not able to articulate really which medication the*
> *patient has been on etc and in that particular*
> *instance it was useful to see (ehm) by looking at*
> *the electronic database we could tell that they*
> *were on anti-depressant medication and we then*
> *could sort of work out which one we should look*
> *at for when you are observing the overdose, which*
> *could obviously, [inaudible name of drug] overdose*
> *might need to go on a monitor. It affected the way*
> *we, we took care of the patient. Obviously we*
> *check through the blood which ***levels but it*
> *was additional information to treat the patient.* (ANP)

The IHR provided the means to access relevant patient-specific information at the point of care when necessary, particularly for the patients with medically complex conditions. According to participant MR1, the kind of information that is particularly useful is the past medical history and the list of drug history:

> *Yes there'll be a, there will always be a prescription*
> *and there'll always be a list of past medical history*
> *often there's sometimes get blood results and things*
> *like that but that would be less relevant as we*
> *have got access to that anyway and so it is really*
> *that list of drug history and past medical history*
> *on which occasion will be very valuable.* (MR 1)

The accounts highlight that the doctors and nurses decision-making is dependent upon their ability to notice and make sense of what is happening to the patient and their environment. Safety of patients and the delivery of quality care demand that the clinicians be aware of the subtle as well as obvious changes and tools such as the IHR do not just enable the tracking of medication use prescriptions to make care safer but can assist the cognitive work of nurses and doctors. Effective care delivery will contribute to workflow and promotion of a safe environment for both clinicians and patients.

Information deficits contribute to medical errors which are significant hazards and may result in patients' increased length of stay (Kyriaco and Coben 2000) and the huge human and financial costs (Leape 2000) incurred. Anandh Rao and Agarwal (2003) highlight the annual estimated costs of "loss" to be around 20% of budget to NHS organisations. Adverse events relating to medication represent suboptimal care (Weingart *et al.* 2000). It is one of the most common type of adverse events (Audit Commission 2001) which occurred in all healthcare systems, and are judged to be preventable (Vincent *et al.* 2001, IOM 2001)

Placing the participants' accounts into context, it can be seen that the task of cross-checking and the creation of a medication list for each patient is a time-consuming and complex activity when considering the number of patients that passes through the unit each day. For the clinicians in the EMAU, the treatment of acutely ill patients interacts with temporal urgency in a complex way. The task of compiling a comprehensive medication list is exacerbated when the condition affecting the patient is yet to be diagnosed. Medication reconciliation is a complex task when the management of the patient included uncertainty or unpredictability.

Often information about prescribed medications is incomplete or difficult to obtain. To secure information about the medications these health professionals often have to 'work-around' by involving the patient's family and/or General

Practitioner (GP). Participant DMF2 highlighted the value of the IHR in today's clinical practice where age, fragility, dementia and supposed pharmaceutical provision are of particular concerns to health care professionals:

> *It (referring to the IHR) was very good ehm with*
> *(pause) with, if you have a confused patient and*
> *is muddled and couldn't tell you things. If the*
> *relative gives consent you could look at it to see*
> *if you could find out the exact drug history, if*
> *people forget to bring their repeat prescriptions*
> *and that's all the time you know and you know*
> *when they last seen their GP and medical history.*
> *It was beneficial in that respect if you remember*
> *to use it…* (DMF2)

The older people will make up the largest group of adults regularly using the NHS (Office for National Statistics 2008). Dubois *et al.* (2000) cautioned that increasing numbers of elderly patients presenting for healthcare services (e.g EMAU services), the complexity of medication use and the different number of medications prescribed for patients will continue to rise. The effort to create medication lists will increase administrative time which can be disruptive for EMAU workflow. The unintended consequences that accompany disruptions and workflow issues could be gaps in medication lists, delays in treatment and adverse drug events due to medication errors. The resultant effect will be jeopardy to patient safety and healthcare costs. The IHR technology has a place in healthcare. If well designed and properly used by the clinician, the IHR will not only reduce the risk of adverse drug events and harm to the patients but provide significant savings to lives and health care costs.

Lack of information about patients can affect issues of liability, responsibility and accountability. So it is not surprising that the Individual Health Record technology was perceived to be useful by the EMAU doctors and nurses in their day to day work. The participants' articulations reveal the problem-solving process and that the IHR is a solution, not an 'empty vessel' and ' perhaps the knight in shining armour', perceived to be essential, to liberate and to enlighten

the lives of the care providers and users of the healthcare services. The remarks of this nurse manager, NM 2 echoed the relevance of the IHR:

> *Er I found it really, really a good tool, making*
> *sure most of the patient's details are right in*
> *front of you because of the access to computers.*
> *A good technology really. Yes I want the*
> *IHR back. First thing, I would be jealous they*
> *will be implementing to have it and we are*
> *not (referring to other units having the IHR*
> *whilst theirs have been withdrawn).* (NM2)

Every day, patients with continuous, complex care needs make hundreds of thousands of transitions across different sites of care and these patients with complex acute and chronic care needs will often present themselves at the EMAU. During transitions between settings, this population is particularly vulnerable to experiencing poor care quality and problems of care fragmentation. For the doctors and nurses managing patient transitions is about knowing your stuff and not having to work in the dark. The generation of the patient's medication information can construct a greater degree of certainty about the patient's condition. The publication of reports such as the United States Institute of Medicine's report 'To Err is Human' (US Institute of Medicine 2000) and 'An Organisation with a Memory' (DOH 2000) in the United Kingdom has brought patient safety to the foreground. These reports have become a significant component of the NHS Plan and the NHS quality agenda (DOH 2000, 2001). It is without doubt that one of the significant challenges for healthcare organisations has to be improving patient safety and this hinges on influencing health professionals to behave more efficiently. Designs for safe care strategies to prevent errors, make errors visible and mitigate the effects of errors are recommended (Weingart 2000). The accounts from these participants have illustrated that the IHR technology can bring vital information to the bedside to facilitate efficiency in the health care system, reduce the problem of overloading, and improve safety and quality. The Local Health Board cited medicine Management findings which suggest that 10% of patient safety in hospitals were related to errors with medicines. Feedback included situations where medication

to which a patient was allergic or intolerant was prevented and medication liable to misuse was identified and managed. According to the Local Health Board data the commonly used data items were repeat medications and medication history. Their face to face survey corroborated the participants' accounts that the IHR was used for medicines reconciliation. Even though the pharmacist aligned to EMAU declined to participate in the study, data from the Local Health Board revealed that pharmacy had the greatest increase in use. The IHR improved prescribing and was a valuable source of information on drug formulation.

6.4   IHR Bridging the Intersection of Care

The idea of critical junctures, although often used in the historical and political context can be applied to this micro level of practice. The actions of these frontline clinicians are temporally bounded sequences of events and interactions (Hannigan and Evans 2013) which can impact personal health and experience of the individual patient as well as the clinician in lasting ways. There exist critical junctures or opportunities to provide appropriate services and intervene in the disease process. Care transitions are critical junctures for the elderly patients and those with chronic conditions and co-morbidities. Different problems belong to different areas of responsibility. In a complex organisation different components of the organisation function and coordinate with other components. To meet the requirements of the patient good and effective communication between health providers is an essential component of high quality health care (Hassol *et al.* 2004) yet poor information flow interrupts the daily work of the healthcare professionals in the EMAU. Often the time of admission to EMAU can be an obstacle to information retrieval, particularly during out of hours as General Practitioners (GPs) are no longer required to make after-hours care available to their patients. This nurse manager, participant NM2 articulated the difficulty encountered in trying to establish the medication list for patients admitted during the night:

> *Er, it is difficult, yea, so especially for example*
> *again with regard to the middle of the night and*
> *the GP surgery is closed. So it tends that it delays*

some sort of medication treatment wise because
doctors doesn't know especially patient doesn't
know, they don't have the list of medications.
They don't know about them so we have to delay
until the morning, until, until we wait for their
surgery to open and that's the time we can confirm
what dose of medication they have. Erm, it is risky
for the patients especially those epileptic ones,
for the diabetics obviously as well because obviously
when people don't know the dose you tend to delay,
delay or probably overdose or under dose, that sort
of thing either way round. So it is risky on the part
of the patients. (NM2)

This nurse manager further expanded that in every day practice it is difficult to speak to a General Practitioner:

I find it (IHR) is a very positive addition to the
Computer Works Station (CWS) and I find it's
use very simple and I need it to be simple [laughs]
and you know to be able to access the records of
the GP particularly when there is no one at the GP
practice, is incredibly useful and I also think it makes
patient care safer. (MR 2)

It is difficult I think because er you have to go through
their secretary and decide 'oh the doctor is busy at the
moment. They've got patients to see.' So you tend to
just, I think most of the time to the practice nurse of
the district nurse that we tend to call rather than the
GP. (NM2)

Clinicians can experience high communication loads which mean a relatively large extent of time and effort has to be allocated to communication in order to coordinate activities. These require interacting with many agents (Tan *et al.* 2005). As highlighted by nurse manager's extract above, to contact the patient's General Practitioner (GP) does takes up time. Often the health professional will have to make contact more than once, communicating with the practice manager to secure access to the GP as the opportunity to speak to the GP will depend on the GP's time and availability.

The flow of information passes through a number of channels and involves various roles within the EMAU and other nested units or services. Multiple contacts have to be made just to obtain information about the patient. These pose challenges for team working, seamless coordination and continuity of care. Where it is difficult to communicate with the General Practitioner, according to this medical registrar, having access to the patients IHR gives the clinicians a starting point:

> *So having access to their GP records ok it is assuming*
> *that the GP record is kept up to date but at least it gives*
> *you a starting point.* (MR 2)

From an information perspective, the IHR can be viewed as an agent in the provision of optimal care and smooth transitions across the care for both the clinicians and patients. The EMAU handles urgent care needs of patients which are not confined to weekdays and work hour. The need to coordinate and exchange information speedily, better, more timely, accurately, and comprehensively within healthcare has become most evident. Ensuring that clinicians and patients have timely access to the appropriate level of care on nights and weekends does not only have the potential to reduce unnecessary emergency department use but it can also ensure that patients receive patient-centred and efficient care.

These participants expressed that having rapid and timely access to patient information makes the management of care easier. For example deputy manager, participant DMM1 cites speed and time as reasons for the support of the IHR:

> *Yeh, I find it very helpful especially with…when*
> *everybody is on the run looking for something.*
> *Clerking a patient, you would have stayed with*
> *this patient for quite some time. You know it is*
> *easy to get information unless like, er, you know*
> *clerking a patient takes like one or two hours*
> *because the patient doesn't know all the information*
> * but if you got the initial information from the*
> *patient, you then add the information from the*

computer and then you amalgamate that
information it will end up with a solid information
from the computer and the patient. And then it
will facilitate your diagnosis and treatment.(DMM1)

According to this participant, to be able to access the patients' information makes healthcare delivery more effective. The IHR enabled prompt and timely communication at the intersection between primary and hospital care

The Local Health Board data indicated that access to the IHR reduced the need got telephone calls to general practice. This was corroborated by data collected by the pharmacy team that time spent by pharmacy team was halved pre and post going life. Less time was spent chasing up on incorrect drug histories on discharge,

6.5   IHR Enhancing Patient-Professional Relationship

The Individual Health Record technology can help enhance professional relationships. It is in these interactions that the potential for better quality and improved outcomes will be achieved. In this extract, participant ANP describes how the IHR technology assists with professional practice, how having knowledge of the patient's condition enhances how the patient will view the professional and possibly has significant impact for professional-patient relationship:

> *Uh – professionalism I would say is obviously,*
> *is being able to be a knowledgeable on your*
> *subject matter. Yeah? I mean, I think for myself*
> *my area of expertise is acute medicine, so*
> *treating a patient who presents to MAU, (ehm),*
> *for the first 48-72 hours is our area of expertise*
> *because with loads of people with chronic diseases*
> *we are not expert at everything but we have to*
> *stabilise patients that come through the emergency*
> *setting. So (ehm) any additional knowledge on*
> *those patients then will enhance your professional*
> *approach – wouldn't it?*   (ANP)

Patients expect the health care professionals to know about their condition when they seek care. Participant NM 2 further enlarged on the benefits of the IHR in relation to building partnership and trust:

> *Er professional practice, well if you think about quality issue, safety issue I think it does influence professional practice really because er in all the things you have to do on a patient you have to double check this, double check that, like allergies, like what sort of medications especially in particular to how much dose to take because sometimes Doctor {name] may jot down different dose, but may have to increase or decrease it but you know that they are on a particular dosage and sometimes doctor doesn't know the dose of the medication but we know straightaway because of the IHR. It is quite handy. Erm, and (Pause) also from professional practice if the patient wants to know some sort of information regarding the medical notes, some sort of medical details from the GP, we are able to let them know as well. So we are making a relationship between the patient and the staff through the IHR. They do tend to trust you in some way. (NM 2)*

In the following extract, participant ANP explained how timely use of patient health information in the IHR can inform the patient during their consultation with their health provider:

> *I could expand on this, about, I'd mention to patients in the past certain medical terms, they don't understand and then they ask me certain things, so I know there are (ehm) times where you have to revert to (ehm) computerised information in order to gain access really to know what happen to the patients, what their previous diagnosis is etc. (ANP)*

In this account, the IHR can assist the professional in empowering the patient to play an increasingly central role in his/her care. Having access to timely information can assist in the provision of care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions (IoM 2001, NMC 2015). According to Plsek

(2001), the strength in a complex organisation is derived from how different components coordinate and fulfil their tasks for proper functioning (Greenhalgh and Plsek (2001).

In the following extract participant DMF1 supports the view of Ab and Addabit (2004) that the IHR creates the informational basis for communication and more cooperative working between healthcare professionals and patients:

> *I think it is in information sharing about the patient, ehm because when you come in you are allocated certain groups of patients and these are the patients you look after and you know those ehm but the IHR when we have access particularly to allergies and next of kin, you could get those sort of details and everybody is aware. I think it just improves our communication as a whole really – talking about patients and making sure people are aware.* (DMF1)

Olson and Eoyang (2001) depict the IHR as a system that serves as a physical container, a structure to allow teams to operate that enhances the way health professionals work. The IHR promoting team work was also brought up by participant ANP as illustrated in the extract below:

> *I think (ehm), well (pause) definitely because basically the information that one of us gain is used for the whole of the time that the patient is in hospital, (ehm) once when somebody comes in through medical assessment, they are seen by a junior doctor or myself and then a consultant sees the patient. So the information is all the time relayed to the next level, and then if we either discharge them back to the community or whether they go to another ward, that information will follow through, so whoever, whichever health professional reads the document that have been written they will obviously have (ehm) comes from the same source really.* (ANP)

Groups of such agents can be seen as adaptive agents, generating policy-shifting behaviours. For example the IHR supports communication and aids clinical and

operational processes and patient safety (Local Health Board Data). 'Crossing the quality chasm' (IoM 2001) highlight that healthcare is not always as safe as it ought to be. People's right to be safe is not always upheld. The Institute of Medicine (IoM 2001) emphasised that safety was dependent upon health care systems and organisations, and patients should be safe from injury caused by interactions within systems and organisations of care. The IHR technology has the potential in meeting the needs of the humans interacting within the EMAU. Electronic prescribing (e-prescribing) through a computerised provider order entry (CPOE) system is one way to reduce medication errors from poor handwriting or incorrect transcription. Several studies (Jha *et al.* 2009, Igboechi *et al.* 2003) reviewed reported fewer adverse drug events (ADEs) and fewer serious medication errors with potential to harm patients after CPOE implementation. The Local Health Board data has reported that electronic health data in real-time for decision support has the potential to both reduce costs and improve the quality of patient experience and safety for the unit, hospital and the National Health Service. The IHR was a valuable source of information on drug formulation. Their user survey found commonly used data items were medication and medication history. Their medicines management findings revealed more appropriate prescribing. The IHR appeared to be an important tool in aiding clinical staff to prevent prescribing of a medication to which a patient was allergic/intolerant, helped identify or manage requests for medications liable to misuse.

6.6 Summary of Chapter

The technical work being done by the multi-disciplinary team members (doctors and nurses) in EMAU is full of complexities. In their everyday work, information seeking is an important activity. The EPR system played a supportive role as a mechanism for sharing information and providing context during the search for patient information. What each participant saw, experienced or felt seemed similar to what the others have found. These were concerns about professional practice, accountability and patient safety. In

managing the continuous care and movement of patients, the doctors and nurses required a high degree of clinical judgment which was informed by patient and environmental cues. Quality information was needed to make decisions that lead to quality and safe care. These professionals brought their skills, abilities and knowledge to the tasks, as a system agent with different expertise and each requiring a specific type of information content. They worked purposefully as a team towards an emerging outcome, that of patient diagnosis and care which is safe. Each of their interactions was influenced by the characteristics of the environment, the agents and context. The use of the EPR system (behaviour) was motivated by a complex information need often triggered by fragmented information resources (information resources reside in multiple and dispersed systems) or complexity of information need (particularly drug regimes, patients who have impaired recall and co-morbidity). As the information problem became more complex and nuanced, the practitioner looked to the IHR for support, to help him or her find the information. They valued the EPR system as a tool that supports their clinical decision-making by allowing them access to timely patient health information. The accounts provided were of requiring assistance mainly in the areas of medication reconciliation. These doctors and nurses revealed their vulnerabilities and of their role as an active agent, bearing great responsibility to ensure that the patient receives the care that is needed. Their narrations revealed that the task of providing quality and safe care to patients is highly complex with a number of distinct possibilities which must be considered, anticipated or dealt with. Complexity in this sense means many factors must be considered to determine the outcome of an action. For example, they have to decide whether to limit delays in treatment such as the 'act and wait' or 'wait then act' and 'ring the General Practitioner' approach. It meant being forced to select, being forced to select means contingency; and contingency means risk. Therefore care processes are complex as patient needs are complex. The care team is also highly complex, consisting of many agents and having to interact at multiple layers of organisation and at different time-scales. There is increasing amount of information to be processed in

substantially shorter periods of time. The EPR technology can change the working conditions and enable the clinicians to cope with this emerging problem, contributing to better clinical outcomes so the potential for errors is reduced as well as improving patient experience. The EPR helps bridge interfaces, reconciles medication, and enhances relationships. Thus, the EPR technology can foster connections and interactions between the various agents (Vargo and Lusch 2011, Olson and Eoyang 2001) involved in a process of exchange between the clinicians, the patients and the environment.

CHAPTER 7: ISSUES WITH ADOPTION OF THE IHR

The accounts and discussions in Chapters 5 and 6 demonstrate that today's healthcare setting / hospital has to adapt to the many shifting and coalescing factors such as an ageing population, patients with chronic illness, on higher number of medications, increased use of unscheduled care services, the significant challenges in meeting waiting times targets and the knock on effect for scheduled and social care services. As integrated organisations, the EMAU cannot be considered in isolation from the rest of the system. There is a need to find new ways of working in order to maximize care, to have a care system that is integrated, gives a positive patient experience, where care is patient-centred, individualised, timely, safe and clinically effective (WAG 2014, NMC 2015). Informing healthcare (WAG 2003) is a strategy to bring NHS Wales into the 21st Century, to support change through the introduction of tools and techniques appropriate to the information age. According to Berwick (2010: 9) *"...improvement in healthcare is not independent, it is interdependent and it needs to be done everywhere, by everyone at the same time."* This chapter reports the multi-disciplinary team members' perceptions of factors influencing and/or hindering their seeking to improve.

7.1   User Interaction with Computer

The implementation of the EPR technology alone is not sufficient for ensuring the potential benefits are achieved in terms of efficiency, effectiveness, and quality of care. The project team initially invested effort and recognised that effective training was an absolute requirement for all users. Training addressed system function, patient information available and information not available, requirements for consent, emergency consent, confidentiality notice, audit of activity and IHR issues. The training provided a good foundation for use although the survey indicated it can be improved further with refresher training.

According to the current project manager, she was asked to step in to train the doctors and nurses following the departure of the previous trainer. By then there was a written training package uploaded on the computer work station for the

staff to work through. The practitioners were expected to self-learn. The doctors learn by 'see one-do one'. She has to do training sessions with nurses and will take a bit longer. Most of the participants have used the IHR, therefore have interacted with computers. A variety of comments were received which indicated that the frequency and use of computers were dictated by professional roles. For example participants who have independent prescriber status such as the participant ANP and the pharmacists in the EMAU used the computers to access patients' records more often than nurse managers as they have to provide patients with quicker and more efficient access to medicines. For example, ANP commented: 'On average I use between three to probably (ehm) 3-4 times (ehm) on a day whilst these nurse managers commented: '*Every shift for one or two patients'. (DMF1) and 'Only once' (DMF2)*. The most frequent users are the doctors. According to these medical registrars:

> *OK on a typical shift at the [name of hospital]*
> *I would see somewhere between twelve and*
> *twenty patients ehm I would say I would have*
> *used the IHR may be for half of them. (MR2)*
>
> *Yeah definitely yeah definitely every shift uhm as*
> *I say it very much depended on what patients were*
> *coming in. I think I used it more at night than during*
> *the day and that was because patients at night would*
> *tend to come from the A&E and left through through*
> *the GP and if I'm estimating may be two or three times*
> *during the average on call. (MR1).*

Participant ANP made it a point to mention that another prominent user is the ward pharmacist*:*

> *Yeah, I can tell you- our pharmacist (ehm) I believe*
> *you might have spoken to her, I'm not sure…(name).*
> *OK, she is our ward pharmacist, one of them, and*
> *(ehm) she uses it for checking drug information because*
> *they are always checking GP records…* (ANP)

The nurse manager of the unit further endorsed that:

> *The IHR was used mainly by the [Advanced] Nurse*
> *Practitioner. She used it quite a lot and also the acute*

care physicians and the MAU team that were based
here because because they had more of an
understanding. (DMF2)

According to participant MR 2, the doctors do accessed the IHR technology, therefore interact more with computers than the nursing staff:

Certainly a couple of my SHOs, my junior collegues,
they had accessed it and used it as well. Ehm, I'm not
so sure about the nursing staff, ehm not to my knowledge
but they may have. (MR 2)

All the participants in the study commented that the technology was easy to access within the unit. The participants rated themselves as satisfied or very satisfied with the IHR system that was implemented for their use. The participants' comments illustrate that the information needs and information-seeking behaviour are within the context of their work- related roles and tasks (Chapter 6). Clinician attitude can make or break clinical information system adoption. The users' satisfaction with the IHR technology appeared to be linked with the system's usefulness (Davis 1993) and to the degree in which the technology assisted the individual in performing (Goodhue 1995) his or her portfolio of tasks.

According to the Local Health Board data, junior doctors and the pharmacists made the greatest use of the IHR. Access of the IHR was greater at weekends. 20% of IHRs are accessed on a Saturday or Sunday compared to 16% of weekday admissions. The IHR was also used more frequently overnight/early morning. It was observed that IHR access was greater when in-hours general practitioners and community pharmacists are closed.

Several policy documents (Institute of Medicine 2009, Department of Health 2008, WAG 2007, WAG 2005, Wanless 2002) have called for the computerisation of patient records to make for better, safer, cheaper and more integrated healthcare. Electronic Patient Record (EPR) systems support

physicians and other healthcare professionals in multiple care management areas. The EMAU as a subsystem also contains its own subsystems. As a complex adaptive system, the nurses, pharmacists and doctors as agents following simple rules can generate amazing complex structures. They have to self-organise, adapt to and evolve with their environment (Greenhalgh *et al.* 2008).

7.2   Automation Reducing the Inefficiencies

A Senior Manager (SM1) of the organisation when asked whether the organisation can be without computerised / electronic patient records gave this view:

> *I.. Right I having been a clinician I recognise the value*
> *of very easy, quickly and easy to access clinical information.*
> *I also am very aware that because in [Health board] we are a*
> *little ahead of the game and we got quite a little rich portal*
> *ourselves I am well aware of the value that is placed on that*
> *by our consultants and clinical staff and the fact that as a*
> *result they have removed a lot of er more inefficient paper*
> *processes.* (SM1)

Reflecting on his role as clinician and Senior Manager of an acute hospital, he sees the use of computer technology as a critical first step towards reducing paper processes that create inefficiency in acute hospitals. The nurse manager and clinical nurse lead in the EMAU also touched upon this view by enlarging on how information communication technology can manage clinician time and be efficient and effective:

> *…it is actually is very is very helpful, making things*
> *much easier for people to do, er unlike before that you*
> *have to use different technology so you have to write it*
> *manually and ehm adding things now you can communicate*
> *by computer which is very good, ehm email for example*
> *ehm instead of writing it waiting for the post to come*
> *through within the next two days especially within the*
> *hospital we do have a second postal system ehm so er*
> *second class postal system so you ended up ehm that*
> *it is quicker to ring somebody rather than to wait for*
> *the post to come through. Look that's ehm that's the*

good side about computers to communicate with other,
even in other Trusts and even in ehm like if you do have
students that you want to liaise with the university you
can communicate through email. Ehm it is quicker to
access patient ehm patient–wise you can easily access
the time of the admission anything related to patient.
Service provision is excellent with computers. (NM1)

Participant NM2 proffered that information communication technology not only provides healthcare professionals with speed and easy access to clinical information through the removal of inefficient paper processes but also contributed to the efficiency of delivering care in this extract:

Erm it (computerised IHR) gives us a quick access to
every patient's details, also with regards to treatment that
they had in the past, medication they might have as well.
This is obviously if we use the paper-based medical notes,
sometimes it may take time for them to get retrieve from
medical records, so like a quick kind of access to all these
kind of information about the patient really and also it is
more handy for the er the er professional medical medical
er team to quickly know about the patient really. (NM2)

Deliberating further on how computers can promote quality and efficiency in care delivery, the Senior Manager focused on the impact on the roles undertaken (in this case nursing) could have a bearing on the types of information required and the ways in which such information are sought and used:

So two elements really: there is the quality of care and
efficiency of delivering care. And from a quality of care
perspective going back in my day if I knew I have an
admission coming in, the old thing I could do to get
maybe a bit of an understanding was go down to the
notes section try and see if there was a previous outpatient
clinic letter that would give me a steer, may be even if lucky
some inpatient notes previously but it was grabbing and me
knowing that there was a cupboard over there that I had a
key for to get it. If I could have a back stage and just done
a search on a computer and seen that information which is
what we are at now I think that's great. So I totally think
the quality, and the quality of the information also has a
basis and impact on the efficiency of care. (SM1)

Here the Senior Manager (SM1) was linking clinical tasks to include responsibility and on how computers can help workflow by providing a smooth admission process, especially when healthcare professionals can see as much of the patient history as possible. The ease and speed of computers in aiding the retrieval of several timely pieces of information about the patients was cited by this participant:

> *I like the use of computer. It really helps us when it comes to tracking down all the information that is necessary for the particular patient. You can easily log in and look at what happened with this patient previously, with his previous medication, previous medical history and you can easily collaborate that with the patient compliant care. You can easily, you know it helps with the diagnoses, it helps with the treatment of the patient and at the same time especially with the relative, you can easily have a look at who is the next of kin of the patient because suppose to be there, there is a telephone number there. There is the GP there, all the information regarding the patient you can easily look into the computer.* (DMM1)

Workflow processes appears to be of pressing concern for healthcare professionals. They perceived information communication technology to be beneficial for improving quality and efficiency in the delivery of healthcare services and communication with others. For example, the Senior Manager (SM1) further illustrates the major efficiencies that can be gained from using electronic referral:

> *Let's take referral that's a great example. When we look at it from the time a GP wrote back to the time that patient was seen that referral document had thirty nine hand-ons. And now that's scary. So that's GP to secretary, secretary to travel, travel to porter, porter to... and thirty nine times you know. Now we have bought in an electronic referral process and we have just launched so GP right clicks the button in its files, that comes up on the workflow of our referral people, they find information on the PAS and that fires back then off to the consultant and the*

consultant then can look at it and say if this is priority I'll see it in a minute or whenever and he fires back. So it is less than ten concensus but every time you click a button it's a microsecond to get to the next one rather than you know this waiting for the post. So there are major efficiencies to be gained.(SM1)

The above extracts articulated most of the participants' positive attitudes toward the use of computers in healthcare. The participants have previously highlighted that healthcare work is often fragmented and rushed due to the dynamic EMAU environment and external pressures (Chapters 5 and 6). They have identified several reasons why the workflow processes in the EMAU require attention and cannot be viewed in isolation. These challenges are of: coordinating care for the acutely and chronically ill patients, professional roles and participation in a patient's care, patient-focused and safety initiatives, and cost and efficiency pressures to improve patient flow.

In drawing attention to these factors, the participants are highlighting that the systems and methods by which their unit and organisation can achieve their goals require that the workflow processes are adapted and optimised to suit its evolving environment. Hospitals are generally organised by functions, hence workflow processes are formed around these functions. Patient care, however, occurs through a broader perspective. It is in the interaction among the workflow processes that complexities arise, causing increased interruptions and creating conflicts. Therefore it becomes essential for these functions to be integrated, otherwise poor workflow processes impede communication, coordination of care and impact on quality and efficiency. The extracts from the participants revealed their realisation that computers can play a strategic role in managing the organisation of patient care. The capability of the computer to amalgamate and disseminate information (Meadows and Chaiken 2003, Coiera and Clarke 2004) can assist to augment the processes and generate larger improvement activities.

The benefits of computerisation of healthcare were also articulated as enabling better interaction and communication within clinician-patient related care. According to this participant the government should spend more money investing the technology as:

> *I think, life is easier, work is easier and then it*
> *benefits for the patients at the end of the day. Isn't*
> *it, instead of saying like you writing and talking*
> *you could spend that with you know giving*
> *care, more care, getting the standard when it*
> *comes to direct patient care. (DMM1)*
>
> *Erm overall idea is that it makes, it actually*
> *improves communication.* (DMM2)

The above extracts conveyed the general consensus that healthcare systems need the support of assistive technology. Information communication technology has been valued as the great potential for transforming the health care system. The use of information communication technology can improve quality of care by providing the right information at the right time, to the right persons (WAG 2003, IoM 2009). These findings offer some valuable insights into how individuals are working collectively around common tasks in the organization and are actively and explicitly shaping technologies, work processes and routines in a mutually adaptive way. An interim lessons learnt survey relating to the IHR was also undertaken by the Local Health Board during the proving period, around May 2008. The report showed that the IHR improves clinician confidence, particularly with older patients and improves prescribing. The report finding reflected very positive attitude of the clinicians and suggest that the IHR aids clinical processes and patient safety as identified in the literature review (Shank *et al.* 2012, Edwards and Morczygemba 2004).

7.3 'Consent please'

The movement of patients through the acute medical assessment unit is rapid (Cameron *et al.* 2000). Efficiently managed information is a key resource in clinical practice. The participants in this study have had access privilege to the

IHR technology, able to use computers in their work and held positive views of their use in healthcare. The world of information-seeking of these professionals complex and there was shared value of the IHR as an essential tool to bring information close to the point of care, unlike having to wait for the paper medical notes to be delivered to the unit. To these participants, information can now be available if you have access privilege:

> *So far I haven't encountered, I haven't encountered any er*
> *critical incident about it but I was really*
> *reluctant to use it at first because of the confidential*
> *issue and you have to make sure you ask the patient*
> *consent which makes me reluctant to use it really. (NM2)*

> *We would access it as well but it always*
> *has to be with patient consent. (DMF2)*

Users are limited to consultants, nurses and pharmacists working in EMAU. They can access an IHR using one of the three designated computers in the EMAU, only for a patient who had been admitted on to the EMAU and with patient consent. Also in place was a robust automated audit checking of every access to the IHR. Controls had to be in place as stakeholders welcome measures to ensure and monitor the security of IHRs. The IHR project was also gaining attention from the media. The project was covered by two local newspapers and the Informing healthcare (now NWIS) website.

The technology promising to unify the currently disparate pieces of a patient's medical record may also threaten the accessibility of the information and compromise patients' privacy (Mandl *et al.*2001, Mandl 2012). Two participants, NM2 and DMF 2 did highlight the necessity to have the patient/individual's consent to view the record. According to participant SM2, who heads the information governance department of the Local Health Board, access privileges have to be a necessary consideration:

> *Information governance then is a er about confidentiality,*
> *data protection er security, risk of security and er the ability*
> *share information across er professions and across the*

organisation as well. We we tend to look after the duty of confidentiality around the information, ok and that could be any information, it can be personal information or corporate information er and I suppose in terms of the IHR in EMAU it is about looking at er the rights of people to actually view and use that information appropriately, that is probably what we are looking at, and uhm in terms of our role within that we had to understand what the process was, the IHR, what they want to get out of it, what the purpose was and then understand who is involved, understand what information was required at each step along that pathway, care pathway and then determine where it was allowable in inverted commas for an individual or set of people to have access, what security arrangements around that access were and er uhm whether we then just say yes we agree that that is er relevant and proportionate access to that set of information. It didn't mean to me as enabling access to everything but it is by proportionate in purpose and we have to ensure that for example in the MAU er whether er the pharmacy department was allowed to look at it or not and we will we would determine whether the purposes were proportionate to the information that were had been seen. (SM2)

There are barriers to overcome as users and systems designers/developers are at the centre of several varied systems such as Information Governance Group whose membership includes members from general practice, Local Medical Committee, British Medical Association, Community Health Councils, [Named] Healthcare NHS Trust and Informing Healthcare (political, membership groups, information-seeking frameworks). How patient data can be accessed, used and disclosed have to be regulated and all participants are aware of this, as articulated by this medical registrar's extract:

Hmm [pause] with a lot of electronic information there is always concern about inappropriate access. And that you then have more greater access to more people. So I think that an important aspect to think about and to have a log of who is accessing what and make that very clear as they do with the CWS if you are accessing your own medical information or relatives then people can spot that. So I think that side of thing is very important. (MR 1)

There is always due concerns of the risks of breach of patient information or the improper use of information and regulations have to be in place to build and maintain the public's trust. Reflecting on accessing the IHR for patient information, participant DMM1 spoke about the ease of obtaining consent but also highlight the paradoxes encountered:

It's the same thing if you have confused patient really, when you ask for the consent you don't really know whether the patient is really consenting you to use the information available in the computer for them. So but most of the time when I asked a compus mentus patient, if they do ask, if they did ask then I said 'Could I use the information in store for you in the computer because it will help us, it will easily help us with regard to the information, they will say 'yes'. I didn't experience any difficulty er getting consent from them. (DMM1)

One of the deputy managers, participant DMF2 pointed out that access privilege interpretations may block health professionals from accessing required information and certain groups of patients may not benefit at the point of care, if they are unable to give consent, however, there is awareness that the professional can use emergency access permissions, if in the best interest of the patient:

Yes I do. I do. I think not everyone can give consent. The reason you need it a lot of the time is for those patients who can't give you consent (laughs). You know they can't tell you everything, so that sort of, you know 'no win' situation really. Isn't it? You can get information if you can get consent from the patient and lots of the time the patients come in on their own, from nursing homes and even though they send a letter, it is not always clear. So it was a hindrance. (DMF2)

Unlike in the case of paper notes, explicit consent has to be sought from the patients because the notes are electronic. According to participant SM2, information governance is all about proportionate access and purpose:

It is all based around purpose and for different information systems the different set of people may have different purposes and therefore a

pharmacist may have a different set of purpose
for the IHR but for something for a different
system may have a different purpose and we
may or may not approve access depending on
what that purpose is about. (SM 2)

The issues brought up by the participant revealed that there are impediments that stand in the way of this ideal of sharing information. The general impression is that most healthcare organisations do show little willingness to share data. The IHR technology in the EMAU can limit access to specific users and track who has accessed what information.

The provision of quality care is dependent upon how care for the patient is coordinated. The safety and quality in patient care are often compromised due to information gaps and a lack of provider access to crucial patient data at the point of care (Stiell et al 2003), yet, the availability of electronic patient record does not resolve this problem due to information governance.

In this extract, the medical registrar, participant MR 2 discusses the dilemma and complexity of wanting to access the Individual Health Record technology of a patient who is unable to give consent:

It is great in people who have the capacity to consent. Ehm I'm
just trying to think, in those that you know who I'm uncertain
about certain medications I would ask them if they were happy
er consent for me, consent for me to look at their IHR, the vast
majority would say – oh yes do. In those that didn't have
capacity ehm where the need to know about their medical history
was important but they are not able to consent ehm so I think you
have to look at it under common law, you know if you have not
for a patient who is able to consent and a procedure for instance
is needed to maintain life or maintain health then you will have to
do it under common law. Now having access to information
about patients who are unable and consent is just as important
because it will either change your clinical decision–making or
enhance your clinical decision-making and or it may you know
give a piece of information that suddenly bring you know the
whole story together and you come up with the diagnosis.
(MR 2)

This participant resorts to using and securing consent from the patient's family if they have power of attorney. Other complex cases brought to attention by this participant included the patients deemed to lack mental capacity to consent:

> Ok ehm for instance I've had patients who came in with acute, an acute confusional state, having being unwell for a very short period before coming into hospital and their confusion fluctuating, so they seem to have orientation towards time, place, person one minute and a few minutes later they are not and but when they are lucid I've ask them can I access their medical history they said 'yes' and now whether that was deemed to be capacity and informed consent [pause] you know [sigh] I've `had patients who ehm had just been very unwell with things like pneumonia, I've had patients very unwell with other infections and when I've asked them for permission they granted permission to look at the IHR and so you know there's been lots of different examples of patients where they have not been able to give a full and thorough history of their past medical problem but you know they have been deemed lucid enough to understand that I can access their medical history and in order to do so they needed to give consent and they have.(MR2)

Whilst participant MR 2 awaits the patient's lucid stage, Medical Registrar, participant MR 1 would resort to use the 'break the glass' rule (emergency access):

> I remember there was a step in where you have to say you have got consent from the patient. Ehm ironically the patient that were most useful to access you couldn't actually get consent from them so that was you know it was felt in their best interest to get that information. (MR 1)

There is a requirement to obtain consent. According to the General Practitioners Committee (BMA Wales):

> "…Because it is a subset of the GP record, GPCW feels that access must be restricted to clinicians only - by which we mean doctors and nurses involved in the direct care of

the patient - and that the explicit consent
to view should be restricted to the time and
for the purposes of the consultation only and
not extended to allow access subsequently
even for audit purposes. (GMC allows access
for local audit but we do not believe that audit
carried out in secondary care on practice data
constitutes local audit). Explicit consent to
view should be obtained by the consulting clinician"
(LHB data)

Both participants were able to illuminate how they balanced the fine line between availability of information and the patients. Every of the participants are aware of the need to obtain consent from the patients, however, there were constraints experienced. For example participant NM 2 articulated concern over the verbal rather than the written process of obtaining consent:

Because er, the confidentiality you go through
building trust with the patient, you ask them
verbally without any sort of written consent
and then if you ask them and then you access
the IHR, you tick all the boxes and then later
the patient say 'no I didn't ask, who told you
to access my details?' So where do I stand
then? Apart from obviously I would tell them
'no you consented verbally' but nothing else
apart from sort of signature what so ever, that's
the sort of things that concerns me about. (NM2)

Participant NM2 is highlighting the onerous complexity of explaining consent to patients. The consent issue was also identified by participant MR1. According to participant NM1, the process of multiple agents asking for consent from the patient is complex and can be confusing for the patient:

Ehm [pause] there is another thing for IHR
I remember just cross my mind, every time
you access the IHR you have to get the consent.
It is a single it is not ehm it is not like a single
consent that you can open it every time. Let us
say for example one of my staff would like to
have a look at it er because you are the coordinator
you coordinate, you liaise with the doctor, but
there is always somebody who directly look after

*the patient, so they want to know as well ehm
being the being the nurse looking after the patient
and they can liaise with the relatives or they can
update them. So they have to get the consent again.
Ya. That is probably probably that's one of the
downside that I I remember because the patient said
oh I have already told the nurse already, ya I have
consented it's okay why are you asking again? And
myself would say oh ya I am a different nurse or I
need to access it again or and some times say because
I work in Triage as well, ehm when I do clinical I
do cover Triage and so when I go there when I think
someone has already asked them I'll write it down
and here comes the doctor who wants to obviously,
doctor from their side, they wanted to have ehm ehm
the information again they would be asking again.
The patient oh doctor I have already been asked. So
from the iteration of different things you can ehm,
part of the hindrance I can see at that time perhaps
thinking about frequency ehm if within this admission
at the end of the day we are working alongside each
other and imagine if say the night staff will be having
a handover again and the night staff will be interested
in looking at the IHR they have to get the patient consent
again which is like really repetition of things, it doesn't
or it doesn't actually help when it comes to time, time
management.* (NM1)

In contrast to the paper record, it has to be put into context that users have to individually obtain consent from the patient to log into the IHR system as the system is designed for a single user. According to participant SM2 (an information governance manager), providers must use the IHR technology in a "meaningful" way, that is to improve care, enhance safety and promote care coordination. By contrast with paper records, an electronic patient record system is authenticated by username and password as a way of maintaining a record of who accessed what. Patient privacy and confidentiality must be maintained. The clinicians have to be open to new ways of doing things.

In the following extract, deputy manager, participant DMF1 recognised the need to respect the patient's wishes and that there is a need for a mechanism to

differentiate between authorised users who need immediate access to information in emergency.

> *Ehm if the patient not capable to consent, I am sure there was a box on there that said patient unable to consent. If somebody I said to you would you mind I look at your GP record and you can said 'no' obviously I would if you were happy to make that decision that will be your choice if you didn't want me to know anything but that's fine I will go no further. But for elderly patients who were confused or whatever ehm I am sure there was a box there you could (pause) override it, yea and probably were in those situation for the patient.* (DMF1)

Reluctance to use the IHR was highlighted as not due to resistance to the use of computers but cautiousness relating to information security and confidentiality issues as highlighted by Nurse Manager, participant NM2:

> *but I was really reluctant to use it at first because of the confidential issue and you have to make sure you ask the patient consent which makes me reluctant to use it really.* (NM2)

All the participants were able to explain ways of dealing with the patients to obtain consent, illustrating how data confidentiality can be maintained with the IHR system they use. The aim of IHR system is to improve access to patient information at the point of care. This involves the ability to retrieve the patients' medical records speedily and allowing many clinicians to have simultaneous access to the same medical record. Information sharing can be a great incentive for adoption of the IHR system, but all the above extracts showed the paradoxes that the IHR also creates data security challenges. The above extracts forwarded by the participants showed that new technology, new organisational structures, new techniques and knowledge, and new demands change the world of technical work—often in unexpected ways. Changes may create new, unfamiliar gaps or may change the character of old, familiar ones so that previously constructed bridges do not span them. According to Thorn et al (2013), even when health

information exchange systems are readily available, non-technical barriers such as restrictive access policies, impede use.

7.4   Detachment from General Practitioners (GPs)

Traditionally, the General Practitioner (GP) remains extremely significant in patient management. Some participants, for example MR2 have noted that the increased use of information communication technology such as the IHR will inevitably have implications such as working in isolation:

> *No ehm having the IHR there means that I don't have to have either a telephone conversation with a GP about a particular patient. So it sort of detaches us a little bit from primary care, ehm unless it is you know us passing on information to primary care for them to act upon, ehm but even that now most of it is done electronically ehm with electronic discharge and ehm electronic medications so you know we don't actually speak to GPs very much anymore unless they phone up for advice say when I am on call*. (MR 2)

According to Brockstein *et al.* (2011), a particular value of the EPR has been the opportunity for optimal communication, however, unpredictable behaviour can result in surprising outcomes or unanticipated consequences.

7.5   General Practitioners Not Signed Up

The doctors and nurses participating in the study values the IHR as a repository tool that contains patient information which can assist them with patient management. Hayrinen *et al.* (2008) highlight that the primary organisational impact is that EPRs improve communication among healthcare professionals, through real time health information exchange (IoM 1999, Menachemi and Collum 2011) wherever and whenever as opposed to relying on the slow processes of telephoning, faxing or writing pertinent information to each other. The GP is the hub of patient-information. It is essential that if the IHR system is implemented for clinicians' use, then they must be able to rely on the system to

support their work, however, they have encountered inconsistencies in information management as illustrated by the following extracts:

> *I can certainly think of cases where the*
> *IHR had minimal information in, so patient's*
> *medications weren't entered, recent medical*
> *history wasn't entered and it meant you were*
> *still working in the dark a little bit ehm that*
> *would be when I'm working at night, there's*
> *nobody at the GP practice. Ehm so if I*
> *encountered that scenario during the day I*
> *would simply phone the GP practice and get*
> *the information in the old fashioned way.* (MR 2)

The following extracts revealed the type of problems encountered by the participants when they attempt to use some of their patient's IHR:

> *If they wanted to implement the IHR? [Interjection by*
> *interviewer: yes] Ehm, first of all they need to have the*
> *GPs in the local area on board because if the GP aren't*
> *uploading patient records to the IHR then it is not a*
> *worthwhile enterprise. Ehm I have to say it was less*
> *than 10% of the patients I looked at but there were still*
> *a significant number that that didn't have anything*
> *uploaded to their IHR. Ehm you have to have the*
> *cooperation of the GP before you even start. I think*
> *it is pointless to put it in place unless all the GPs, the*
> *consortia or Health Boards are in agreement.* (NM2)

> *So I found I was using it when it was available*
> *for some patients (ehm,) then, there were*
> *occasions where because not all GPs were*
> *signed up to it at the time that there were some*
> *patients who didn't have any information, that and*
> *then that was a little of a bind because you know*
> *that you are logging on to something that perhaps*
> *you weren't always going to get health information*
> *records, but I find on some occasions that some*
> *GPs weren't signed up to it.* (ANP)

Participant NM 1 showed how annoying it can be to log into the system but is confronted with missing information:

> *And also ehm it did progress in a way about GP*

*participation ehm because initially when they started
there were only I cannot remember exactly how many
GPs ehm there were who would like to who are signing
for it. And I said oh that was very good, at least they can
update it because they said the IHR within 24 hours er they
get updated every time. So I said that was very good. So
there were GPs and there are there are sometimes, oh
unfortunately oh which GP are you and whenever you
look oh they are not the ones who participated. So you
can't really access the IHR and these are the people that
you wanted it.* (NM1)

Although some concerns about data confidentiality were observed, these were not as huge a barrier as to the unavailability of information having on logging into the IHR system and not finding the information required:

*Because it is a limitation really, because you are
expecting that you could access the whole lot of
them. That's the idea, the principles behind why
we have the IHR. Because it is not complete –what
is it for then? Because, then you can have those
details apart from who knows because of the high
confidentiality issue, so far on my side I just found
it not complete and makes professional service
incomplete as well.* (NM2)

For a start the GPs have to be engage with promoting the IHR to their patients to encourage them to opt-in. These extracts revealed that the health care system comprises multiple knowledge-driven communities of professionals. More effective clinical practices, care processes and ways of working are dependent on the rapid sharing of safe and good quality information. Shared modern information and communication technology systems are central to modernising the front-line delivery of care, treatment and services to patients (WAG 2003, 2014, 2015. The healthcare system is also an organisation of people, institutions and resources (human and non-human) aimed at providing healthcare services for a community and ensuring healthcare for all citizens. This comprises distributed activities of complexity at various organisational levels (macro, meso and micro) which are dependent upon several actors and agents (IoM 2000,

Crabtree 2003). These healthcare professionals and their patients through complex and autonomous function in a net of relationships.

> *Ehm, first of all they need to have the GPs in the local area on board because if the GP aren't uploading patient records to the IHR then it is not a worthwhile enterprise. Ehm I have to say it was less than 10% of the patients I looked at but there were still a significant number that that didn't have anything uploaded to their IHR. Ehm you have to have the cooperation of the GP before you even start. I think it is pointless to put it in place unless all the GPs, the consortia or Health Boards are in agreement. Ehm if they are in agreement, then they should ask Trusts who have done it before and you know from a technical point of view you need the help of the information, informatics computing services and do it with the help of the Trusts that already done it. (MR 2)*

It is easier said than done. Several of the challenges faced by the clinicians (in healthcare) are problems that need an integrative approach using system-wide thinking. Many components of the overall system still operate as independent agencies. This contributes to the difficulties in optimising a large, complex system such as the NHS in that optimising its individual parts does not take into account interactions among the parts. Nevertheless, all participants expressed their desire to continue working with the IHR technology if this was still available for their use which could lead to significant changes in clinical practice.

7.6   Legacy Systems

The participants were asked for their view on implementation and log rolling programme of the IHR. According to participant SM1, if IHR is developed correctly it could be a real revolution in the health but it must be planned and tailored to make the transition safer and more efficient to both the healthcare practitioners and the patients. The relationship between interconnectedness, interdependence and complexity is simply and powerfully illustrated in this excerpt:

Personally I am not convinced that a national direction
is right. And I think the problem, you know trying to be
positive about this, this philosophy that comes from [name
of person] all the time called called Once for Wales. If you
are going to do it then be more efficient do it once for
Wales but I actually believe that because we operate ehm
in a far more risk focus way so what we say is we need
this bit of software we need it now, we've think we've got
key people who think that is going to be safe ehm we put
it out there and if there is an issue we immediately pick
this up and modify and we have the backing of our senior
clinicians in accepting that risk to move things forward
quickly. From a national perspective they haven't got
that luxury. They have to go and sell the whole thing
politically, they have to go and put it through
massive governance checks and and they have to
put it through everybody and they have to ensure
that everybody is on board with it, so there's a huge
communication. Now my believe is let's take the
IHR as an example you have said I want each
Health Board to design an IHR, link it with your
GP supplier, get your GP supplier together and
deliver that. I believe that the total costs of seven
Health Boards doing that on an individual basis will
be far lower than one national cost which have to
account this huge dare I say Quango element and
political thing forward. So I do not believe and I'm
not on my own the Once for Wales I believe will be
far more expensive than the seven times for Wales.(SM1)

Interconnectedness may occur between individual elements of a system, between sub-systems, among systems, between different levels of a system, between systems and environments, between ideas, between actions, and between intentions and actions (Weick, 1976, Plsek and Greenhalgh 200, Anderson *et al.* 2003). This interconnectedness leads to interdependence between the elements and the dimensions of a system, and gives rise to complex behaviour. The number and nature of connections between elements was proved to be a crucial feature that determined the behaviour of the overall system. Participant SM1, a senior manager was indicating that in the real world, events both inside and outside the system can cause radically different outcomes (Gribbin 2004).

Participant SM1 was inferring that efforts to control are usually futile, slowing down the capacity of the system to react and adapt. There appeared to be some opposition to the top-down control by NHS Wales and the One Wales vision and rigid structures. According to Weick (1976) systems where elements are not tightly linked or interdependent with many other components are called loosely coupled systems. In these systems, elements influence each other over longer timeframes, and in more diffuse and subtle ways. Still on reiterating on top down control, Participant SM1 pointed out that NHS Wales is a long way from meeting its aims whilst the hospitals are battling with efficiency savings and will struggle with spending on expensive IT infrastructures. Participant SM1 draws attention to the complexities which involves working with various kinds of 'legacy' system which historically have been introduced with the best of intentions but has not been continuously maintained, modified or developed to accommodate organisational or technological change. In consequence these legacy systems are unlikely to do all that is required to fulfil current enterprise or even 'talk' to more recent applications.

These participants are stakeholders in the NHS. They recognised the challenges and opportunities presented by ICT but there is also the strife to keep pace with the increasing demand of the service and the challenges of technological implementations. The trajectory of IHR system has not been easy. It has been the subject of controversy linked not only to availability and the technical skills of users but also to culture and economics such as value for money. For example, an EPR system for the National Health Service in England (UK) started in 2005 but it has been greatly delayed and frequently criticised. Participant SM1 expanded further on the complexities of introducing and deploying technologies in organisations undergoing continuing and often significant change and paradoxes. Participant SM1 pointed out how legacy system concerns are not merely technological but also organisational in the sense of being intimately wrapped up in the everyday accomplishment of work and thus responsive to changes in working circumstances and priorities. In this excerpt, a variety of

examples have been provided to illustrate the ways in which the self – organising capacity of the healthcare system been restrained by rules that are anything but simple. The EMAU as a complex adaptive system resides within and interact with other systems in a nested or embedded fashion. For example, in Wales, the overarching vision and architecture is provided by "Informing Healthcare Program" (IHC), now NWIS. The standards for privacy policy, security and interoperability are also prescribed by NWIS. Funding is highly controlled via the nationally agreed concept of "common by design", Once for Wales to facilitate incremental development of national Electronic Patient Record capabilities and local investment is supported for the national benefit. It has been designed that these components will unite into a national solution that will be implemented across all Health Boards. Participant SM1 is trying to explain that the dimensions of a system are also important to consider (Mittleton-Kelly, 2003), all of which are intricately intertwined. Adaptive agents need to be seen as reacting to both internal and external stimuli, including each other and the wider system. The degree of connectivity between these elements and dimensions has a crucial impact on how change happens within a given organisation. The coupling of the system has an effect on its adaptability to the environment and its potential to survive, and therefore defines its fitness.

Adequate and sustained funding has been implied as critical. Participant SM 1 has also indicated that the pace of infrastructure development appears not to meet the pace of service delivery, admitting that service delivery faces adverse risks and would prefer to develop the technological solutions themselves as an organisation. That would be faster and cheaper. This practitioner recognises that frontline staff needs the tools, yet, policy intent is often slow and hard to implement. The participant expressed that the slow progress of the IHR implementation is not helping as there is a gap between macro intention and reality as it unfolds on the ground. According to SM1, the decision-makers have much power but possess little understanding of the changing nature and managing of the urgent demands of healthcare service delivery at the operational level. The account highlights the fact that complex systems are also frequently

made up of nested hierarchies or levels. These are unlike hierarchies in organisations, which are linked to authority and status; instead, these relate to sub-systems within an overall system – or hierarchies of scale. This means that an initiative, such as the EPR technology implementation taken on any given scale (EMAU) has implications for other higher and lower levels of the same system. In addition, where there is a high degree of interconnectivity and interdependence, different elements and dimensions at different levels of a system can feed back into each other, constraining, driving and influencing changes at other levels.

Participant MR 2 commented that there is the need to find ways to provide and hopefully even improve services with the same or fewer resources:

> *I think it could be` done more simplistically.*
> *Ehm you don't need the same `system for every*
> *single hospital, every single GP practice across*
> *the country. It doesn't need to be standardised to*
> *that level. Ehm what I would say is there must be*
> *a simple way of allowing these systems to talk*
> *to each other rather than a universal system to*
> *the whole of the UK. That would be my solution*
> *to it. Allow the different Trusts to communicate*
> *with each other in a more effective way by allowing*
> *the different systems to access each other. I don't*
> *think that is a difficult thing to do.* (MR 2)

In a demanding environment such as this, efficient communication and effective interpersonal interactions between staff members who are providing and organising care are crucial to balance the complex set of care steps for every patient (Pare *et al.* 2006, Creswick *et al.* 2009, Geisler *et al.* 2010). In this excerpt Participant MR 2 ponders on the difficulties introducing new technologies and on securing a consensus among multiple stakeholders on new strategies and organisational practices. Any information systems that are implemented for use must well reflect the complexities of the clinical setting and be interoperable.

Both participants SM1 and MR 2 agreed with the views of the professionals and policy makers that the EPR can be used effectively to contribute to knowledge sharing, however, they were concerned with the government's top down initiatives and mechanistic approach to develop and implement the IHR in the clinical settings. The complexity of organisational networks and the difficulty in persuading different actors, groups and personalities to agree on the generalised solution can result in the failure to deliver systems to deal with seemingly straightforward problems. Here the complexity of the interacting processes, the multiplicity of business demands, political agendas and the technological difficulties can render the development of a viable information system difficult or impossible. The articulations from the participants were obvious, that the implementation of any system would depend on adequate long-term funding to achieve its long-term goals. In part, this is because the implementation of any technological comes with high upfront costs for technology and systems.

These local agents are adaptive, therefore macro plans for improved delivery based on institutional reform, shifting roles and mandates are perceived as unrealistic. The complexity of real world systems is not always recognised and acknowledged. Both the excerpts of participants SM1 and MR 2 revealed highlighted the different kinds of problems faced by healthcare providers and policy makers and their ways of dealing with them. Participants SM1 and MR2 were relating to the issues or messes of the NHS systems that do not have a well-defined form or structure. There is often not a clear understanding of the problem faced in such systems. Such systems often involve economic, technological, ethical and political issues. The messes discussed concern money, technology, ethics, social relations, politics and all of these dimensions need to be dealt with simultaneously, and as a whole. Both the excerpts of SM1 and MR2 reflect potential examples of emergence; self-organisation. The articulations show that actors at all levels of the given system need to be empowered to find solutions to problems and challenging the existing dichotomies of 'top-down' versus 'bottom-up'. These participants are pointing to the problems, which are systems that are only partially understood. In such

systems, there is no single clear cut way of doing things – there are many alternative solutions, depending on the constraints faced. These participants' extracts highlight the substantial complexity of the system, a system that embeds the technological and the social, the organisational, the economic and the political.

7.7 Summary of Chapter

The findings from this chapter revealed that the participants were positive of the use of computers in healthcare. They have found the IHR system provide speed and easy access to information and help with workflow. The system was easy to use and they were satisfied or very satisfied with the system. Potential barriers identified were pertaining to issues of consent, General Practitioners not signed up and legacy systems. The issues reflect that everything is connected and that healthcare is a complex adaptive system.

CHAPTER 8   DISCUSSION AND IMPLICATIONS

8.1 Introduction

The aim of this thesis was to explore the multi-disciplinary team members' use of the electronic patient record within one emergency medical assessment unit. In order to achieve the aim of this research, a qualitative case study was chosen where multiple data collection methods (interviews, observation and documents) were used. In this discussion chapter the original contribution of this research is presented. The findings of this study will also be discussed. This will be followed by a discussion of the implications of the findings. Finally the strengths and limitations of the study will be considered and conclusions drawn.

8.2   Contribution of the Study

This study highlights the role that the IHR technology can play in improving health outcomes and makes recommendations for ways in which the NHS could improve its adoption and use of new technologies for meeting its objectives and sustainability. The workflow in the EMAU requires large amounts of multi-tasking, is interruption driven, and is non-transparent. The clinicians do their best to deliver optimal care despite the "system." These professionals came across as passionate about doing the right thing and are attempting to provide the right care for patients despite the system.

The EMAU can be seen as part of a complex system or network where the unit acts as the front door to many other hospital departments. The picture of the EMAU environment that emerges from the study is a unit that is busy, with distinct series of tasks where there is inherent potential for human error or failure. These professionals are working with diverse groups of patients presenting with diverse conditions and time. The clinicians are working under pressure to adequately complete tasks and given the tightly coupled and complex interdepartmental interactions there exists the potential threats for the safety of patients framed by the complex tasks carried out by different specialised professionals and departments.

Used as a knowledge management system (KMS) (Melymuk 2002 Abidi 2001, IoM 2001), the EPR can make a positive impact on the delivery of healthcare through the reduction, if not removal of for example adverse drug effects and medical errors caused by human oversight.

Ensuring people have a positive experience of care and reduce the currently unsustainable cost of care can only be possible when there is a platform for collaboration, when the healthcare professional is being connected, being aligned and being intelligent. The findings from this study revealed that the EPR when socially and organisationally embedded and used by people in particular contexts for particular social acts can yield positive outcomes. Better outcomes can be achieved through real-time cross-referencing of patient information, through knowing one's patient and delivering care right first time, on time and every time to create patient safety, efficiency and quality of care.

The EPR system is a desirable tool to enable the goals of healthcare reforms, to address the quality of care and the efficiency by which it is delivered. With the ever increasing and complex demands on healthcare organisations, the motivation for today's Health Boards has to be in establishing and promoting innovations which can sustain both an effective alignment with healthcare environment and managing internal interdependencies to support long term care and the ageing population. Berwick (2013) cautions that failure to meet patients' needs can occur when working conditions do not provide the care providers with the conditions for success. It was worth noting that Berwick's statement above was reflected in this medical registrar's contemplation of the value of the EPR:

> *The question is what is the alternative? How and how do you. I suppose it is very difficult to measure the impact that electronic records give you er and if if I I see someone in the night, yeah, it may not be numbers wise that important, to the vast number of patients it is probably not that important but the thing is*

having access to information can be very
important to a few people and and but I
suppose if you look at it from a health
economic point of view, yeah it is probably
not cost-effective, and but I don't see the
alternative now nowadays so much is, so
many patients are seen in different places
so you know here we can easily have a
patient that is seen in [name of city] for something,
then you don't have any paper records or as
some hospitals are very bad at getting all
notes so you can go two weeks in a hospital
admission and the notes never arrive. In that
situation the time spent phoning people
getting copies of them faxed over, it's I don't see how.
I think the future has to be you know electronic
patient records. (MR 1)

Knowledge management in a fragmented way can pose considerable suffering and danger for people who use services and large costs in dealing with the consequences. Therefore, innovating from the frontline (Goodwin 2009) by making the EPR system available to improve outcomes, experience and value as well as enable incremental change can make a difference for the user, service providers, the hospital, Trusts and NHS.

Effective innovation starts small and the
simpler it is the more potential it has for
being effective. (Hughes 2006)

Now here in Wales, the design and use of intelligent information systems such as the electronic patient record system in real time practice holds the promise of simultaneously transforming practice and research (Lang 2008).

8.3 The Pivotal Moment

Electronic Patient Records have the potential to facilitate data sharing and impact on quality improvement, cost reductions and workflow enhancement. Emphasis is placed on delivering quality health care which is dependent upon knowledge, dynamic interventions and strategies. It is about building a culture of safety and the delivery of care that prevents errors involving health care

professionals, organisation and patients. A culture of safety depends on healthcare professionals working together with their patients and using information tools. The clinicians need technology that provides quick access to all patient information at one time and in one place. The technology must be user friendly (for example ease of use) fast paced and time-limited access. The EPR technology, in its current simple state can facilitate the provision of direct care and guide the doctors and nurses with prioritisation and management of care decisions (Chapter 6), however, it must provide as much up-to-date information about the patient.

At micro–level, the factors relating to the design and evaluation of systems, the users and their working environment have to be considered and understood, otherwise as this participant bemoaned:

> *I think from my understanding of how our computer systems work in the NHS is that we have got huge problems with our overall networking of computers, that a lot of this equipment is substandard, you know meaning really all of those should be upgraded ...(laughs). if you go into private industry and that if you go into supermarkets you will see flat screen computers and you come into hospitals and you see a really poorly resourced department. I mean it is scandalous in this day and age. (ANP)*

The development of a National Health Information Infrastructure to support the implementation of IHR across Wales has to continue to enable the National Health Service (NHS) to proceed towards an electronic record for patients by 2016 and to connect general practitioners and hospitals to achieve quality of healthcare in Wales. NHS Wales is at a pivotal moment in healthcare, a turning point where the use of information technology in managing patient health records in hospitals is becoming essential as demands on the health care system increases each day. Necessary steps are needed to assist Health Boards and in particular, the healthcare professionals to impact the delivery of high quality, safe and compassionate healthcare in Wales. Local Health boards will require

start-up investments required for the move from legacy and suboptimal technology and workforce development to benefit from optimal integration of systems, adoption and benefits realisation within health system and population.

> *I can't see how anybody wouldn't want to welcome*
> *the electronic record. You have to have information,*
> *don't you? That's what we work with. (ANP)*

The delivery of care should be pragmatic, professional, and patient-centred. Each group of professionals, although differently educated and trained, must be able to complement the others in the provision of care for patients with severe or complex conditions. To permit this kind of flexibility, the Government and those leading the NHS must equip healthcare professionals with the appropriate tools. Changes in the organisational and financing structures will not generate the desired outcomes unless the healthcare professionals are enabled to practice differently, to consider the patients' health conditions and their transition across a myriad of specialists and diverse care. Adverse events can happen when patients moved between providers and across sites of care. The patient's health information (medical record) must now move seamlessly with the patient, unlike in the past and currently where these continue to be setting-specific.

The direction now must be to procure the technology for clinicians' use. The technology must be capable of 'meaningful use' - in this sense, an electronic patient record system that shares information where and when appropriate between care providers and which is dependable and safe. Providers of healthcare are independent entities, exist in separate geographical locations and yet must work together across time and space to create continuity of patients' experience. The delivery of care in Wales is critically dependent on information systems that enable seamless communication between the people and the public services they need. There is widespread belief that new technologies such as the IHR technology can provide continuity of information flow and access to overcome the isolated silos of health data encountered by healthcare professionals.

For the patients presenting at EMAU, treatment plans normally include a strict review of medication use due to the potential for complex drug interactions (Chapter 6). Patient medications can be a useful indicator of chronicity of disease and care complexity. It is crucial that the clinicians have access not only to timely patient medication-data but that the information has to be accurate and with safeguarded integrity. It is anticipated that medication-data is changed, updated, and shared within a closed-loop between the primary and the secondary healthcare. Currently there are information gaps and uncertainties (Chapter 6.4). The IHR can bridge the intersection of care. It has become significant that the Government, leaders of healthcare systems and policy-makers must focus on providing a simple technology such as the IHR to enhance and facilitate the processes of communication, coordination, or collaboration between patients and their providers, or between providers and other providers to effect patient safety and quality care.

> *Why not – yeah, why not. It should be part of a…, if information is to be available, then we should be using it. Should it be used better I suppose if you got an individual patient record, then it is an interface between primary and secondary care, and if we are not actually, We got all our clinical work station (CWS) where we now are doing electronic discharge summaries, so how then if we have something separate, that is separate from the other systems, how then do we integrate them? We don't want to be duplicating then and then adding to one record or electronic discharge summary and then typing the same information to the IHR. So I'm not sure how we are going around that? (ANP)*

The IHR system can mediate the information gaps and should not be developed as static entities, but should be allowed to grow and adapt to emergent user requirements. Good system quality is very important to reduce cognitive effort and time when using the system. Poor system performance may be a barrier to

adoption (Koutsantonis and Panayiotopoulos 2011). Poor system performance may be a barrier to adoption

The number of decision nodes in the domain of clinical decision making is vast. The aim of developing and implementing the IHR within the EMAU was and has to empower the clinicians. Sadly this plan and project was not totally implemented. Greenhalgh *et al.* (2008), reinforcing the views of Sobo *et al.* (1999) highlight that the roll out of new technologies or innovations such as the shared electronic patient records (NWIS 2013) are complex and multifaceted. Complexities are encountered at micro, meso and macro levels. Electronic patient records record such as the Welsh universal individual health record could support improved information management within the health care system and could reduce failures in care delivery that occur as a result of poor quality or misinformation in the system. The introduction of the electronic patient record system, however, gives rise to new cycles of investment in ICTs amidst the many changes within the NHS. There are questions as to whether those who finance ICT developments within the NHS will remain committed with the high cost of the continuous development and redevelopment of the technology and will require sustained funding.

In macro-change opportunities such as the development of the IHR technology for the benefit both healthcare professionals and their patients is a challenge which involves multiple stakeholders in the collaborative process. Managers and leaders should be aware of factors that support or complicate aspects of health professionals' work. Reducing or removing the factors that complicate clinicians' ability to be mindful and make sense of changes will result in decisions that lead to safe practice and quality care. The 'right' timing of a new technology can reduce the stress related to change and promote a healthy work environment. Therefore reducing the barriers and strengthening processes and systems to support these EMAU doctors and nurses in clinical decision-making are significant to achieving safe and quality care.

At the micro-level - Within the EMAU environment, the IHR technology was used by the doctors and nurses for clinical decision-making, as a container for information, cross-checking patient safety, medication reconciliation, bridging intersection of care and enhancing professional approach (Chapter 6). The patients admitted to the EMAU are with complex conditions (Chapter 5). When it comes to caring for them one might reasonably expect that the higher the level of complexity of health care will there be demands for more involvement of multiple disciplines with different occupational backgrounds. Clinician engagement according to Yu *et al.* (2010) is crucial for sustaining the rollout of new technologies. The shared electronic patient records must be accepted by individual patients and health professionals if they are to be embedded in organisational and inter-organisational routines. The literature review (Chapter 2) has highlighted that several EPR innovations have been unsuccessful due to multidimensional phenomena such as legacy systems, non-interoperable systems, funding issues, the lack of integration into practices and organisations as well as professional factors (Greenhalgh *et al.* 2009). This process is greatly influenced by the material properties of the technology, the individual's attitudes and concerns, and interpersonal influence. This study advocates for more serious modes of engagement and cooperation from all organisational, disciplinary groups and individual healthcare professionals. These are possible interrelations between factors that will influence the use of the IHR systems to a certain degree. The coordination of such intensive cooperation from funders and designers to users will require a lot of time and effort and support from meso and macro level leaderships.

At the meso level - Good quality information is as important to the Local Health Board in the managing of its business or enterprise as it is to delivering healthcare services to an ageing population seeking preventative healthcare and the increasing number of patients with long term conditions and requiring management of chronic conditions (IoM 2000, Hamid and Cline 2013). The

Local Health Board has to deliver a more efficient service providing improved clinical outcomes, all within ever reducing budgets. Effective information sharing processes (Ben-Assuli 2014b, Franczak *et al.* 2014, Slight 2013), supported by technology investment can help deliver benefits realisation for organisations if they are introduced alongside a process that enables integration with existing systems.

At the macro level - historically, hospitals have allowed their departments to purchase their own technological solutions from allocated budgets. These solutions may have met the needs of the clinical specialities but not the needs of a network of hospitals as an enterprise. The current situation is one of multiple legacy systems which now need to be replaced or updated to achieve technological interoperability, that is for the systems to be able to communicate with others effectively. Increasingly care is being delivered across care boundaries and multiple specialities so there is an increasing requirement to bring about new approaches to clinical work and patient care instead of just allowing it to evolve randomly. According to Holden (2005), the application of the understanding of healthcare as a complex adaptive system includes supporting an environment of listening to people (health professionals and patients). At the meso-level, this process is influenced by organisational antecedents, the readiness or receptive climate for using the new technology, and the operational aspects of implementation such as funding, space, time, leadership and staff engagement. These issues can influence the Health Board's decisions and choices to fast-track, delay or adjourn the evolvement of a technology when pursuing sustaining and disruptive technologies such as the IHR system. The NHS and Health Boards have to effectively perform their social responsibility function to members of the public.

At the macro-level - The delivery of improved patient care in Wales is critically dependent on information systems that enable seamless communication between the people and the public services they need. This calls for improved planning of

services or through the provision of information systems to support the individual patient care process locally and nationally. In order to do all this in an integrated approach the process must be influenced by organisational and socio-political forces. Evidence and guidance about costs, benefits and risks (Fitzgerald *et al.* 2002) will have to be taken into account. NHS Wales Information Services (NWIS) in conjunction with the Welsh Government to put into effect their ICT Strategy. Hartswood *et al.* (2002: 14) emphasised approaching such innovation with the aim of co- realization, that is boundaries must be broken down both within technology production and between technology production and use.

The participants in the present study have been generally hopeful and positive about the potential of the EPR system. The nurse managers revealed that they could more effectively manage their time with the use of computers supporting their role. Both the nurses and doctors also commented that the EPR system enabled them to more efficiently make decisions and effectively manage their delivery of care in an emergency medical setting. They spoke of the time-saving potential of the EPR and of how the EPR supported interaction and communication between the clinicians and their patients. The interview accounts helped to shed light on the impacts on the people working within the EMAU, on patients and on the inter-connected relationships with stakeholders within and outside of the unit. The EMAU clinicians do want the EPR system. Information is a key organisational resource that is central to all its functions and strives to error reduction and patient safety.

Informing Healthcare (WAG 2003), the National programme aims to continue modernising health service delivery and promote new ways of working through better access to information and knowledge. Information technology is perceived as one of the key enabler for Designed for Life and which is now built upon by Prudent Healthcare (WAG 2014) - the strategies to deliver safe, world class health and social care for Wales. These policies and strategies are making

electronic patient records a vital part of the transition to computerised documentation and to be used widely in healthcare services to improve communication, centralise and consolidate patient data, and improve efficiency (Lee et al 2013; Rothman et al 2013; Creswick et al 2011). These technology-driven changes are directing the workforce to develop competencies in key areas such as patient-centred care, team work and collaboration, work efficiency, quality improvement, patient safety and informatics. The Welsh Government intends to log roll the EPR system to all unscheduled care settings to leverage the new digitised infrastructure to deliver more patient-centred, equitable, and cost-effective healthcare (WAG 2015, 2003).

Nurses, together with the other healthcare professionals will experience changes in the very culture of their workplace (Westbrook et al 2009, Huryk 2010, Tall *et al.* 2015). The workplace shifts can affect outlook and attitudes (Ochieng and Hosoi 2005). Adoption and use of EPR systems in hospitals have been slow and with mixed outcomes. Hospitals are complex organisations and the workforce is varied. It has been indicated that implementation of any technological system such as an EPR system into the workplace is not just a technical project (Takian *et al.* 2012, Greenhalgh *et al.* 2010, Tall *et al.* 2015). Existing work practice will change and work arounds or overdependence on the system can introduce unintended consequences (Menon 2014). Given the scale of the investment it will be an expectation that the workforce to use the technology. Since the EPR impact is manifest through the individual user of the system, NHS Wales will need to develop a nursing and healthcare workforce capable of using electronic patient records to improve the delivery of healthcare in an e-care environment.

8.4 Recommendations
8.4.1   Informatics education and training
Nurses and all healthcare professionals must bridge the gap between information technology and clinical practice because of their proximity to patient care. An informatics competent workforce is a significant component of a safer healthcare

environment for all patients. A whole system approach where academia, local and national level system providers, (managers, educators, professional associations, policy makers and regulators) work in partnership as the transformative model is necessary to ensure that the current and future workforce are prepared to practice safely and effectively in an e-care world.

8.4.2 General Practitioners and Patients to Opt in

The current Welsh EPR contains structured data from the General Practitioner. The management of information within the EPR will likely impact the health outcomes of individual patients. The delivery of quality care requires data about the patient. For the benefit of the other health care professionals who are part of their team work and are dependent on the information to deliver care, the data must be communicated across boundary through information systems for managing patient and population health outcomes (IoM 2012, Kelley *et al.* 2013). Currently patients are allowed to opt out of registration from electronic patient records. General Practitioners to work closer with the patients and must raise the significance of the role of electronic patient records.

8.4.3 Continuing Professional Development for Informatics

Nursing and Medical informatics, however, is not to be equated to health informatics. Health informatics could usefully be included in the curriculum to assist and empower a cadre of professionals with the tools and skills to assist healthcare to move forward in an ever changing environment. Informatics knowledge and skills are essential to ensure that professionals are proficient in technological and cutting-edge clinical applications and are able to offer the highest levels of patient care and safety.

8.4.4 Leadership

Technology transitions can be difficult to manage (O'Mahony et al 2014; Hurcyk 2010, Stevenson *et al.* 2010; Timmons 2003). All in leadership roles to champion and grow users with positive attitude, to shift away a culture of

resistance to new technology as highlighted by some authors in the literature reviewed (Ash and Bates 2005; Timmons 2003). The successful implementation of EPRs is largely dependent on people who use them and the organisational culture in which they work (Huryk 2010).

8.4.5 Research

The study has provided an insight into the how multi-disciplinary team members are able to use the EPR system to improve care quality in complex environments such as the EMAU. Questions regarding the quality of care, communication, patient outcomes (Eley et al 2009, Edirippulige 2005, Axford and Carter 1995) and measurements of the impact of EPRs on workflow and healthcare service delivery (Perry *et al.* 2013; Furukawa *et al.* 2010; Wu *et al.* 2006; Simpson 2005) remain to be explored.

8.5   Strength and Limitation of the Study

This study provided a rare example of an in-depth study of an electronic patient record system in (recent) use, in the only site in Wales where this was possible. It was a socio-technical work study. Clear findings emerged on the usefulness of electronic patient record re: medication safety, bridging the intersection of care, as vessel for information in the case of patients unable to give their medical histories and facilitates co-production to enhance safe, patient centred care. The limitation is the lack of opportunity for contemporaneous data generation of the electronic patient record in use.

8.6   Conclusion

The aim of this study was to explore the multi- disciplinary team members' use of the electronic patient record within one emergency medical assessment unit. Questions were:

*   **How will the multi-disciplinary team members view the use of computers in healthcare?**

The findings in Chapters 5, 6 and 7articulated their positive attitude to the use of computers in healthcare. The clinicians rated themselves as being satisfied or very satisfied with their use of the EPR.

- **What kind of issues or factors motivated the multi-disciplinary team members to use the electronic patient record technology?**

  The themes: Managing the dynamic context of the EMAU and Patient safety in (Chapters 5 and 6) provided the factors which motivated the clinicians to use the electronic patient record. For instance the EPR assisted the clinicians with: the day to day demands of their role, coping with gaps and uncertainties, medication safety, bridging the intersection of care, as a vessel for information when patients are unable to communicate their medical histories, and enhancing patient-professional relation – a basis for co-production, safety and person-centred care.

  What were the opportunities and barriers that influenced the multi-disciplinary team members' adoption of the electronic patient records?

  The barriers were related to consent issues, concern regarding detachment with the General Practitioner, legacy systems, delays and funding and training issues. Keen and positive workforce.

  What policy interventions are required to maximise the benefits of IHRs and increase the healthcare professionals' use of the electronic patient record technology for quality improvement?

  Getting General Practitioners to engage with patients to 'opt in' for the EPR rather than 'opt out'. Consent issues and secure EPR as fear about information breach. Provide informatics education and access to EPR.

CHAPTER 9   **THE RESEARCH JOURNEY**

9.1   **Introduction**

In this final chapter, I will illuminate part of my lived experience as a doctoral candidate conducting a qualitative case study research for the first time. Research design provides the overall structure for the research procedure, the data that a researcher collects and the data analysis that the researcher conducts. So planning is crucial to ensure the success of my research. I will explain the journey and challenges of undertaking this qualitative case study research, my naive decisions along the process and above all what I have learnt.

9.2   **The Art and Science of Doing Qualitative Research**

Research, according to Janesick (2004) is an active verb. In the conduct of quantitative research, the researcher strives for reasoned explanation, representational accuracy, and certainty whilst the qualitative researcher strives for arousal, vividness, and interpretive creativity. Qualitative research is a way of viewing the world that goes beyond the ordinary and where people's perceptions have meaning within given contexts (Janesick 2004). Much of my learning about research methods has been in the language of science and of a research tradition that has kept the science and art of conducting research separate. In the process of learning to be a successful qualitative researcher I have found that the art and science is really inseparable. Not only have I to learn how to perceive the world that is immediately before me but that I have to possess creative skills which is as crucial as it is to be analytical, to feel as well as to think, to be reasoned, passionate and to arouse while offering explanation. To become a qualitative researcher, I now have to 'train the mind, the eye, and the soul together' (Janesick 2004:2). I have to be aware of own aesthetic capability. I have to learn to see, listen, feel, and seek to be attentive to the unfolding moment and I have to learn about qualitative methods in the language of science. All these will require a lot of educating and practice.

9.3　Problem Formulation

The actual research began with the formulation of a researchable problem. Janesick (2000) suggests that qualitative research begins with a question or questions. These questions can be early/provisional questions - an intellectual curiosity if not a passion for a particular topic.

Some qualitative researchers, especially those who write about grounded theory, recommend waiting until one is in the field and collecting data to fully develop research questions. For me waiting to go into the field was not an option (Chapter 1). I am a nurse lecturer and I prepare one of the main disciplines of healthcare professionals who make up the huge workforce working within the NHS. My teaching interests are related to aspects of work place practice, work force issues, organisational management and behaviour and health and nursing informatics. So any questions that relate to the interconnected nature of people, tools, tasks and organisational forms are of interest to me. Besides I belong to and participate in information technology, health and nursing informatics networks. So a topic such as the EPR which has practical relevance for policy, the workforce and decisions makers has stirred curiosity, been a subject of discussion and questioning. So it was of no surprise when I decided to pursue the professional doctorate in nursing programme in late 2006 that I would turn my gaze on this subject. At that time I was involved in the activities of an eHealth for Nursing in Wales (eNWI) Network, the Royal College of Nursing (Informatics) and NHS Wales Informatics Services to discuss strategies to promote health informatics in Wales to raise awareness of eHealth, in particular the Electronic Patient Record vision, however, have no direct with the EPR implementation programmes. So I was involved with leading Master classes, writing joint papers and presenting these at nursing informatics conferences locally and internationally.

When I heard about the first EPR system (Individual Health Record) that was being pilot implemented within a secondary healthcare setting in one District General hospital in Wales, I decided to undertake this as a doctoral study. The piloting created an opportunity to study, first-hand, the rolling out and uptake of electronic records. I wanted to explore the multi-disciplinary team members' use of the electronic patient record system within that emergency medical assessment unit.

The formulation of the questions was guided by the literature review. The questions were:

- How will the multi-disciplinary team members view the use of computers in healthcare?

- What kind of issues or factors motivated the multi-disciplinary team members to use the electronic patient record technology?

- What were the opportunities and barriers that influenced the multi-disciplinary team members' adoption of the electronic patient records?

- What policy interventions are required to maximise the benefits of IHRs and increase the healthcare professionals' use of the electronic patient record technology for quality improvement?

These questions were focused on understanding human perceptions, experiences and interactions with the technology within the work practice. Therefore they were exploratory questions which were suitable as the base for qualitative inquiry, exploratory because the existing research is confusing, contradictory and not moving forward (Barker *et al.* 2002). Exploratory research seeks to find out what is happening. For this study I wanted to know about the intentions and perspectives of those involved in the use of the EPR system in the context of EMAU. I will draw upon the contents of a reflective journal to make the connections between theory and practice:

In contemporary clinical practice environment ICT skills are advantageous to the nurses…staff. Hard to imagine IHR…without it. Who uses? 24/02/10

I have a habit of doodling and this was one of my early thoughts in my notebook. I had met with a small group health informatics colleagues three days ago. I was recalling some of our discussions from our meeting and trying to make meaningful connections between theory and practice and I was curious whether the IHR technology will be used if it was available for use. Therefore the phenomena can be assessed in new light using a qualitative case study research to generate new insights. I was interested in how life is for them. I wanted to know about their work life, relationships and how they are affected by the technology and environment. So my challenges were learning to be attentive, to observe and to situate myself in order to see most effectively.

9.4   Knowledge and Methodology

Factors related to research design include the aims of the study, the focus of the research, the context (settings) and the object of study (Mason 2002). The role of theory in the research is a key question and concern for researchers in any tradition, regardless of philosophical stance. Theory (Chapter 2, 3) serves as an initial guide to design (Chapter 4) and data collection. It is part of an iterative process of data collection and analysis (Chapter 4). Informed by the literature (Chapter 2), my previous knowledge and experience, it was obvious to me that electronic patient records (EPRs) have been developed and used with various degrees of success and failure. The literature has revealed that the uptake of the EPR systems in hospitals have been low and its impact on quality of care undeniably mixed. The implementations of EPRs have turned out to be costly and an unexpectedly long and challenging process where many goals are yet to be met. The literature also revealed the different ways in which these technologies were studied. The process of uptake/adoption of technology has motivated a variant of research studies such as the Technology Acceptance

Model (TAM) (Davis 1993), Task Technology Fit Model (Goodhue 1995), Diffusion of Innovation Model (Rogers 1995) and the United Theory of Acceptance and Use of Technology (UTAUT) theory (Venkatesh *et al.* 2003). Besides the extent to which the EPR is used, in the place where work happens (patient care delivery) is not well explored. The implementation of EPRs has been studied by various researchers from a wide range of fields and disciplines. There is evidence of interest in designing successful healthcare information technologies and with each tradition focusing on particular aspects. There were claims that EPRs and other health care technologies have failed to adequately support collaborative work. This has led to studies which focused on developing healthcare technologies that are capable of representing articulation work resulting in an increased focus on understanding complex coordination processes as well as the important roles that artefacts play in articulation work in health care settings. Much of the literature has moved to focus on how EPR technology can be configured to support information sharing and collaborative practices. Some studies advise viewing the adoption of the EPR system as a dynamic and reflexive process where the technology is part of complex and interconnected system, locally shaped and reinvented through situated use. Researchers were also encouraged to pay attention to the way in which social and political interactions are intertwined.

What has also emerged from the literature was that the actual use of the EPR is fragmented and inefficient compared to the potential. It has been saddled with unforeseen costs, benefits not realised and disillusionment. It depicts a picture of an ongoing learning process where people try to configure ways of utilising the technology (Rolland 2005). Therefore the ultimate aim of research must be to develop a deeper understanding of users' needs and local practices in order to design and configure EPRs that will support such needs. Research focuses have to be on how the technology is used in an organisation and the importance of taking users and their situated work practices into account. The complexity of technology implementations within the health sector has been continuously

underestimated. The healthcare sectors have been criticised as lagging behind other industries when it comes to adopting information technologies. This reflects the practical relevance of studying the use of EPRs, especially in light of the various initiatives that are currently taking place. Thus the combination of the policy context and the existing literature has helped with my problem definition and identification and shaped my research questions. The literature helped to identify that a topic such as the EPR has practical relevance for policy, the workforce and decisions makers.

A theoretical framework shapes the questions and serves to help the researcher find some focus, such as defining the selection and parameters of cases (Yin 1994). Where was my theoretical perspective framework? These were some of the words I have jotted in my notebook: an antithesis perspective, an artefact perspective, an utility perspective, a technique perspective, an agency perspective, a network perspective and a power perspective. There are different lenses that have been used in the process of knowledge construction about information communication technology (ICT). This showed how much thought had to be given to research design (Marshall and Rossman, 1995). In hindsight, it has made me realised how the omission of a theoretical framework/s in the early part of planning can result in one's work being steered by uninformed rather than informed expectations. For example, using Complex Adaptive Systems (CAS) Theory (Chapter 3) as the theoretical framework to set the scene for all stages for the research would have assisted in determining the questions for the interview schedule, the methodology and data analysis, thus deepening the understanding of the phenomena of focus and the complex relationships among aspects of those phenomena (Sheikh *et al.* 2011). This was a huge learning point for me - developing an understanding and acknowledging the position on the role and usefulness of theoretical framework/s in empirical work.

Qualitative research is steeped in a tradition of guidelines and reflections on roles and it can be a struggle to find a respected methodology which in itself can

be difficult to understand or apply without training, hence often create tensions and anxieties about "doing it right". Some methodologies are more prescriptive about method than others, but all of them provide the researcher with an overall strategy for formulating, articulating, analysing and evaluating their methods (Carter 2009:1318). For example several methodological problems can be observed. One example is methodological fundamentalism insistence, that a particular methodology should never be changed or combined with elements of other methodologies (Carter 2009). Doing so would be accused of method slurring indicating the lack of understanding of the methodology.

For my study, I wanted to understand how the multi-disciplinary team members' in the EMAU use the EPR system. It was a study of perception, of experiences, of human beings undertaking their everyday activities involving a new technology in one organisation. The phenomenon is contemporary and can be examined in its natural setting or real life situation. Data can be collected by multiple means. No experimental controls or manipulations were involved. A qualitative single case study research was deemed feasible to enable the researcher to examine data at the micro-level or within the context of its use (Yin 1984). It was a single case as it was the only hospital where the technology could be studied and the complexities of real life situation which may not be captured through experimental research explained. Case study research focuses on an understanding of a given situation and context and may involve a range of techniques including interviews, observation, questionnaires and document analysis (Darke *et al.* 1998). I wanted to explore a contemporary phenomenon in depth in order to understand how the electronic patient record system had been used by multi-disciplinary members within one EMAU setting. This was a specific real-life context (Darke *et al.* 1998, Yin 2003). The nature of the research questions shaped my choice of a qualitative case study research. It had specific strength in generating interpretive knowledge when studying social-technical phenomena (meanings and processes) and actors in their natural settings (Denzin and Lincoln, 1994). This was consistent with the aim of my

research project where the experiences of individuals and the contexts of actions were critical. For this study, the role of the researcher was not as the discoverer of an external reality but as a builder of a clearer view of the phenomenon under study through explanation and with emphasis on 'thick description' (Stake 1995) to provide better insights into detailed behaviour of the subject of interest. The intention was not to represent the world or theory generation but to represent the case.

I was interested to illuminate and understand the individual's experiences and the meanings they ascribe to the EPR-adoption process. The use of a qualitative real life case study research allowed me to explore the actual experiences of people's everyday world through the point of view of participants. I read literature on the subject and found myself going through the process of clarifying 'the case', asking questions such as: what is it a case of and why is this case a useful one to study. This explained why grounded theory, phenomenology and others were ruled out. As the EPR is socially and organisationally embedded, used by people in particular contexts for social acts (Greenhalgh *et al.* 2009), the use of a qualitative case-study research enabled me to explore the interplay between the healthcare practitioners, the EMAU and the technology on the work practices (the linkages between people, organisation and technology) and vice versa. This could not have been achieved using any other approach.

9.5   Method and Research Actions

There were decisions, decisions and decisions to make such as selecting methods within the chosen epistemology and methodology that will produce the best data to answer the questions. How access was gained, the purposive sampling, the collection of data using face to face interview, observation and documents which are the pathway to the final research result (data analysis and reporting the research findings). Not only were there a lot of decisions to be made but there were also some risks encountered (Chapter 4). Without sampling, data

collection, data management, analysis and reporting, there will be no research. I worried about how I was going get over them as well as to write all these. Would anyone be interested or would I be seen to be narcissistic and self-indulgent. Shall I suffer if I did not write in this way? These issues have led me to question whether I am cut out to be a qualitative researcher – to be constantly engaged with issues, which are complex, not without challenges and require a fine balancing act on a number of levels.

Epistemology influenced implementation of method and the way in which quality of method is demonstrated. I was confronted with the use of strategies of deliberate control, and strategies that allowed for the release of control to enhance my ability to see clearly the lived experience that was before me. The research practice has to be controlled to uphold the model of the scientific researcher who is fully in control as to be seen in the eight continuous primary activities of framing the questions, meeting people, asking questions, analysing data (textual and other material), writing, critiquing work, refining and reading. All these are intimately and intricately connected. According to Lincoln and Guba (1985) the principles of reliability and validity are adopted in our work as we have to justify and legitimate what we do via audit trails (Lincoln and Guba, 1985). These efforts at increasing control may enhance the credibility of what we do, but may not necessarily enhance our ability to see clearly the lived experience that lies before us. For instance, the interview is one of the most commonly used qualitative data collection method (Patton 2002, King and Horrocks 2010), yet, this is often being oversimplified. For my study, participant interviewing was selected as my main data collection method (Chapter 4) as qualitative interview can provide in-depth, contextualised, open-ended responses from research participants about their views, opinions, feelings, knowledge and experiences (Creswell 2009). As I was exploring the multi-disciplinary team members' use of the electronic record (EPR) system, the use of interviews can reveal the past, uncover particular events such as how the EPR system was used or affected the participant's practice, thoughts and feelings as well as

information about the social setting which would otherwise be closed or unreachable for researchers (Weiss 1994). Therefore the potential answer to a question requires an explanation, not a straightforward yes/no. So a qualitative case study research using in-depth interviews was employed to find these answers. Face to face individual interviews to collect primary data was appropriate for an interpretive study (Walsham 1995). The oversimplification of the interview method as data collection was encountered in the hospital review process of the doctoral research proposal when I was applying for ethical approval to gain staff participants in interviews. No more than fifteen minutes interview was granted by the Research Risk Review Committee (Chapter 4) despite two communications between the novice researcher and the Chairperson of the Research Risk Review Committee to request for at least 30 -40 minutes of interview time. The length of interview time plays a significant role in the elicitation of rich and multi-sided data or shallow and superficial which can have serious limitations for a study that is seeking context dependent knowledge. My supervisors and I did explore the feasibility of changing the research methodology or design at one stage. Then with the support of one of my supervisors, the Committee was contacted again and finally granted a favourable opinion on the basis that individual staff agrees to the interview times. This slight difficulty presented a significant temporal obstacle as the problem took more than eight months out of the programme of study as well as added pressure to participant sampling as the EPR system was 'pulled out' when I returned to the field. Qualitative research in healthcare settings is necessary for increasing knowledge and understanding of meaning and experience, however, ethics in research is necessary in the safeguarding of human rights. The hospital had concern regarding removal of their staff away from patient care. Regulating research within such rigid guidelines not only restricts qualitative research methods in favour of more amenable forms of research but also illustrates the power of Research Ethics Committee over knowledge production (Haggerty 2004).

9.6   Insider –Outsider Issue

Qualitative researchers are not in control when in the field. I just did not know what I was going to encounter. Qualitative approaches are used in attempts to explore/describe a phenomenon or relationship. For this study, the focus is with the case rather than variables and of understanding differences rather than calculating the mean of responses. The interviews were semi-structured in nature, consisting of a set of eleven open-ended questions to allow for exploration of different ideas and concepts during the interview itself. Interview was selected as the primary method for data collection as I wanted to know what the other person has to say of his/her experience of a defining event, idea or thing. The interview schedule as discussed in Chapter 4, was developed with guidance from the literature review, from the various theoretical models used by the authors.

I frequently questioned my epistemological and ontological assumptions and my positionality as an outsider, a Chinese female novice researcher and my role as a nurse educator which I have to discuss as the process of doing qualitative research is very different from that of quantitative research. Qualitative researchers are not separate from the study. We do not have limited contact with our participants but are firmly in all aspects of the research process and essential to it. I recalled my early days in a kindergarten where I was the only Asian child in an environment where everyone spoke English, then the constructive criticisms of 'being introverted' or is it 'social/selective autism' from mentors and tutors during nurse training days. I thought I have overcome this but instead I suddenly felt a heightened sense of vulnerability. Like my first day in the kindergarten I was drawn to the experience of being an outsider, will this cause discomfort and what will be involved to maintain my footing as a researcher (novice).

9.7 The Primacy of Relationship

Yes, I was concerned about gaining access to the research site – a common problem amongst researchers which I was to note. Researchers often spend considerable amount of time on this task, especially when the research requires an in-depth study of their respective research field (Okumus *et al.* 2007, Patton 2002; Shenton and Hayter 2004). Fieldworkers have long acknowledged the problems of gaining access to research settings but often failed to analyse them in a systematic manner (Feldman *et al.*, 2003). I was conscious that I was a guest (outsider) in other people's habitus (Bourdieu, 1977) and the interactional process of data gathering. As interviews deal with thinking and thoughts, this is the best way to get into the lived experience of a person as the person can narrate that experience. Interviews invite the individual to talk about their needs, wants, expectations, experiences and understandings at both the conscious and unconscious levels (Nunkoosing 2005). I became much more aware of my status as an outsider researcher when I was asked pointedly by one person (a pharmacist) whether I belonged to their group, was I commissioned by Informing Healthcare to conduct the research, who gave me access and from the others who did became participants, on whether I was auditing the unit or what was my role? Not being part of the social group I was researching I was constantly worried as to whether people will be keen to participate and explain about their use of EPR technology in the belief that I have no knowledge of using it. I was very aware that gaining detailed and comprehensive accounts from the participants rests in my power and authority as seeker of knowledge and methodological expertise.

There were events not anticipated, frequently well into the process of inquiry and not uncommonly it turned out to be about something rather different from the initial foreshadowed problems (Hammersley and Atkinson 1995). For example, environments can be challenging and not knowing what you are going to get means that you have limited control over fieldwork and required a flexible approach. What can sabotage the researcher trying to conduct a good quality

interview - interrupted by bleeps, by knocks on the door to inform the participant to attend to the waiting patient, to discuss administrative issues, the unit manager expecting me to interview their staff /participant there and then as the EMAU happened to be 'quiet' at that moment of time and the odd interviews having to be undertaken in a busy office or in a waiting area of a clinic at the end of the day.

I am in this office with this Deputy Manager of the unit. I was glad that she has decided to participate. It has taken her over a week to decide. Finally I am able to meet with her. She apologised for my having to wait for her and we smiled. I went through the process of explaining the study to her once again, not that she is not aware as we have met before and she has had a copy of the information sheet. As with all the other participants before her I wanted to make sure that she understands what she is partaking. She consented and signed the form whilst I proceeded to put a 'Do not disturb, interview in progress sign' on the outside of the door. I adjusted my digital recorder as she has agreed for her interview to be recorded and proceeded to ask her the first question on my interview schedule. Just as she was going to speak, the office door was flung open. It was the Senior Nurse of the unit, one of the gatekeepers that I have previously met to explain the study. She stood there and held a conversation with the deputy manager (the participant) regarding the completion of an administrative form. My recorder was running and the Deputy Manager kept casting a look my way and I could see that she was embarrassed. All I could do was smile. The conversation went on for about three minutes, came to a conclusion but no sooner for the Senior Nurse to return again to clarify one aspect of the conversation that they have had. When she has finally finished, the Deputy Manager closed the door and we both burst out into laughter. So it was not surprising that she used 'Jack of all trades' when asked about her role in the EMAU.

This excerpt from my field notes illustrated one of the several the interruptions I have to come to terms with my "researcher as participant" role; a role that is dependent upon my "self," both the self that I bring to the research setting and the self that I create in that setting. I felt helpless and at the same time annoyed, trying not to show my feelings. I was aware of my active participation in the data collection process, that the researcher in qualitative research is actually the main tool of data collection. I was not simply a passive observer or note taker but I was much more important than the interview schedule or even the environment. As the researcher I realised how significant I was to the quality of

the whole data collection process. Hammersley and Atkinson (1995) and Walsh (2007) point out that the quality of the relationship that is established has primacy in the process and cannot be overstated as the quality of the data obtained is directly related to the researcher-participant relationship. The challenge in these busy settings is differentiating important sounds from the noise. So no matter what, how I engaged with the field and its participants was crucial. I began to appreciate that conducting not only a good interview but good qualitative research requires understanding of how our positions and interests as researchers affect all stages of the research process. I have to fit in and I have to do much to prepare for every stage. I have a complex everyday life. I work full time and have to navigate complex social and personal demands, make decisions and negotiate interpersonal relationships. My mind and energy are constantly preoccupied with plans, expectations and decisions. I turned up as negotiated but the participant was unwell and has left the ward. Qualitative field-work requires flexibility and ability to efficiently react to on-going situations. With participant interviewing, it cannot be simply a matter of dashing in and out. It would have been problematic to collect a planned number of interviews if researchers are not prepared to be flexible and organised. Managing control in qualitative research involves holding in place the incompatible expectations of orchestration and surrender, discipline and presence.

The differences between the participants and I can be used as a tool to provide a particular perspective. What role should participants play in the interpretive process, if any? I thought a great deal about the question of whose interests would be served by my research (Wolcott, 1995 Mauthner and Doucet 2003). The participants were allowed to adopt the position of "expert" and put in the position of authority about the topic in question. I observed that reducing the fear of judgement encouraged the participants to talk more freely, thereby eliciting more detailed and in-depth accounts. I maintained my distance with the participant by taking into consideration Haw's (1998) caution that the researcher's closeness to the subject of investigation can blunt his or her

criticality, causing them to overlook, or take for granted, aspects which are familiar to them. Human encounters are power relations (Brinkmann and Kvale 2005). As much as I wanted to collect thick -rich data, there are the rights and duties to the people researchers study. Ethics forms were submitted early in order to gain official permission to undertake the research and I recognised when to call a halt when following up individuals, to respect and provide duty of care in terms of informed consent, meeting needs, rights, privacy, anonymity and confidentiality (Harre 2005). In the complex healthcare environment the qualitative researcher has to possess ethical perception, judgment and reasoning skills.

9.8   Observation as Data Collection Method

As I was able to gain access to the EMAU, observation was a valuable way to gain a 'rich picture' of a setting. Observation (Chapter 4) can inform about the influence of the physical environment. For example non-participant observation allowed me - the researcher - to see for myself, in an unobtrusive way, what happened or what went on in the EMAU if I wanted to develop theoretical understanding of what is occurring as the researcher does not need to become 'part of the action' It is worth noting, however, that there may be a problem of gaining access with some aspects of a setting being 'off-limits' to an outsider for legitimate issues of confidentiality and privacy. For this study I was not known personally, apart from that I was a student researcher and I had turned up to undertake a prearranged interview. This role, as a student researcher, gave sufficient positioning for me to be able to undertake unobtrusive observations in the healthcare setting. For example I would sit at the patient's seating area, stand near the nurses; the doctors' station or outside the Unit manager's office. I tried to be un-noticeable as possible and I had to be selective, observing largely that which can assist me to answer the research questions (Chapter 4: 4.5.2) and to help the researcher get the feel for the layout of the place, how things are organised and prioritised, the events of the day, who were/was involved, what and when and how people interrelate and the cultural parameters. These were

recorded in the research journal. I was disappointed that I was not able to see the EPR system being used by the clinicians or with the patients nor was I able to observe how the clinicians engaged with each other or the patients or what issues were discussed between them as issues of informed consent and privacy have to be considered.

9.9   Use of Documents

For this study I have also used both printed and electronic material, newspapers (clippings/articles); press releases; program proposals, organisational or institutional reports and survey data (Chapter 4: 4.5.2). Atkinson and Coffey (1997:47) refer to documents as 'social facts', which are produced, shared, and used in socially organised ways. Document analysis requires that data be systematically examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss 2008), however, there have been criticisms that this has not always been used effectively. In this qualitative case study I have utilised document analysis as a means of triangulating data—'the combination of methodologies in the study of the same phenomenon' (Denzin, 1970: 291). The intention was to seek corroboration through the use of different data sources and methods to provide 'a confluence of evidence that breeds credibility' (Eisner 1991: 110) and reduce the impact of potential biases that can exist in a single study. The documentary literature is a potential source of empirical data for case studies; producing rich descriptions (Stake1995, Yin 1994) on the background and context within which the participant operates (Mills *et al.* 2006). For example, to verify some aspects brought up during the interview on the technicalities of the IHR technology, I used articles published by the Local Health Board and NWIS to contextualise information. These documents, together with interview transcripts and journal entries became part of an audit trail.

The use of appropriate documents can help me to uncover meaning, develop understanding, and discover insights relevant to the research problem.

Documents may be the most effective means of gathering data when an implementation or innovation such as the EPR system can no longer be observed or when participants have forgotten the details, taking into consideration that I had utilised a retrospective sample. For example, I had wanted view of the evaluation documents by Informing Healthcare. Local Health Board's minutes of meetings and the audit report by the Welsh Audit Commission (WAC) as it has come to my knowledge that the team has undertaken an audit of the EPR implementation project on the 14th of September 2009. The challenges that I have found were that documents may not always provide adequate detail to answer the research questions due to low and difficult retrievability. These were occasions where a researcher may have to secure appropriate documents by exercising the Freedom of Information Act (FAO). I wrote to WAC and NWIS but to no avail. One's outsider status may hinder due to reluctance on the part of potential interviewee or organisation to share data for fear of recrimination if they do. Yin's (1994) comment that access to documents may be deliberately blocked was worth noting. Yin (1994:80) cautions against biased selectivity, due to incomplete collection of documents. The researcher, when conducting qualitative case study research is dealing with organisations and individuals with their own goals and objectives, hence, must be aware of how these influences will relate to and affect the conduct of their research. Qualitative research is not an activity that can be done without training and experience (Hennink *et al.* 2011). For those of us lacking in these skills, doing qualitative research comes with a number of pedagogical challenges. Pedagogically, it was sink or swim and I did both. I have learnt that there is no shortcut to bringing the component parts together and that immersion in the field, onsite puzzle-solving, making mistakes, building confidence by doing, managing research relationships, overcoming anxieties and fears are all part of the practice of qualitative research.

9.10   Data Analysis

Analysing (Chapter 4) and presenting qualitative data (Chapters 5,6,7) is one of the most challenging aspects of qualitative research. It is a labour intensive and

time consuming task. Of the two fundamental approaches: deductive and inductive approaches (Burnard *et al.* 2006), Even though I was guided by the principles of Framework Analysis (Ritchie and Spencer 1993) (Section 4.6), its structure was flexible to assist me to analyse the data inductively rather than deductively based on a priori themes which have been decided in advance which can severely limit theme and theory development. The Framework Method provides systematic and visible stages to the analysis process and is a flexible tool that can be adapted for use with many qualitative approaches that aim to generate themes. The tool itself has no allegiance to either inductive or deductive thematic analysis and is not aligned with a particular epistemological, philosophical, or theoretical approach. Where the research sits along this inductive-deductive continuum depends on the research question. The inductive process, however, is the most common approach to analyse qualitative data. Unlike deductive approaches which involve using a structure or predetermined framework or theory to analyse data, the inductive approach uses the actual data itself to derive the structure of analysis. The selection of analysis method, however, should have been considered at the proposal stage of the research and should fit with the research questions and overall aim of the study.

With qualitative data analysis, it is the researcher who has to make sense of the descriptive accounts provided by the interview transcripts, field notes and observations by exploring and interpreting the data. In section 4.6, I discussed the stages in the thematic data analysis process applied to my study. The themes, however, do not just emerge. Instead they resided in my head as I thought about the data and created links as I understood them. When compared with quantitative data analysis, the process of qualitative data analysis is arguably more subjective, so different researchers may interpret the same data somewhat differently (Pope *et al.* 2000). A common belief amongst social scientists is that qualitative accounts cannot be held straightforwardly to represent the social world, thus a definitive, objective view of social reality does not exist. The qualitative researchers have to be mindful of their theoretical stances and values

as data analysis methods are not just neutral techniques. They reflect, and are imbued with, theoretical, epistemological and ontological assumptions (Mauthner and Doucet 2003). This showed that the qualitative research does not simply 'give voice' – it is the researcher who selected, edited and deployed to frame their arguments. It remains a fundamentally subjective and interpretative process. It is thus debatable as to whether qualitative researcher should have their analyses verified or validated by a third party if to make the analysis more rigorous and reduce the element bias. According to Burnard *et al.* (2006), despite perpetual debate, there is no definitive answer to the issue of validity in qualitative analysis. Different readers interpret texts in different ways depending on their social location and perspectives (Denzin 1994). Data analysis and interpretation stages of research carry the epistemological, ontological and theoretical assumptions of the researchers who developed them (Alvesson and Sköldberg 2000), For this study member checks (respondent validation), that is returning the interview transcripts and/or data analysis to the respondents and requesting them to validate or refute the researcher's interpretation of the data were not undertaken. Instead data analysis was independently peer reviewed by a suitably experienced colleague (inter-rater reliability). Two transcripts were also emailed to one of the research supervisors for additional insights into theme and theory development (Barbour *et al.* 2001). I did attend two data analysis sessions, however, the level of input and support at the data analysis stage is rare for postgraduate students. I recognised that as a social researcher

Analysis is iterative and occurs throughout the entire research process, shaping and reshaping the study and the data is gradually transformed into findings. I am expected to reflect on how I come to know what I know. This was the most frustrating and paralysing stage of the research journey. I resorted to organise significant quotations onto my wall charts thematically and pasted quotations into each one. Workload and time constraints were competing factors. The task was time consuming but necessary to offer visual evidence of dominant themes.

Decisions have to be made and everything comes down to the amount of time available or ease of access to adequate resources.

I am integral to the social world I study, hence attention has also been devoted to issues of power and exploitation during data analysis and interpretation, how the data were interpreted, my role in the analytic process and the pre-conceived ideas and assumptions I brought to the analysis. I tried to bear in mind Strauss and Corbin's (1990) caution about researchers often failing to see much of what is there because they come to analytic sessions wearing blinders, composed of assumptions, experience, and immersion in the literature. This could account for how the theoretical framework (Complex Adaptive Systems Theory) emerged from the data. Researchers are reminded that the validity of their interpretations is dependent on being able to demonstrate how they were reached. As theoretical frameworks take account of previous knowledge to inform the topic and approach of the early empirical work, the information that was gathered for the study needs to always be interpreted through a theoretical framework in order to offer a clear explanation of what has been found. As there are multiple theories on the same issue, these will provide varying perspectives.

Qualitative research methods may or may not involve a theory that is explicitly determined a priori (Munhall and Chenail 2008). In some instances, the pre-determination of a theoretical framework would be the antithesis of the very nature of the method itself, as in research using Grounded Theory approach (Glaser and Strauss 1967) as the primary concern is with the discovery of theory directly from the field data. However, this does not mean that theoretical frameworks are abandoned in qualitative inquiry. Traditionally theoretical frameworks are developed a priori, before data collection or it can evolve during the course of the study, of which the latter is the situation for this study. I had to decide which lens to use to build the argument, establish the context of the problem, and explain findings. In seeking to understand whether and how the EPR was used, I discovered themes such as complex interactions, interconnected

systems and diverse groups of people in interview data that established Complex Adaptive Systems theory (CAS) (Chapter 3) as an emerging framework, the lens with which to view the world and for understanding the phenomenon. This was to provide a common world view or lens from which to support one's thinking on the problem and analysis of data (Merriam 2001). CAS theory thus assisted me to reflect on the data and explain my interpretations of the respondent's words or how I later write about the person to retain some grasp over the blurred boundary between the participant's narrative and my interpretation. This developed confidence in my understandings in order to be able to communicate to others how life is and how it works for these professionals. I have to be mindful that complex minds, attached to our preferred ways of seeing the world hinder our ability to observe the world anew. The familiarity of our social world poses difficulty because of our need to fit emerging reality into previously established patterns of perception. It is about understanding the experience of the other, so the key is to be aware of my limitations and to reflect on them. Walsham (1995), cautioned that theory can provide a valuable initial guide but when used in a rigid way stifles potential new issues and avenues for exploration. There is the danger of the researcher only seeing what the theory suggests. There are limitations by not having theoretical frameworks from the outset of the study as these are the lens with which the world is viewed and research questions framed. As a qualitative researcher, one had to learn not to force preconceptions on the findings, be blinded or misdirected by what one brought to the study. It was about learning to preserve a considerable degree of openness to field data, discover themes in the interview data, clear one's mind and attend to the shapes, patterns, sounds, smells, and colours of the participants' worlds so as to provide a full and revealing picture of what is going on, to develop a good understanding of the phenomenon.

9.11 How was CAS useful?

I drew on Complex Adaptive Systems (CAS) Theory (Chapter 3) to provide the lens to understand the structure and dynamics of complex systems such as the

EMAU, actors, and technology interacting to produce change. The theory evolved during the fieldwork as I gradually began noticing as well as encountering various empirical complexities in the field. I found myself encountering uncertainties in the field and noted that these uncertainties were not only encountered by me but by the participants as well. These were intensified during the course of the research as the accounts of the participants led me to identify that the work of managing and delivering healthcare was cumbered with uncertainty and unpredictability due to the diverse and complex situations encountered on a daily basis. The NHS is a complex system and has to be considered as an integrated whole and in a less linear way. The adoption of the EPR is not linked by a linear and predictable path. There are multiple interacting factors which can be viewed as a result of the influence of actors and their interpretations, policies and from the open nature of the health system, often not generating the same impacts over time and in different places. Therefore research strategies that allow investigation of complex causality can offer insights and perspectives of relevance.

9.12   Writing and Reporting

As both a consumer and producer of research, it is essential that one has a firm grasp on just what is entailed in producing legitimate, valid results (Chapter 5,6,7) and conclusions (Chapter 8). Everything has to be rationalised and interlocked– what influenced the choice and focus of the topic, the encounters and relationships in the field, the content and analysis and finally the writing up of the research.

In qualitative research we set out to understand the phenomenon of our study. We begin with decisions but are confronted with a complicated array of possibilities. Articulating a clear research question, giving a rationale for the focus we have chosen, locating our inquiry in existing knowledge and literature, and formulating questions to be asked are ways that we as researchers begin but the worry is constant. If the focus of my gaze is too broad, I risk losing myself in

the complexity; if the focus is too narrow I may lose important information about context. There was the constant anxiety about what I have excluded, what I will miss. I had entered the field hoping to find something exciting but instead the accounts provided unexpected insights into the everyday emotional challenges involved in delivering effective and safe care. What I have heard and observed have been helpful in identifying work practices and processes and organisational dynamics which can be improved through designing appropriate technology as well as enriching the body of knowledge on technology use in secondary healthcare setting. The participants provided several insights into everyday situations and everyday culture. What were shared were discussions of ordinary work and similar stories about the challenges of their working lives but why did they 'pull out' the EPR system? This knowledge may be more revealing and interesting. When we compose our research, it is important to be mindful of how we allow our attention to be drawn to experiences that we find interesting or important. Equally, we are likely to shift our attention away from topics that appear boring or mundane. Yet there are times when a focus on the mundane aspects may offer more insight into the dynamics of practice than the features that "stand out". It is the start of focusing on the "trivial" that the patterns in our organisation of everyday experience can be seen and understood more fully. I have to accept that it was more crucial to commit to what was part of my inquiry, that the research questions were answered and so the mundane and everyday can be fascinating. Qualitative research is an interpretative and subjective exercise, and the researcher is intimately involved in the process, not aloof from it (Pope and Mays 2006). Researchers are usually the relatively more powerful part in the power relation between researchers and researched. The study groups are most vulnerable and at the mercy of how the data that they have 'handed over' will be manipulated. They are now in the hands of the other who has the monopoly of interpretation over the participants' statements.

9.13 Determining Rigour and Trustworthiness

Qualitative research as well as case studies are frequently being criticised for lacking scientific rigour with poor justification of the methods adopted, lack of transparency in the analytical procedures and the findings being merely a collection of personal opinions subject to researcher bias (Sandelowski 2004, Farmer *et al.* 2006, Morse 2006).

Therefore the concepts of rigour and trustworthiness (Chapter 4) in which a study is conducted become important issues to ensure the credibility of findings. According to Morse *et al.* (2002), research without rigour is worthless. It becomes fiction, and loses its utility. This implies that research has to be evaluated for its quality if findings are to be trusted, believed and utilised in practice, hence Morse (2007) urges qualitative authors to reveal how rigour was attained and maintained if we want to feel confident incorporating research findings into our practice.

Would my study be of interest to anyone and will it be taken seriously? As my study is in the applied field of healthcare, any implementations into practice can affect the lives of both providers and users. I have to feel confident that the findings of the study can be applied to improve practice. Therefore the issue of trustworthiness of findings loomed large for me. I was uncertain how I can ensure that the interpretations of reality presented in my study are as true to the phenomenon. I read on the topics of establishing reliability and validity for qualitative research and tried to follow the arguments and views of various authors (Guba and Lincoln 1981, 1985, Sandelowski 1993, Merriam 1995, Noble and Smith 2015) that there is no accepted consensus about the standards by which such research should be judged. The literature did provide some clarity on the subject of trustworthiness. Three major aspects of rigour: internal validity, reliability and external validity (generalisability) were highlighted. Attention was constantly drawn the notion of reflexivity which add to the trustworthiness of the study. I experienced difficulties with understanding and demonstrating

this notion of reflexivity. So what are the strategies that I can draw from the literature to employ if there is no accepted consensus about the standards?

Qualitative research is more concerned with understanding rather than knowing a phenomenon (Wolcott, 1990). It is based on different assumptions regarding reality, thus demanding different conceptualisations of validity and reliability. Merriam (1995) expressed that notions of validity and reliability need to be grounded in the world view of qualitative research. According to Kvale (1996) one cannot talk about the validity of the study, but of the validity of the assertions and inferences one makes during data analysis. Interpretive accounts should be judged on grounds of coherence, plausibility, and whether they help us gain a better understanding of the phenomena under study (Yin 1994, Kuzel and Engel 2001).

Internal validity has been emphasised as one of the strengths of qualitative research. The question was how congruent were one's findings with reality. In other words, as there are interpretations of reality involved, how would I as the instrument offer my interpretation of someone's interpretation of realty? How valid and reliable was I as the researcher? The things (worked examples provided) that I have done in an attempt to strengthen internal validation are briefly outlined below:

- Multiple sources of data (Triangulation) such as interviews, observations and use of documents to ensure that one hears about the phenomenon, sees what is taking place and reads about it. Different methods and perspectives help produce a more comprehensive set of findings.(Fraser and Greenhalgh 2001, Kuper *et al.* 2008);

- Accounting for personal biases which may have influenced findings at the outset of the study (Sandelowski 1993) through reflexive accounts and maintaining a reflexive journal;

- Strict maintenance of records to provide a clear decision trail (Sandelowski 1993, Long and Johnnson 2000). For example, digital recording of interviews allowed for repeated revisiting of the data to check and ensure interpretations of data are consistent, transparent and that emerging themes remain true to participants' accounts;

- Use of rich and thick verbatim extracts from the participants, for readers to make judgements about whether the final themes are true to participants' accounts (Slevin 2002);

- Transparent and clear description of the research process from initial outline, through the development of the methods and reporting of findings;

- Emerging themes examined and discussed with peer colleagues to reduce bias and ensure plausibility of the emerging finding; and application of findings to others contexts.

The notion of reliability is problematic in a study such as mine as it is focused on studying people and their behaviour which is never static as their interactions are complex and not the same day after day. For this study, the sample used was a retrospective sample and it was past a year on after the EPR system was 'pulled out' when they were interviewed. As this was a case study research, they were the only sample I could access and exhausted. The clinicians and professionals were used to reflection in and on practice. It was surprising that all the participants could still recall their use of the system as they were able to inform me that 'they could only access the EPR only from the EMAU computer', as well as made it a point to indicate 'which one'. Prior to the interview I showed them a picture illustrating the EPR screen to assist recall. The intention of the study is to understand the world from the perspectives of the participants. There could be no benchmark nor can it be replicated. As a sort of internal validation, Lincoln and Guba (1985) encouraged the researcher to strive for dependability or consistency in which the results of the study reflect to the best the researcher's ability to the data collected, in other words- are the results of the study consistent with the data collected?

Stake (2000) reinforced the view that the researcher's knowledge of the case faces hazardous passage from writing to reading and researchers must seek ways of safeguarding the whole research journey. In my study, I tried to ensure that data supported interpretations, and strove towards "thick description" (Stake, 2000). This was to strengthen generalisability (Guba and Lincoln 1985),

concrete universals (Erickson 1986) or user generalisability. The provision of adequate information/description of the phenomenon under study by letting the participants speak for themselves was a way to allow the user/reader to determine closely whether their situations matched the research situation. In this way, I was allowing the user/reader to determine usefulness and generalisability (user/reader generalisability) and application (concrete universals).

Stake (2000) rightly points out that the researcher can confront hazards which can affect the research journey. The kind of tensions and dilemmas I have encountered were duties derived from power and ethical perspectives such as confidentiality and anonymity. For example, anonymity in research is often a good thing but it can also serve to deny the participants and organisation a voice in the research product that originally emerged from their statements (Parker 2005). The participant's voice can be silenced thus leaving the researcher free to interpret according to her own research interests. Also, how will this assist me to write persuasively so that the reader experiences being there (Cresswell 1998) without breaching trust? The other issue of writing in the first person and to include accounts of self and one's feelings was to risk exposure, of being preoccupied and self-absorbed. I was very conscious of these while constructing my thesis and it troubled me as I have always been used to writing in the third person. As both a consumer and producer of research, it is essential that one has a firm grasp on just what is entailed in producing legitimate, valid results and conclusions. Everything has to be rationalised and interlocked– what influenced the choice and focus of the topic, the encounters and relationships in the field, the content and analysis and finally the writing up of the research. I have attempted to provide adequate information or description of the phenomenon under study. I have let the participants speak for themselves as a way to allow the user/reader to determine closely whether their situations matched the research situation, the usefulness, generalisability (user/reader generalisability) and application (concrete universals).

9.14 Conclusion: What Next

Some beautiful paths can't be discovered without getting lost (Erol Orzan). This doctoral thesis is the first step in the beginning journey as a researcher. In the previous sections, I have discussed the practical challenges that were faced in undertaking the qualitative case study research as fulfilment for the Professional Doctorate in Nursing. Conducting research is not a quick process. Once I embarked on the journey the research became a constant entity in my life. It quickly developed a momentum of its own, at times becoming all-consuming, at the very forefront and at other times like a back track in my subconscious.

Qualitative research can be described as being both an art and a science. Important and necessary aspects of the qualitative research involve the mastery of facts, philosophies and procedures (McAllister and Rowe 2003). At the same time the development of analytic skills such as passion, engagement and creativity are required. I have read and struggled with the language and process of research. The textbooks and papers on the subject of qualitative research are not always make easy reading and mostly prescriptive, demonstrating the process of an iterative manner of doing research in a 'recipe book manner' (Hunter and Smith 2007). Apart from supervision, opportunities to engage with the research community to explore and share "research story/project" or "research journey" did not happen often enough. Engagement with research experiences can serve to breathe life into the concepts studied or open up opportunities to talk about the role of the researcher and the influence of the data on the researcher and the researcher on the data.

Many times I have vocalised my frustrations that the demands of servicing two huge intakes of undergraduate programmes, the full time role of lecturer, module leader and personal tutor as well as the constant thread mill of administrative tasks and teaching created tensions between my contractual role as lecturer and my role of learning to 'do' research – to explore, practice, exercise, and express my thoughts, concerns, confusions, revelations, and insights. Learning to 'be'

creative, to 'do' research and to 'think' (Richards and Morse 2012) qualitative research did not come easy for me as a full time nurse educator. For, one of the annual postgraduate symposium I presented a poster entitled 'The emotional labour of being a qualitative researcher' which won me the best poster prize. The poster captured some of the moments when I did not clearly know where I was going, how I would get there, or where I would end up. At most times it seemed that only my supervisor has been truly interested in my journey. Coping with setbacks has certainly been an important learning experience. The things I have learnt from undertaking this study are:

- **Find the space and make time** - for thinking, listening, reading, writing and talking. Not having the relevant resources make the task of completing the project becomes exponentially more difficult.

- **Develop strategy/ies** – for shifting boundaries and making choices to put a project together Problem-solving skills are needed to manage the unexpected detours and changes. The challenges faced and how these are overcome require multi-tasking. A strategy has to be developed and the best course of action/s identified, planned and implemented.

- **Make a commitment to complete the project** - Like with any well laid out plan, it's important to stick to it even when the chips are down. During my research journey, I experienced elation and some frustrations as well. Due to unforeseen circumstances there were delays along the way. All these have taught me that patience, determination, tenacity and stamina are our best friends when encountering the difficult areas. "Sticktoitiveness" is crucial to completion and success of a project or task.

- **Standing on the shoulders of giants** – when undertaking research there are a number of sponsors and door openers involved in this journey in different ways. I still struggle with developing effective networking as well as skills in effective literature retrieval. Not only does the student researcher invest much effort, emotion and commitment in the journey, so do the supervisors, librarians, panel reviewers and external examiners.

The journey described so far was not linear. Rather it was a journey which moved forward and backward, allowing opportunities for revisiting 'sights' in a recursive manner and when I did revisit places I had already been, I did so with

different eyes. It is alright to read about research paradigms, the researcher participant relationship which led to the collection of rich data or the analytical approach and quite another to carry it out. The goal for the doctoral programme is to have students learn the theory and to emerge from it with some skills and passion to becoming a confident researcher (developing the research and writing skills to publish), becoming a recognised researcher (developing expertise and becoming part of a research community), becoming a productive researcher (developing the skills to access grants, conduct research and publish regularly) and becoming a sophisticated researcher (becoming a leading thinker in a field) (Akerlind 2008).

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Appendix 1: Research Participant Information Sheet

Title: The Multi-disciplinary Team Members' Use of the Electronic Patient Record Within One Emergency Medical Assessment Unit.

You are invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully before you make your decision to take part.

1.1 What is the purpose of the study?

The findings of this study will provide insights into how health professionals use the technology. The information can be used to support workforce development and aid decision-makers and systems designers in systems selection, specification and design.

1.2 Who are the researchers and who is funding the research?

The researcher is a postgraduate student with Cardiff School of Nursing & Midwifery Studies, Cardiff University. The study is being conducted as part of the Doctorate in Nursing Programme.

1.3 Why have I been chosen?

You have been invited to participate in the study because you have the experience of using the IHR system and will be able to discuss its impact upon the way you work and your role.

1.3   What will happen to you if you decide to take part?

You will be interviewed if you decide to take part. The interview will last approximately fifteen – thirty minutes. I will try not to take up much of your time. You will be asked to complete and sign the consent form (which is attached with this information sheet). Then I will arrange a date, time and place

to interview you. The interview will take place over the next three months. During the interview I would like to hear your story (views) of experiences with particular reference to the implementation, your use of the Individual Health Record System as well as its impact on your role and work. The interview will be audio-recorded so that I can capture the data to decrease misunderstanding of your answers and aid in correctly quoting your words.

1.5 What will happen to the information I give?
Your rights will be protected. All information collected from you during the course of the research will be kept strictly confidential and anonymous. The research data and transcripts will be accessible to me and my supervisor. In accordance with the Data Protection Act (1998), the research data will be stored in a secure location. You will be informed on completion of the study and where the results will be published, so you are able to access the results of the research.

1.6 Will my talking part be confidential?
Confidentially will be safeguarded in the following ways:
a)Data will be collected during the interview and will be tape-recorded. The interviews will take place in a room that is free from interruptions and where conversations cannot be over heard.

b)The tapes will be transcribed by the researcher and will be coded or pseudonymised to ensure anonymity. They will be stored in a locked filing cabinet which can only be accessed by the researcher.

c)The data will be coded and analysed. Access to any computerised data will be password protected, known only to the researcher.

d)The anonymised or pseudonymised results will be used to write up the research report, for publications in relevant academic papers and presented at conferences. The findings will be used to advise systems design,

implementation, education and training policies. If you would like to be informed about the findings of the study, I would be very happy to supply you with a summary or the complete findings of the study at the end of the project.

1.7 What if I wish to withdraw?
Your participation is entirely voluntary, but I hope you will be willing to help. You can withdraw at any time you wish, without giving a reason and with no negative repercussions.

1.8 Has this study been reviewed?
The study has been reviewed by Cardiff University School of Nursing and Midwifery Studies Research Review and Ethics Screening Committee and Aneurin Bevan Health Board - Research & Development Committee.

Alternatively, if you are concerned about the study and would like to talk to someone you can write to:
Dr Ben Hannigan
Cardiff School of Nursing and Midwifery Studies
Cardiff University
Eastgate House
35-43 Newport Road
Cardiff CF24 0AB
Email: hanniganb@cf.ac.uk

Contact information
If you would like further information about the study please do not hesitate to contact me at the following:
Researcher: Pauline C T Tang
Tangpc@cf.ac.uk
Telephone number: (029) 2068 7819
Thank you for your help.

Appendix 2: Interview Schedule for Participants

Questions to ask: Can you tell me:

Q1. What is your role within this Unit?

Q2. What is your overall opinion of the use of computers in health care? Did the IHR system help or hinder the achievement of organisational goals? What are its key positive and negative aspects?

Q3. As a nurse/doctor/pharmacist.... how do you see the IHR system within the EMAU influencing
- Your role in provision of healthcare
- Your working practices on a day to day basis
- Your working style as a professional
- Your working style as part of a team

Q4. How often do you use the system? For what tasks? If do not use – why?

Q5. Who else uses the IHR system on this unit? What do they use the IHR system for?

Q6. Were there any problems encountered using the IHR system? Any critical events, risky situations?

Q7. Are there barriers that prevent the effective use of the IHR system on your unit?

Q8. Are you confident in using the system? Do you find it easy to use? What support was available to you? What education and training did you receive?

Q9. If you were asked to indicate your satisfaction with this system, how would
   you rate it on the following scale?

Very satisfied   Indifferent   Very unsatisfied

☐_____☐_____☐_____☐_____☐

Q10. What advice would you give to a department / unit that is looking to
   implement IHR systems? What sort of things should they be
   considering or doing?

Q11. According to the Government and the National Audit Office, so far the
   finances spent on electronic care records did not represent value for money.
   What are your views on this?

Appendix 3

Cardiff School of Nursing and Midwifery Studies

Consent Form   Participant Identifier Number:

Title Project: The Multi-disciplinary Team Members' Use of the Electronic
Patient Record within One Emergency Medical Assessment Unit.

Names of Researcher: Pauline Chai Tin Tang   Signature

1.   I confirm that I have read and understand the Participant Information
Sheet for the above study. I have had the opportunity to consider the
information, ask questions and have had these answered satisfactorily.

2.   I understand that my participation is voluntary and I am free to withdraw
from the study at any time, without giving any reason and without my rights
being affected.

3.   I agree to the use of audio-recording, and understand that verbatim
quotations from my interview may be used anonymously in the report produced
from this study, in papers produced for publication and for conference
presentation, but I can withdraw the use of any part of the material at any time
before the report is published.

4.   I agree to taking part in the study.

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Name of participant   Signature   Date

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Name of person taking consent   Signature   Date
Copy to: Participant, and Researcher site file.