A Strategic Roadmap for Achieving the Potential Benefits of Electronic Health Record System in the State of Kuwait

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Abstract

This research investigates the desired benefits of using an Electronic Health Record (EHR) in Kuwait Primary Health Care Centers and the perceived barriers to its successful adoption. From this, a set of key strategic capabilities are proposed, ranked for priority and urgency as a roadmap for EHR adoption in the State of Kuwait.

This thesis examines the organization of the health care system in Kuwait and important issues related to primary health care, including the implementation and current use of the EHR system at Kuwait primary health care centers. International evidence of the EHR system benefits, barriers and capabilities such as interoperability, confidentiality and security were used as the basis for user surveys. The research applied domain theory and research-based improvement strategy as a means of identifying the stakeholders and the priorities area of investigation. The research utilized a quantitative research design focusing on multiple case studies as the survey methodology.

Two case study surveys were conducted to identify the main benefits and barriers that affect the adoption of the EHR at international and national (Kuwaiti) levels. The first survey involved international and national decision makers. The second survey involved healthcare professionals working in Kuwait primary health care to assess their view regarding the features of the current system, the benefits and barriers of more complete EHRs.

The results of first and second surveys were used to develop a list of key EHR system capabilities and adoption requirements relevant to Kuwait primary care. This list was used for the design of a third survey, for senior stakeholders at the Kuwait Ministry of Health, to identify their strategic roadmap priorities.

This research, drawing on the literature of the EHR design and implementation, a study of international initiatives of the EHR adoption and outputs of three case studies, has emphasized the importance of developing a strategic roadmap for Kuwait to achieve the potential benefits of EHRs.

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Chapter One: Introduction

The need to improve the quality of health care, escalating health care costs and increasing trends of stakeholders in health care settings are forcing dramatic changes in health care delivery systems throughout the world. These factors have combined to facilitate the introduction of a new model of health care delivery; central to this new era in health care is the electronic health record (EHR) system. Electronic health records provide numerous benefits to patients, health care professionals, health care systems and governments. The use of the EHR is growing rapidly in various countries including the UK, the US and Australia. Each country has developed its own method of design, adoption and implementation; however, they face many challenges, particularly relating to interoperability, privacy and security.

This research aims to examine how an EHR system has been adopted in Kuwait in order to recommend future priorities regarding its function and infrastructure, to ensure adoption can be improved and benefit maximised. In Kuwait, the Ministry of Health decided to introduce an EHR system at a primary health care (PHC) level because PHC facilities act as 'gatekeepers' for other health care service.

This thesis is composed of eleven chapters. Chapter one presents an outline of the thesis.

Chapter two provides a general explanation of the health concept, values and goals of health and an introduction to the measurement of health care systems in general.

Chapter three describes the definition and features of primary health care including: the core values; principles; objectives and elements of a primary health care system; the primary health care team and the benefits and challenges of primary health care teams.

Chapter four focuses on the history and characteristics of the state of Kuwait including: facts; information technology; the development of Kuwait's health care delivery system and barriers to development.

Chapter five describes the EHR in terms of: e-health; the development of e-health; the motivation to adopt an EHR; the characteristics, capabilities and role of EHRs; the process of

adopting the EHR; EHR applications, standards and interoperability; national EHR initiatives; confidentiality and security issues; benefits and barriers and strategic factors.

Chapter six outlines the research methodology in terms of: research definition; research strategy; research process and implementation; reliability and validity; ethical considerations; analytical tools and limitations.

Chapter seven focuses on an analysis of the research data from an international perspective, including an analysis of the benefits and barriers to adopting an EHR.

Chapter eight examines the research data relating to Kuwait's health care professionals' perspectives on the EHR.

Chapter nine considers the findings of the research data relating to Kuwait's e-health strategic roadmap.

Chapter ten discusses: the main themes of the research literature; a summary of three case studies and their limitations; the main categories of EHR benefits and barriers; stakeholders' perceptions and the 'reality gap' of EHR adoption in Kuwait.

Chapter eleven concludes by considering future studies on the development of e-health and EHRs.

The end of the thesis includes: a list appendices; a glossary of terms and references.

Chapter Two: Health

2. Introduction

Healthcare has always been an important issue for society, both economically and culturally. It is a vital element for the welfare and wealth of the public. Effective health is not only the absence of disease, but it also encompasses a preventative role. The World Health Organisation (WHO) defines health as a state of complete physical, mental and social well-being(WHO,1946).

Healthcare is influenced by a range of factors, like new technology, advances in medicine and society's expectations. A healthcare delivery system is a way of organising health services. It is a finite resource so, as people's expectations grow, it has to be managed effectively and efficiently by governments throughout the world. Healthcare is delivered through primary care centres, which deal with patients whose healthcare can be managed outside of hospital. Secondary healthcare is managed in hospital. Tertiary care provides more sophisticated care in specialist medical centres.

Definitions of health are numerous and have changed over time. However, it is important to understand the characteristics of good health. These definitions have been discussed by practitioners and academics for centuries, in the hope of developing a global standard. More recently the WHO has played an important role in this process, with the responsibility of ensuring different nations cooperate with each other to develop affordable healthcare systems that provide speedy, safe and quality care. Good healthcare is dependent on education and research opportunities, as well as appropriately resourced treatment and service facilities.

This chapter will focus on understanding the definitions of health including: the concept of health; health determinants; genetic inheritance; physical health; social and environmental health; health behaviour and values and goals of healthcare. In addition, the indicators that measure healthcare will be discussed and related to practice around the globe.

2.1. The Health Concept

Health was once defined holistically and thought to be influenced by people's habits relating to lifestyle, exercise, the environment and food (Stanhope & Lancaster, 2000). Later, health was seen only as the freedom from disease (physical or mental) and as medical science progressed, in the 1900s, many diseases became treatable (Pender et al, 2002). The machine mode of the human body became a way of perceiving health. It meant dividing the human body into manageable parts and seeing health as the absence of disease, leading to medical specialties that focused on particular body systems. This model enabled medical research to advance in the early half of the twentieth century (Larson, 1999: p. 126); however, it is a rather narrow understanding of what comprises the health of a person or a society and makes for some limitations. Hadley (1982: p. 41) states that most scholars agree:

'Health is a multidimensional concept which encompasses not only the absence of disease and disability but also the ability to carry out normal tasks and activities and to maintain an overall sense of wellbeing.'

Various definitions of health have developed over time, and four key models are as follows:

- The medical model: distinguishing between illness, disease and a healthy body, including mental health (Wood, 1986).

- The holistic model: the whole person, including physical, mental and social health(Larson, 1999).

- The wellness model: 'better than normal' states, as well as subjective feelings of health(Larson, 1999).

- The environmental model: factors that can affect health in a multiplicity of ways (Larson, 1999).

The medical model sees disease as a condition in which the structure and/or function of the body is disturbed or deranged, and illness is an individual perception of disease. However, critics believe that health must be seen as relative and not absolute – recognising that health can also be influenced by other factors, e.g. economic, environmental, social, etc. (Wood, 1986). The

medical model overlooks preventive medicine and ignores the social customs of defining disease (Culyer, 1983). It is possible to be ill or to perceive symptoms without having a diagnosis, or one may have a disease without an illness: a disease in a presymptomatic stage (Williams, 1993).

In 1947, The World Health Organisation's constitution stated that the highest quality of care was a human right, and defined health as 'a state of complete physical, mental, and social wellbeing and not merely absence of disease or infirmity' (United Nations, 1984). Although this holistic model seemed idealistic at the time, it is now the norm (Greenfield & Nelson, 1992). Many critics suggest that this definition is too broad and abstract, and does not respond to the characteristics of different cultures. Some have said that it does not incorporate social well-being on a personal or social level (Barenthin, 1975; Pannenborg, 1979; Patrick & Erickson, 1993), however the WHO definition continues to be the mainstream global definition for health.

Although it has its limitations, the wellness model of health can influence research and development in health promotion, education, diet, exercise, stress and lifestyle. It defines health as an individual's perception of how well they feel and whether there is 'optimal personal fitness for full, fruitful creative living' (Goldsmith, 1972: p.213). Critics suggest that this definition is too subjective to be measured properly, and incorporates too broad of a spectrum of factors, like 'happiness, quality of life and other global matters' (Larson, 1999).

The environmental model of health focuses on the physical environment that influences people's lifestyles. Critics suggest that it ignores the individual and concentrates too much on the need to adapt the environment. Romano's environmental definition of health states that it is 'the capacity of the organism to maintain a balance in which it may be reasonably free from undue pain, discomfort, disability or limitation of action including social capacity' (Goldsmith, 1972: p.13).

The environmental model influences research on certain diseases, such as asthma and allergies, as well as on the physical environments that can contribute to these diseases.

2.2. Determinants of Health

Genetic inheritance and the physical, natural and social environment affect health, as well as the way healthcare is developed and provided; they are often discussed in terms of how they relate to poor health. The impact of these factors on health is affected by an individual's response to them, both behavioural and biological (Evans & Stoddart, 1994).

2.2.1. Genetic Inheritance

Individuals with a particular set of genes may be more or less at risk of developing a particular disease. These impacts are measured by showing an individual's relative risk of exposure to an environmental factor (Pencheon et al, 2001).

2.2.2. Physical Environment

People's work and home settings expose them to various unsafe conditions. For example, the greatest health threats to farm workers in the United States (US) are injuries from farm machinery (Myers, 2001). Office workers are exposed to passive smoking, nitrogen dioxide from gas-fuelled cooking stoves, formaldehyde exposure, 'radon daughter' exposure and other health problems found in sealed office buildings (Samet et al, 1987; US Environmental Protection Agency, 2006). Clearly, there are many hazards in the home, from internal and external sources, such as road accidents and industrial pollution. In the US, these threats are known to have a disproportionately heavy impact on low income and minority communities (Institute of Medicine, 1999; Centers for Disease Control and Prevention (CDC), 2003).

2.2.3. Social Environment

This is a complex issue and new research is regularly undertaken. Job loss and threats of unemployment have a negative impact on health (Kasl & Jones, 2000), showing that non-physical occupational factors can also affect health. The demand control model suggests that employees with high psychological demands and modest decisions-making roles are at the highest risk in relation to poor health outcomes (Theorell, 2000).

Some studies have also found that individuals who are isolated or disengaged from other people have a higher risk of premature death. It has also been suggested that whether a person is involved in social relationships or not can predict whether they will comply with medical services or can adapt to extreme life events such as: natural disasters; caring for a dependent parent or the death of a loved one. This shows that social integration, social networks and social support influence health (Berkman & Glass, 2000).

Socio-demographic characteristics of health are important issues when discussing the concept of health, e.g., race, ethnicity and socioeconomic status. In particular, poor health is often linked to low socioeconomic status (Williams, 1993; Lynch & Kaplan, 2000), and some examples of associated diseases include: cardiovascular disease; diabetes; asthma; cancer and HIV/AIDS (Department of Health and Human Services, 1998). Research is currently focused on discrimination as a reason for health disparities within racial and ethnic groups (Krieger, 2000; Mays, 2007).

2.2.4. Health Behaviour

Styles of health behaviour are important determinants of health and are often the focus of health promotion strategies; such behaviour can include smoking, abusing drugs, not using seat belts, making unhealthy food choices or not engaging in adequate exercise. It is clear that an individual's personal behaviour has an impact on most of the diseases and conditions that cause death. McGinnis and Foege (1993) showed that in 1990 the leading factors that caused death in developing countries were smoking, diet, a sedentary lifestyle, alcohol consumption, microbial agents, toxic agents, firearms, sexual behaviour, motor vehicles and use of illicit drugs. In 2002, the situation remained the same (McGinnis et al, 2002).

Many health promotion strategies, like the 2010 'Healthy People' agenda (US Department of Health and Human Services, 2000), targeted the types of lifestyle behaviours mentioned above, although there was still widespread agreement that health is influenced by the individual's genetic inheritance and is a response to the physical and social environment. Some of the health indicators that depend on lifestyle (as opposed to non-lifestyle factors, i.e. environmental quality indicators) include: levels of physical activity; obesity; tobacco use; substance abuse; sexual behaviour and immunisation status (US Department of Health and Human Services, 2000).

2.2.5. Healthcare as a Determinant of Health

The need to provide healthcare could be seen as an inability to previously identify the negative factors that influence a person's health. Whatever the reasons, healthcare will always be necessary and clearly affects a person's health status.

Healthcare can be explained in terms of primary, secondary and tertiary prevention. Fos and Fine (2000: pp. 108–109) define these terms as follows:

'Primary prevention is concerned with eliminating risk factors for a disease. Secondary prevention focuses on early detection and treatment of disease (sub-clinical and clinical). Tertiary prevention attempts to eliminate or moderate disability associated with advanced disease.'

Primary care aims to reduce the incidence of disease in the population and prevents the development of disease or injury before it occurs in individuals. Secondary prevention is the early detection of an existing disease after it has developed. Tertiary prevention focuses on the best treatment of a disease in order to reduce the incidence of complications, e.g., rehabilitation and limiting the impact of disability.

Healthcare systems have their least impact on primary prevention and seem to focus mostly on secondary and tertiary prevention. Evans and Stoddart (1994: p.43) argue that, other than for immunisation, the major focus of healthcare prevention activities is on the behavioural determinants of health rather than physical and social environments. They state:

'The focus on individual risk factors and specific diseases has tended to lead not away from but back to the healthcare system itself… The 'product line' of the healthcare system is … extended to deal with a more broadly defined set of "diseases": unhealthy behaviours.'

Healthcare systems are thus affected by an array of determinants including: genetic weaknesses to certain diseases and treatments; environmental factors; lifestyle and behaviour; service provision and medical regimes; social circumstances and ethnicity. The health of individuals can also be affected by powerful organisations such as care service commissioners and providers, as well as governmental and private policy makers.

2.2.6. Summary

The health of an individual and a population as a whole is integral to the success of a society. The prevention of ill health is fundamental to a healthy society. Healthcare is influenced by a range of factors like new technology, advances in medicine and society's expectations. Definitions of health are numerous and have changed over time, developing into four different models of health. Determinants of health include genetic inheritance and the physical, natural and social environment – sometimes their effects are underestimated.

Good healthcare is dependent on education and research opportunities, as well as properly resourced treatments and services. Healthcare is delivered through primary care centres, hospitals (secondary healthcare) and specialist medical centres (tertiary care). The style in which these healthcare services are provided can also affect a person's health.

2.3. Values and Goals of Healthcare

'The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.'

(WHO Constitution,1946:p.1)

This statement demonstrates that health is seen as a value. Liss (2003) suggests that health values are based on three ethical principles: human dignity (a universal human quality); need and solidarity (those in greatest need) and cost-efficiency (measuring cost and effect in terms of health and quality of life).

The Goals of Medicine: Setting New Priorities (Hastings Center Report, 1996 cited in Kipnis, 2000) sets out the principle that healthcare does have ultimate goals:

a) the prevention of disease and injury and promotion and maintenance of health (where health is understood in terms of functional ability);

b) the relief of pain and suffering caused by illness;

c) the care and cure of those with an illness, and the care of those who cannot be cured and

d) the avoidance of premature death and the pursuit of a peaceful death.

It was proposed that these goals should help develop ways to measure effectiveness of healthcare, to decide on policies and to set priorities ensuring resources can deliver services.

2.4. Healthcare Systems

2.4.1. Healthcare Systems Defined

There are many definitions of what comprises a healthcare system. It is often described by its function, structure, activities or characteristics. However, these definitions do not help with an understanding of why these categories are meaningful. Mills and Ranson (2005) perceived a health system as the interplay between four key functions and their respective 'stakeholders': regulation; government and population/patients; financing, those responsible for collecting funds; resource allocation, those responsible for spending funds and service provision, the service providers.

Frenk (1994) examined the relationships within a healthcare system, including relationships between healthcare providers, the population, the state or government, the resource providers, and other sectors that provide health services. Shakarishvili et al. (2010: p.6) perceived a health system as 'a set of relationships where the structural components (means) and their interactions are associated and connected to the goals the system desires to achieve (ends)'. Each set of relationships had a point which controlled how goals were achieved: finance; macro-organisation; payment; regulation and education/persuasion. This framework has been used as the basis for the World Bank Institute's 'Flagship Programme on Health Sector Reform and Sustainable Financing' (World Bank, 2007); now renamed Health System Strengthening.

The World Bank Strategy for Health, Nutrition and Population (World Bank, 2007) also defined health systems as functions. These included health service inputs (managing resources), service provision, health financing and stewardship (overseeing and monitoring). In addition, the WHO published the framework document *Primary Healthcare – Now More than Ever* (2008), which looked at four policy issues: (i) health inequalities; (ii) people-centred services; (iii) integrating health into public policies and (iv) inclusive leadership regarding monitoring and overseeing health services.

Everybody's Business: Strengthening Health Systems to Improve Health Outcomes (WHO, 2007) stated that a health system includes any group or individual aiming to improve the health of the whole population. It proposed practical ways to organise health systems: service delivery; health workforce; information; medical products and technologies; financing; leadership and governance. This helps to identify if there are any constraints, where and why investments are needed, the outcomes and monitoring requirements.

2.4.2. Goals of Healthcare Systems

From the literature, the goals of a healthcare system can be summarised as aiming to provide healthcare effectively in order to improve the health of the population and protect them from disease, in a financially and racially fair manner, therefore responding to the expectations of the population. A healthcare system is a means by which societies can provide support for citizens to maintain good health (Howard & Bolnick, 2002).

Different cultures have different goals. For example, US healthcare systems aim to ensure universal access to high-quality, comprehensive, cost-effective healthcare. The UK tries to provide comprehensive, high-quality medical care for all citizens on a basis of meeting professionally-judged medical needs and without financial barriers to access. The WHO's 'New Universalism' states healthcare systems should deliver high-quality essential care to all, defined by criteria of cost-effectiveness and social acceptability (Howard & Bolnick, 2002).

2.4.3. Goals of Health System Building Blocks

Figure 1: illustrates the functions and objectives of a health system.
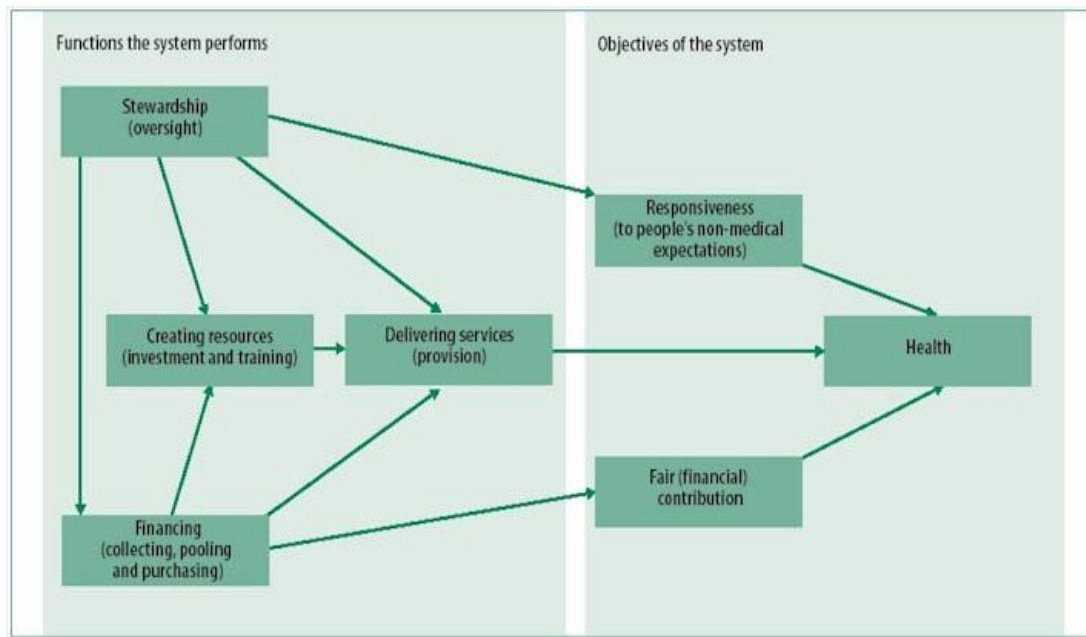
Figure 1: Functions and objectives of health systems

The WHO published a framework to help support the development of health systems called *Everybody's Business: Strengthening Health Systems to Improve Health Outcomes* (WHO 2007). This framework highlights the WHO's health priorities and provides a method to identify any gaps in the agenda. The framework highlighted six 'building blocks' for an effective and efficient health system: service delivery; health workforce; information; medical products, vaccines and technologies; financing; leadership and governance.

The above document also suggests that quality, person-centred services must be delivered in a timely manner and effectively, efficiently and safely to those who need them. Effective service provision (including staffing) must be responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances. Health information systems should provide and disseminate reliable information in a timely manner on health determinants,

health system performance and health status. Essential medical products, vaccines and technologies should be accessed equally by everyone (despite ability to pay) and should be of a high quality, safe, effective and efficient. Health service users should be supported to provide leadership and governance (overseeing/monitoring) of strategic policy frameworks and service provision.

These building blocks were discussed by Hunt & Bachman (2008). Their comments focused specifically on a person's *right* to access the highest standard of health. They felt that the WHO's building blocks did not respond comprehensively to the rights of an individual to achieve good health through health services, health workers, health information, medical products, financing and stewardship. For example, a country might have a health information system, but it might not include appropriately disaggregated data, which is one of the requirements of the right to health.

2.4.4. Healthcare Services

2.4.4.1. Characteristics of a Healthcare Delivery System

A healthcare delivery system includes two elements: organisation and resources. Aday and Andersen (1974) suggest that organisation looks at what a system does with its resources, including how/when people access the system and what happens to them during and after they leave the system. Resources (including capital) include the volume of labour/staffing, buildings, equipment/materials and training and education located in specific localities. This perspective on a health delivery system (along with other examples in the literature) places the organisation and delivery of services at the centre of a healthcare system rather than the individual.

2.4.4.2. Utilisation of Healthcare Services

It is important to understand comprehensively how people use services in order to assess why people seek them. How services are used can be described in terms of the following factors: type (e.g. hospital, dentist etc.); site (location of the service); purpose (e.g. emergency, check-ups, palliative) and timing (e.g. number of contacts, coordination of different services, who/when/how people access a service). These factors can vary and can affect the way people access care (Aday & Andersen, 1974).

2.4.4.3. Types of Healthcare Services

There are a number of elements that make up a healthcare system, which work together to produce health services for individuals (personal health services) and population groups (community health services). They are categorised as primary, secondary and tertiary (Jonas et al, 2007).

Monitoring healthcare is also an important issue in service delivery, achieved by measuring qualitative and quantitative standards. Qualitative standards of health services include: issues relating to organisation of service delivery (staffing/resources etc.); promoting a healthy lifestyle; providing services to all ages and to people with disabilities; fertility; mental health; preventing communicable diseases; chronic diseases; psychophysical rehabilitation and early diagnosis of malignant diseases. Quantitative healthcare services include: improving life-expectancy; decreasing maternal and infant mortality rates; decreasing general and specific morbidity and trauma rates and reducing work absenteeism due to illness or injuries (United Nations Mission in Kosovo (UNMIK), 2004).

2.4.4.3.1. Primary Healthcare

Primary care is the care that most people need most of the time for the majority of their health and illnesses. The primary healthcare system is the first contact between the individual/community and the healthcare system. Primary healthcare includes: health promotion; nutrition; lifestyle behaviour; prenatal care immunisations etc. Primary care can also address the treatment and prevention of major causes of acute and chronic disease in less industrialised countries (Jonas et al, 2007).

2.4.4.3.2. Secondary and Tertiary Healthcare

In general, healthcare services: promote health; prevent diseases and injuries; treat, diagnose and rehabilitate citizens and provide medicine and medical equipment; medical transport; gynaecological-obstetric services; special human production/sterilisation procedures and medical research (UNMIK, 2004).

Secondary care includes a complex array of services that are provided in community hospitals and general practitioner offices. They are accessed after an assessment by a primary care practitioner. Secondary services include routine diagnoses, treatments and procedures in fields such as radiology, cardiology and ophthalmology (Jonas et al, 2007).

Tertiary care includes specialised diagnostic therapeutic and rehabilitative services. It requires staff and equipment 'that transcend the capabilities of the average community hospital' (Rogatz, 1970: p.47). This kind of care is provided by organisations that provide complex services such as organ transplants, open heart surgery, chemotherapy or complications in relation to premature babies.

2.4.5. Health Systems Challenges

It is important to understand how particular health systems evolve and to appreciate the consequences of economic, social and political factors (WHO, 2000). Low-income countries have different challenges in comparison with wealthier nations; however, many policy issues are shared across the globe. Some examples include avian or human pandemic influenza, social security reform, the challenges of an ageing population and the need for continuous care for chronic illness. Most governments, along with *Crossing the Quality Chasm* (Institute of Medicine (IOM), 2001), argue that conventional methods to improve services, like working harder or increasing resources, will not be enough. They suggest that systems will need to change and focus on incorporating evidence-based care that improves the effectiveness of services. Action will be needed to use information technology to make clinical information accessible to patients and service providers. In addition, staff will need to develop and refine their skills through training programmes, as well as working with different organisations to

create a 'seamless service' for patients. In fact, a continuous monitoring programme will need to be developed to ensure the patient is at the centre of healthcare service development and that service commissioners and providers are accountable.

The WHO (2000) identified a number of challenges for the world's health systems, which illustrate the points above; a few examples are listed below.

- Each year 100 million people are impoverished as a result of health spending.

- Globally, health is a US $3.5 trillion industry.

- Large health inequalities persist: even within rich countries, e.g. USA and Australia, life-expectancy still varies across the population by over 20 years.

- An extreme shortage of health workers exist in 57 countries; 36 are in Africa.

- Private providers are used by poor as well as rich people, e.g., in Bangladesh, around three-quarters of health service contacts are with non-public providers.

- In 2000, less than 1% of medical publications focused on health services' and systems' research.

2.4.6. Summary

Healthcare systems have been defined in various different ways; one perspective is to recognise four key functions and their differing relationships, i.e. characteristics, functional components, structural components and activities. The WHO (2007) report proposes that all actors, institutions and resources that aim to improve the health of a population make up the healthcare system. It also defined six health system building blocks that are essential to an effective system: service delivery; health workforce; information; medical products, vaccines and technologies; financing and leadership and governance.

According to Aday and Anderson (1974), a healthcare system comprises resources, organisations and a range of services working together to provide healthcare to individuals and the wider population. All countries now face a host of challenges and opportunities, which before had been characteristic of either poorer or wealthier nations, including issues like social security reform, ageing populations and influenza pandemics. These realities mean governments have to develop more efficient ways of working, and focus on the needs of patients, their own accountability and on measuring the effectiveness of their healthcare services.

2.5. Measurement of Healthcare Systems

2.5.1. Health Indicators

Health indicators are collections of data that help professionals' plan and manage healthcare services effectively. Such data can provide information about one individual or a general population-wide issue. Data can also be used to analyse information over time, for example, if a new service starts, data can be gleaned to interpret how it has been used, to develop and assess quality standards, outputs and outcomes. The WHO (2004) has defined a health indicator as 'a variable with characteristics of quality, quantity and time used to measure, directly or indirectly changes in a situation and to appreciate the progress made in addressing it'.

The United Nations Development Report (2000) states that indicators can help develop monitoring information to inform policy reform, identify health-related rights, identify prevention policies, help create consensus around difficult resource allocation decisions and highlight unseen or ignored issues.

The Epidemiological Bulletin of the Pan American Health Organization (PAHO, 2001), suggests that indicators should measure what they are intended to measure, provide reliable measurements, be specific, be measurable, be relevant to policy issues and be cost-effective. The PAHO also suggests that data should be easy to use, be interpreted by all stakeholders and that data should not be contradictory or missing.

Some academics have defined a health indicator as:

'A construct of public health surveillance that defines a measure of health (i.e. the occurrence of disease or other health-related event) or a factor associated with health (i.e. health status or other risk factors) among a specified population.'

(Lengerich, 1999, as cited in Pan American Health Organization, 2001: p.1)

The International Organization for Standardization (IOS, 2001) developed a framework to help understand the role of health indicators. It suggested that there are different dimensions within which the health of the population and the performance of a healthcare system are set; these should be broad enough to assess differing healthcare systems and incorporate all factors relating to regional and national health outcomes and system performance.

Other authors have looked at the subject and developed frameworks to assist in the development of a clearer understanding of the role of health indicators. Campbell et al (2003) suggested that health indicators should be set within three different areas: activity (frequency); performance (resource use) and quality (of care).

In 2001, a number of countries reviewed the National Health Performance Committee's report to the Australian health ministers and agreed that the health indicators framework should comprise three tires: health status, determinants of health and health system performance.

2.5.2. Health Status Framework

The behaviour of individuals and many community and social factors affect the health status of a population. To identify a baseline health status, other data need to be evaluated, e.g., mortality rates, life expectancy, wellbeing. If there are any changes in health status, they can then be evaluated against desired outcomes and in relation to interventions or other factors. A framework to enable this process to occur is required and includes four dimensions: life expectancy and wellbeing; health conditions; human function and death.

- *Life expectancy and wellbeing:* measures the physical, mental and social wellbeing of individuals. To evaluate whether people are living fruitful lives without disability/disease, indicators incorporate disability-adjusted life expectancy (DALE), disability-adjusted life years (DALY) and self-assessed health.

- *Health conditions:* assess the prevalence of disease, injury or other health-related states. They evaluate trends in the health of a population and can begin to assess the effectiveness of health policies; an effective policy should reduce the incidence of conditions, such as, diabetes, cancer, mental health; asthma and death due to drug use.

- *Human function:* comprises information relating to disability. Some potential indicators could include: years lived with disability (YLD); impairment ratings and levels of independence/dependence.

- *Deaths:* includes mortality rates in relation to age and/or condition. This type of information can provide information on the causes leading to premature death and identify groups at risk. Interventions could include lowering the perinatal and infant mortality rates or years of life lost (YLL).

2.5.3. Determinants of Health Framework

This framework looks at how a population's health status and inequalities are influenced by community-based factors not traditionally related to health, e.g. education, housing. They also encompass socioeconomic aspects, the environment, genetic susceptibility to disease and health-related behaviour.

- *Community capacity:* includes factors like literacy, housing, community support services, transport, community safety, social support and local health services. Ways to measure such factors are currently under scrutiny and will likely include local health services, trust in health professionals, understanding healthcare information and community support services.

- *Socioeconomic factors:* include education, employment and income. Generally, population groups with lower socioeconomic status have poorer health than those with higher socioeconomic status and understanding; these factors can inform policy development.

- *Environmental factors*: such as air, water, food and soil quality and access to clean water and fresh fruit and vegetables influence health directly. There are many measures to monitor environmental factors including air quality, levels of pollution, dust and pollen counts, food quality etc.

- *Person-related factors:* include age, genetic traits and biomedical characteristics; they are not influenced by individual behaviour or by the environment, e.g. Down's syndrome, muscular dystrophy, cystic fibrosis, congenital anomalies of the heart.

- *Health behaviour:* associated with poor diet, insufficient physical activity, excessive alcohol consumption and smoking can cause ill health and put people at risk of contracting cancer, diabetes, heart disease or stroke.

2.5.4. Health System Performance Framework

The performance of healthcare systems must be monitored to ensure outcomes for patients that are of a high quality and are what people want and need. In order to improve quality, the performance of processes and structures are evaluated at an organisational or micro level. At a strategic or macro level, the focus is usually on measuring outcomes to ensure accountability and to support policy development (MacKinnon & McCaffrey, 2004).

Assessment tools need to be developed to evaluate the quality of clinical activities, governance, patient outcomes and management processes (Joint Commission on Accreditation of Healthcare Organizations (JCAHO), 1992). There are two ways to evaluate healthcare; performance indicators and performance measures. A performance indicator can measure a specific processes, structure or outcome within a healthcare system (Angaran, 1993). Performance measures assess the quality, effectiveness and efficiency of existing services, highlighting possible problems and evaluating the impact of new strategies or services.

There are two types of performance measures:

(1) sentinel-event performance measures, which measure a serious event and require an in-depth review each time the event occurs (i.e. percentage of medication errors per prescriptions completed in a hospital) (JCAHO, 1992);

(2) rate-based performance measures, which measure an event against which a certain proportion of the events are expected to occur, even with quality care (i.e. percentage of late prescription refills for a given medication).

The National Health Performance Committee's report (2001) agreed that the new health indicators framework should require that healthcare services are effective, appropriate, efficient, responsive, accessible, safe, continuous, capable and sustainable. Some explanations follow:

- *Effective* is when a care intervention or action achieves a desired result in an appropriate timeframe, e.g., if immunisation reduces the prevalence of a disease in the community. One performance indicator for *effectiveness* could be measuring the prevalence of breast screening against the detection of small-sized cancers.

- *Appropriate* care relates to a patient's personal needs, their wishes and prognosis, e.g. if they have an allergy or choose aggressive treatment rather than palliative care. *Appropriate* care should be based on clinical evidence or practice; there could be a range of treatments that would be *effective* for an individual, but one may be more *appropriate* than others.

- *Efficient* systems achieve desired results with the most cost-effective use of resources. Usually, *efficiency* is measured by comparing inputs with outputs.

  o *Technical efficiency* is the degree to which the cheapest set of inputs produces a particular service, e.g., merging a number of individual doctors' practices into one central place can improve efficiency.

  o *Allocative efficiency* obtains maximum benefit (or outcomes) from available resources; an efficient system provides improved outcomes for the same or for less cost.

- *Capability* is an individual's or service's capacity to provide a service or intervention, based on skills and knowledge. This measure focuses on the standards of training/education of healthcare workers and involves academic institutions, medical colleges and registration boards. Performance measures can include the proportion of doctors who have completed a particular training course.

2.5.5. Summary

Health indicators are data used to assess the health status of an individual, a group or the population. They can be used to assess information over time like service providers' management processes and service quality, as well as outputs and outcomes for patients. Health indicators are an important tool to ensure people have the right to access healthcare.

The National Health Performance Committee (2001) suggested that measurements should be seen in the context of three tiers: health status, determinants of health and health system performance. Health behaviour can cause poor health and there are relationships between socioeconomic factors and the health status of a population. Generally, population groups with a lower socioeconomic status have poorer health than those with a higher socioeconomic status

Performance is measured on micro (organisational – structure and processes) and macro (policy-making – outcomes and accountability) levels. Healthcare services should be effective, appropriate, efficient, responsive, accessible, safe, continuous, capable and sustainable. Appropriate care or treatment should be based on established and accepted standards, such as evidence-based clinical guidelines.

Chapter Three: Primary Health Care

3. Introduction

In 1920, Lord Dawson was asked to write a report on the future of England's health services (Dawson, 1920). At the time, he was the Chairman of the Consultative Council of Medical and Allied Services and wanted to introduce the concept of a health system that could be accessed by the whole population. Within the report, the idea of preventative primary medical care delivered by general practitioners (GPs) was born. Although the report was shelved by the Government soon after publication, it is has since influenced the development of health services worldwide.

These influences were initially seen in the USSR's integrated health system, which used the health centre as a method of delivering health care. In the current health care system in the UK, we can see Dawson's model influencing community-based health care, whereby groups of doctors, nurses and health visitors (and increasingly social workers and other professions) work under the title of 'primary care'(Horder, 1986). More recently however, this practice has gathered political momentum, with global support from governments and non-governmental organisations (NGOs) (Gish, 1979).

A number of major studies have been undertaken over the years examining the status of health care across the world. In May 1975, *Alternative Approaches to Meeting Basic Health Needs in Developing Countries* (Djukanovic & Mach, 1975) was published by WHO and UNICEF (United Nations Children's Fund). This report criticised some of the existing patterns of health care that were not meeting the basic health needs of the majority of people; it called for major changes in the way health services were delivered, asking for them to be made accessible and responsive to the values, culture, and norms within differing societies.

'In many countries less than 15 per cent of the rural population and other unprivileged groups have access to health services…the strategy adopted…by many developing countries has been modelled on that of the industrialised countries, but as a strategy it has been a failure…. In sum…the conventional health services, organized along Western or other centralized lines, are unlikely to expand to meet the basic health needs of all the people…. Clearly the time has come to take a fresh look at the world's priority health problems and at alternative approaches to their solution.' (Djukanovic & Mach, 1975: p.7).

The study examined a range of different health delivery systems from countries with different values, cultures, and politics. It suggested that if health services were part of health programmes that were provided by appropriately trained health workers, who were known and chosen by the local community, rather than bureaucrats 'parachuted' into the community (Djukanovic & Mach, 1975: p.104), then services would more effectively and efficiently respond to local needs.

Community participation in decision-making thus became an important element to developing quality health services. Benyoussef and Christian (1977) developed the idea that a health system should be based around the population it serves enabling tight resources to be spent wisely. Based on case studies, Newall (1975) suggested there were five positive features that supported a community-organised primary health care system:

'It laid down the priorities; it organized community action for problems that could not be resolved by individuals (e.g., water supply or basic sanitation); it "controlled" the primary health care services by selection, appointing, or "legitimizing" the primary health worker; it assisted in financing services; and it linked health actions with wider community goals.'

(Newell, 1975: p.193)

Two years earlier, in 1973, the World Health Organisation (WHO) had looked at evidence from a worldwide study of health that it had commissioned and concluded that the health systems in numerous countries (especially in developing countries) were not responding to the changing needs of their populations – both in terms of quality and quantity. It argued that health conditions were worsening rather than improving, particularly as a result of the lack of integration and understanding between different related sectors, such as voluntary and social organisations, education, housing etc. (at that time, community involvement was not highlighted) (Klecxkowski, 1980).

Klecxkowski (1980) noted that there was a lack of equity in the distribution of health resources, which meant there was limited or no access to health services for a large proportion of the world's population. Other reasons for the decline in health were suggested, including the use of technology that focused on curing illness and disease rather than prevention and rehabilitation, not taking into account the characteristics of differing societies. Governments' lack of appreciation of their populations' cultural characteristics, economic status, and value systems highlighted issues of social injustice, especially in rural and urban slums, which is what made the aim of developing effective primary health care such a priority. After 1975, a number of national, regional and international meetings were held throughout the world by WHO and UNICEF (Bennett, 1979), which became the starting point for an initiative named 'Health For All by the Year 2000' (HFA/2000). In 1977, the World Health Assembly (WHA 30, 43) resolved that:

'The main social target for governments and WHO in the coming decades should be the attainment by all the citizens of the world by the year 2000 of a level of health which will permit them to lead a socially and economically productive life.'

(WHO, 1979: p.7)

As a consequence, what has been described as the largest and most important international meeting relating solely to health (Bennett, 1979; Golladay, 1980), took place in 1978, called the Alma-Ata Conference. A wide range of governmental agencies and NGOs attended, from 134 member states, including delegates from WHO and UNICEF. Objectives included: to promote and define the principles of primary care; identify best practice; evaluate current health systems; identify the role of all agencies' technological capabilities in primary care development and identify recommendations (WHO/UNICEF, 1978: p.11).

Immediately after the conference, the participating governments set out an article with 22 recommendations (WHO/UNICEF, 1978), which confirmed health as a basic human right, a governmental duty, and a global social goal. A new approach to health and health care (especially primary care) was demanded to ensure equity, highlighting the need to improve strategic service planning and delivery with particular emphasis on involving citizens – both individually and collectively.

3.1. Definitions and Features of Primary Health Care

3.1.1. Definitions

Primary health care (PHC) is a complex concept and, over the years, has been discussed and examined with its definition refined as scholars and practitioners learned from practice. One standard definition from Jonas (1973: p.177) states:

'Primary care is medical attention to the great majority of ills. It should be provided continuously over a significant period of time by the same appropriately trained individual (or team) who is sympathetic, understanding, knowledgeable and equipped, who is as capable of keeping people well as he is returning them to health when they fall ill.'

Later, after consideration of an array of different meanings of 'primary care' (Ruby, 1977), a definition was developed by the Institute of Medicine:

'Primary care is the provision of integrated accessible health care services by clinicians who are accountable for addressing a large majority of personal health needs, developing a sustained partnership with patients, and practicing in the context of family and community.'

 (Eisenberg, 1997: p.615)

The Declaration of Alma-Ata (WHO, 1978), which was also ratified by the World Health Assembly, suggests governments should be responsible for the health of their populations, enabling them to lead productive lives, both socially and economically (WHO, 1978: p.1). Specifically, PHC was seen as a practical way of achieving this goal by providing every individual with health services that were grounded in effective social, scientific, and technological foundations, and were efficient and facilitated the involvement of citizens in their planning and development; thus, PHC was defined as:

 'the first level of contact of individuals the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process.'

(WHO /UNICEF, 1978: p.3)

3.2. Context

3.2.1. Socioeconomic Development

It has been suggested that the PHC approach not only ensures service provision, but it is also a catalyst for health conditions to be improved. It is seen to be linked intricately to socioeconomic development; it is suggested therefore, that planning and implementation must be integrated with such initiatives, for example: nutrition, protecting the environment; alleviating poverty; increasing production, increasing employment, and ensuring an equal distribution of wealth (WHO/UNICEF, 1978).

This link between health and the hope of economic development encouraged the World Bank to support the PHC approach and even saw it lending money to health projects in Third World countries (MacPherson, 1982). Bennett (1979: p.505) argues that:

'…primary health care has been firmly established as the avenue which most developing countries will explore in the next twenty years, in order to improve the quality of life and health of every individual in every community.'

The principles of PHC were reported in a document produced by the World Health Assembly (WHO, 2004). They included the need for PHC to: reflect local economic, sociocultural, and political conditions; assess and address the main health problems; utilise a participative community development approach; priorities and ensure access for those in greatest need; and utilise and train local health workers in addition to traditional practitioners to ensure an integrated response to community needs.

It was clear that PHC had to be delivered differently, depending on a country's political, sociocultural, and economic circumstances and depending on locally-assessed need. Models of PHC were seen to provide an appropriate balance of services that ranged from promoting good health, to curing illness, to providing rehabilitative care. Delivery would be based on integrated working and partnerships between professionals, organisations, government agencies, and individuals. There would need to be effective ways to ensure everyone – even the most vulnerable and those in greatest need – could access services. In particular, the PHC team was recognised as a key feature in the provision of successful primary care; thus appropriate training was seen as a high priority.

3.2.2. Strategic Approach

There was recognition that a strategic approach to planning services was needed in order to deliver PHC. It was noted that:

'Primary health care is not merely health service improvement. It is understanding and improving the range of social, political, and economic factors which ultimately influence the improvement of health status.'

(Rifkin & Walt, 1986: p.561)

This also meant that community participation was vital. There are many different levels of community involvement, ranging from direct involvement in individuals' care to involvement in the strategic planning and design of services. This issue will be discussed in more detail below.

3.2.3. Political Climate

The Socialist Experience: There have been a number of academics who have studied PHC delivery in different countries, particularly in the context of a country's political system; in fact, some argue that the health system only reflects the politics of the country. Sidel and Sidel (1977) argued that the PHC approach was possible only in societies where a political (and value) shift had taken place to encourage the redistribution of power and wealth from the rich to the poor. The former socialist countries provided free public health services via health centres (as the first stage of contact), then free secondary and tertiary services. As their ideology suggests, the USSR provided a health system that was socialised, centralised, and professionalised (Sidel & Sidel, 1977; Morley, 1983).

The Capitalist Experience: In the capitalist countries, such as the US, PHC was characterised by the private sector 'free market' economy, apart from Sweden (to some extent: Klein, 1989) and the UK's National Health Service (NHS), which is 'socialised' and looks after the whole population.

The Chinese Experience: Rifkin (1981) argued that although most of the ideas of the Alma-Ata declaration on PHC were based on the Chinese health care experience, the model had often been misinterpreted, and China's lessons concerning the need to have political will and the need for community participation had not been understood. Community participation is often seen as a way of accessing resources to fund PHC, however in China, it enables the population to appreciate, accept, and act on government policy relating to production and social activities. Rifkin (1981) suggested that political will is not purely about a government providing resources. In fact, it relates to a cultural shift whereby the overall goals of a nation are bound together in a strategy of total development. She argued that health care systems are a model to bring about social change, 'Health improvement… [is] a result of a strategy of total development not as a result of change in the health services alone' (Rifkin, 1981: p.5).

3.3. Features

To help us understand how PHC works, it is useful to appreciate its main elements, as set out below.

Availability: In theory, PHC provides curative, preventive, promotive, and rehabilitative health services. However, many developing countries provide only curative services (Sebai, 1988), yet ironically, the majority of Third World health problems would be resolved through prevention activities.

Accessibility: Physical access to health facilities will always be a problem for service providers; public transport is therefore vital. Other issues of accessibility include language, culture, and disability.

Acceptability: This relates to religion, culture, social norms and values. One example of unacceptable practice is where male doctors work in maternity and family planning clinics when it is forbidden for religious and cultural reasons (Benyoussef & Christian, 1977; Gallagher &

Searle, 1985; Stephen, 1991). Substandard buildings are also inappropriate for health facilities, as are practitioners who do not speak the local language and have inadequate awareness and understanding of a community's culture (Sebai, 1983; Banoub, 1984; Stephen, 1991).

Continuity: A PHC system is the first contact for many patients; they value the trust and relationships developed with health workers, who are in continuous contact with their patients (Newell, 1975; Stephen, 1991).

Appropriateness: Staff need to be trained to deal with different needs and to ensure resources are not wasted, for example, in many developing countries, the nurse's role is underutilised and is seen simply as the practitioner who takes patients' temperature and blood pressure.

Referral: The PHC team must deal with the majority of health care needs, but it must also refer on a certain number (80%; Sebai, 1988) to secondary and tertiary care.

Priorities: It is important to prioritise those in greatest need, as resources are limited. For example, health needs due to deprivation and poverty in cities should be prioritised as well as the health needs of the rural poor (Tabibzadeh et al, 1989).

Primary care services are unique in some aspects when compared to the specialist services provided in secondary and tertiary care. Primary health care can be accessed by any individual who wishes to contact the system. It is only when a patient is referred to secondary or tertiary services that those in greatest need are prioritised, and specialists become responsible for assessment and referral. The PHC staff must be aware of the medical records for any individual that exist within the whole health system. In some respects, diagnosis within primary care is more susceptible to errors because there is a greater likelihood of overlooking a disease when it exists and there may be a delay in making diagnoses of less common diseases. Primary care is more often subject to errors of omission, whereas specialty care tends to experience errors of commission (Starfield, 1998).

3.4. Functions

PHC is difficult to understand because of the variations of political, economic, social, cultural, and ideological characteristics among countries; this makes the policies, strategies, and action plans of PHC programmes different in every country. For this reason, commentators began to describe PHC in terms of its functions. Vuori (1985) suggested four ways to understand primary care:

1. as a set of activities;

2. as a level of care;

3. as a strategy for organising health care;

4. as a philosophy that infuses health care.

Donaldson et al (1996) noted that the Institute of Medicine (1978) described PHC as the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community.

To ensure clarity, the report explained further the terms used, including:

- Integrated: Dealing with any health problem at any time in a way that effectively combines services to meet an individual's needs.
- Accessible: Easy to get services (without barriers of culture/language, finance, location, and administration).
- Health care services: Services provided by professionals directly to promote, maintain, or restore health.
- Clinician: A person who uses scientific knowledge to deliver health services.
- Accountable: Responsible.
- Personal health care needs: Physical, mental, emotional, and social needs of an individual.
- Context of family and community: Understanding a person's housing, environment, family situation, and culture in relation to their community.

3.5. Core Values, Principles, Objectives, and Elements of a Primary Health Care System

3.5.1. Core Values

A public health programme needs a core set of values on which to base its implementation, and to which all stakeholders can relate. As an example, we will focus on the Pan American Health Organisation's report (PAHO/WHO, 2007), *Renewing Primary Health Care in the Americas*. To help governments understand and organise an effective PHC programme, the PAHO suggested a set of values, principles, and elements to act as a foundation on which deal with other societal issues, like tackling social exclusion through links with other sectors; helping to integrate social and economic development activities; and ensuring clear lines of management and accountability. It argued that such values would provide a moral 'anchor' to which priorities, policies, programme implementation and evaluation could be tied and which would make sure any health services were designed to be in the public's interest. The PAHO's proposed values included:

- Rights to health – a social value agreed nationally and internationally.

- Equity – unfair differences in health status, access to services and treatment.

- Solidarity – how people cooperate to achieve the common good.

3.5.2. Principles

Principles develop values and help to link them to the implementation process; they provide a foundation for legislation, policies, criteria, evaluation, funding, and operation. The PAHO's proposed principles were:

- Responsiveness – meeting individuals' needs in a sensitive manner.

- Government accountability –assuring citizens' health rights.

- Quality – the best and most appropriate services are provided ensuring dignity and respect.

- Social justice – focusing on health inequalities, especially for the most vulnerable.

- Participation – to develop needs-led services (on a micro and macro level) and ensure accountability.

- Intersectoriality – different sectors working together to meet the holistic needs of individuals.

- Sustainability – strategic planning and long term commitments.

3.5.3. Objectives

Primary health care is a method of providing health services; however, there are many different interpretations as to what PHC can actually mean. Lamarche et al (2003) tried to distil these interpretations into six objectives, suggesting that a PHC model should be:

1. Effective – aim to improve or maintain health.

2. Productive – ensure services are provided and funded efficiently.

3. Accessible – ensure people can travel to and obtain all types of services.

4. Continuous – ensure services are provided whenever they are needed.

5. High quality – conform to recognised professional standards, and perceived by patients to be respectful and appropriate.

6. Responsive – consider the needs and expectations of service users and/or carers.

3.5.4. Elements

The PAHO's report also highlighted how an effective PHC programme should operate (PAHO/WHO, 2007). Identifying specific elements that make up a good operational system can help governments and health authorities develop services in relation to agreed criteria. Some of the key elements of a good PHC programme that were identified included:

- Accessibility – ensuring equity.

- Acceptability – taking into account needs, preferences, values, culture, and monitoring whether people will actually use the services once accessed.

- First contact – the main point of entry to the health and social care system.

- Comprehensiveness – all levels of service should work together to provide for the needs of the whole population through a range of treatments e.g. prevention, specialist care.

- Integration – joint planning and delivery of all services, ensuring clinical and individual perspectives.

- Prevention and promotion – ensuring cost effectiveness; appropriate resource allocation can also support communities to address their own health needs, thus responding to social determinants of health.

- Appropriate and effective – ensuring cost effectiveness and that diagnosis and treatment is sensitive to the needs of the individual and not based solely on, for example, disease.

Any elements of a PHC programme should reflect the core values, principles, and strategic objectives of the nation's health system. For the system to succeed it relies on different sectors and stakeholders to sign up to agreed values and principles and develop effective joint working procedures – both in terms of planning, operation, and evaluation.

3.6. Models of Primary Health Care

Lamarche et al (2003) identified four types of PHC models:

Professional model: This provides patients with a continuous service. Usually, it comprises a health care team with a physician and a nurse. The nurse liaises with other sectors and ensures clinical services are provided jointly. This approach is used in Denmark, the Netherlands, the UK, and the Health Maintenance Organisation (HMO) staff model of the US.

Coordinated professional model: Ensuring PHC is accessible. In Canada, physicians working alone are a patient's entry to the healthcare system. This model is also found in Belgium and the open model of the US.

Integrated community model: Using information technology to promote communication between providers; taking responsibility for continuity of care; offering services whenever needed and working together to ensure that a wide range of services are available.

Non-integrated community model: Offering a wide range of services, but directly and alone, with no integrated information technology, or continuity of care, or constant service availability.

As defined above, the integrated and non-integrated models aim to meet the health needs of a geographic community and they support community development. Finland and Sweden both use community models (Finland the integrated model and Sweden the non-integrated model). The approach is characterised by the governance structure using public representatives, multi-disciplinary teams, and a sessional payment structure (method of remuneration, which is often used by hospitals to pay physicians for 'sessions' of work related to specific tasks).

3.7. Implementation of Primary Health Care

3.7.1. Primary Health Care Approaches

There is no definitive way to approach PHC. Each nation or government must decide what it can afford, and must respond to its own social, cultural, economic, and political situation. Some approaches include:

Selective primary health care: In developing countries, PHC has usually meant a 'selective' process, focusing on a few, high-impact services, which target the most important health challenges in that particularly country e.g. some infectious diseases, child mortality (Walsh & Warren, 1979).

Comprehensive primary health care: In Costa Rica, Brazil and Cuba for example, more nationally-comprehensive systems are beginning to be developed (WHO, 2003; WHO, 2004).

Primary care: In Europe, 'primary care' means a programme that allows for a single entry point into the health system for the whole population (Boerma & Fleming, 1998; Weiner, 1987).

3.7.2. Summary of Primary Health Care Approaches

Renewing Primary Health Care in the Americas (PAHO/WHO, 2007) summarised the main differences of primary health care, comprehensive primary health care, and selective primary health care (as seen in Table 1).

Table 1: Approaches to Primary Health Care

Emphasis	Primary Health Care definition	Approach
Level of care in a health service system.	Refers to the first point of contact with, or the entry point into, the health system. Primary care constitutes the first level of care in a continuing health care process and would commonly be delivered at a clinic, health post, or a private practitioner's surgery. Primary care focuses on personal health or individual health care and is predominantly curative (or therapeutic), preventive, and rehabilitative in nature.	Primary Care
A strategy for organising health care systems and society, to promote health.	The comprehensive PHC approach, as elaborated at Alma-Ata, embodies a set of five key principles: 1. Comprehensive care (which includes a combination of preventative, curative and rehabilitative, and promotion services) 2. Intersectoral collaboration and action 3. Active community participation and support of empowerment 4. Appropriate care and use of technology 5. Equity. Given the pro-equity principle, universal coverage, access to health care, and resources are the foundation of a comprehensive PHC-based health system. Other cornerstones of the comprehensive PHC approach include: • An integrated referral system, which facilitates the delivery of a continuum of care to clients across different levels and places of care in the health care system without interruption • Multidisciplinary health teams, including community-based health care workers. Rather than focusing on the individual, comprehensive PHC uses a public health lens and uses the family and community as the focus to assess risks, priorities, and plan interventions. The 'upstream' social determinants of health are emphasised in this process. At a 'minimum', comprehensive PHC consists of a set of nine basic elements or core activities ranging from an adequate supply of safe water and basic sanitation, to the provision of essential drugs.	Comprehensive PHC
Specific set of health service activities geared towards the poor.	Focuses on a limited number of high-impact interventions to address some of the most prevalent health challenges in developing countries. Although initially conceptualised as an 'interim' form of comprehensive PHC, it became institutionalised as an approach on its own.	Selective PHC

Source: Pan American Health Organisation and World Health Organisation, 2007

3.8. The Primary Health Care Team

3.8.1. Composition

In most industrialised countries, physician-led primary health care teams are most common, even though collaboratively organised teams have been promoted since the 1970s (Sicotte et al, 2002). In 2002, The World Health Organisation defined the PHC team as:

'a group of persons who share a common health goal and common objectives determined by community needs, to which the achievement of each member of the team contributes in a coordinated manner, in accordance with his/her competence and skills and respecting the functions of others.'

(WHO, 1985 cited in Sicotte et al, 2002: p. 992)

The staffing of PHC teams can vary, but in general, they comprise GPs, practice nurses, community nurses and sometimes even pharmacists. More recently, they have begun to include psychologists, occupational therapists, diabetes nurses, physiotherapists, dieticians, podiatrists, and social workers.

3.8.2. Teamwork

The PHC team is an interdisciplinary group that works collaboratively. This style of working requires skills (which has a training implication), giving team members the power to allocate resources and coordinate a range of different services. In turn, this 'commissioning' power can facilitate the development of new services and the improvement of existing health services, for example dental care, medical care, or community support. In the literature, three models appear to define the way this teamwork functions (Starfield, 1998):

Delegated model: The physician is the 'team leader' with legal and financial responsibilities. The roles within the team are defined by the tasks that are performed; physicians tend to perform primary care tasks and non-physicians perform all the supplementary roles.

Collaborative model: There is no designated leader and all primary care tasks, financial and legal responsibilities are shared. There are usually 'key workers' with specific skills to respond to different patients' needs (Stott, 1995), who will act as a focal point for individuals during their care (Freeman & Hjortdahl, 1997). Many community health centres throughout the world are based on this model, including the Center Locaux de Services Communautaires in Quebec, and some HMOs in the US.

Clinical consultative model: This model provides specialist care, depending on the skills and interests of the staff within the team – although not necessarily in response to the population's needs. This model develops hierarchies over time as one specialist dominates another, especially when one person controls more resources than others (Starfield, 1998).

3.8.3. Patient Outcomes

There have been a range of studies that have focussed on the impact of PHC services (especially physicians) on patients' perceptions, their health, and their wellbeing.

Vogel and Ackermann (1998) showed that the number of primary care physicians was related to increased life span and reduced low-birth weights. A UK study by Gulliford (2002) demonstrated that the standard mortality ratio for all-cause mortality at 15 to 64 years of age was lower in areas with a greater number of GPs.

Moreover, in Sweden, Moore (1992) illustrated that PHC services reduce the number of people being referred to specialist secondary services (consultants and emergency care) and reduce age-adjusted total health care costs. In addition, Kohn and White, (1976) discovered that there were higher rates of people visiting physicians (which could not be accounted for by greater health needs) when there were more specialist services on offer than generalist (primary) care services. The suggested reason for this is that specialists may 'over treat' people; for example, more corticosteroid is used on asthma patients by allergists than family paediatricians and physicians (Engel et al, 1989).

3.9. Benefits of a Primary Health Care System

3.9.1. General Benefits

There have been many studies undertaken to assess the benefits of PHC systems. Most international studies demonstrate that when compared with countries with weaker primary care systems, countries with stronger PHC achieve higher user satisfaction, lower healthcare costs, better and more equitable health outcomes and are more efficient (Baicker & Chandra, 2004; Van Doorslaer et al., 2004).

Other studies have shown that people accessing primary care over time have fewer hospitalisations, less emergencies, better compliance and improved satisfaction than those who do not (Rosenblatt et al, 2000; Weiss & Blustein, 1996). Forrest and Starfield (1998) and Raddish et al (1999) proved that localities with a strong PHC system were more efficient (in relation to time saved in consultation, fewer laboratory tests and less health care expenditure). Another case study showed that the overall rates of hospitalisation for certain conditions (e.g. pneumonia, urinary tract infections, chronic pulmonary obstructive disease, angina) reduced when the PHC system was improved (Bermudez-Tamayo et al, 2004).

Finally, it has been suggested that PHC health systems improve equity as they are less expensive for individuals and more cost effective for societies, especially compared to more costly, speciality-orientated care (Grumbach, 2002).

3.9.2. Specific Benefits

There are a range of tangible and intangible benefits from a PHC system, as set out below.

3.9.2.1. Longitudinality

Care over time is a feature of PHC that impacts positively on individuals' health. One study of over 2,000 patients in 89 UK general practices found that patients in practices with 'personal' lists (rather than 'group' lists) – where a general practitioner (GP) had known the patient for long period – were significantly more satisfied with their care (Baker & Streatfield, 1995; Baker, 1996).

A US survey of patients in 1988 found that individuals with a known doctor received better screening for breast cancer, recommended immunisations and used more services when in poor health than individuals who identified a location as their only way of accessing health services. However these findings only related to people who reported a non-traditional site (e.g., a hospital outpatient clinic) as their source of care. In addition, the study made no distinction between having a specialist as a regular source of care and having a primary care physician as that source of care (Lambrew et al, 1996).

3.9.2.2. The Early Management of Health Problems

One US study examined the relationship between having a primary care doctor as their source of care and hospitalisation – which would not have occurred if there had been good primary care in place. Men with hypertension who had been admitted to the hospital from the emergency room in a large metropolitan area were divided into two groups. One group was composed of those who were admitted for a preventable complication of hypertension; the other group was admitted for a condition unrelated to hyper-tension. The study found that those admitted for the preventable complication were four times more likely to lack a primary care source than those admitted for a condition unrelated to hypertension.

This was even the case after considering other factors, like absence of health insurance, level of compliance with antihypertensive regimens, and alcohol or drug related problems. These results suggest that those men with a primary care provider were relatively better protected against hospitalisation for a preventable complication of a common medical problem (Shea et al, 1992).

3.9.2.3. Integrated Care

Continuity of care and identifying problems are imperative when coordinating a person's care package. When different assessors and health workers provide an individual with care at different times, there can be problems with the coordination of the care. These problems can be resolved if the same person sees the patient regularly or if medical records are update accurately.

The Dutch study by Vierhout et al (1995) examined 12 GPs, who had patients aged 10-75 years with orthopaedic problems for whom the doctors were considering referral because they were not sure of the diagnosis or what care to offer. Patients were randomly assigned to 'joint consultation' sessions with an orthopaedist or to the 'usual' care sessions in which they were left to refer or not, as they chose. A year later, the patients were evaluated by an orthopaedist not involved in their care. There were significantly fewer referrals and diagnostic actions in the 'joint consultation' care group, without negative effects on subsequent outcomes. It is interesting to note that more patients were symptom free at the one-year follow up meeting in the 'joint consultation' group than in the 'usual' care group.

Coulter et al (1989) found in their UK survey that the vast majority of referrals were for short-term consultations and care, and patients were expected to continue to return directly to primary care as required. This was evidenced by the fact that some referrals were sought for particular treatments or surgical procedures (36%), specific diagnostic investigations (35%), management advice (15%), reassurance of the generalist or patient (4%) and for long term transfers of responsibility from primary care to other specialty care (10%).

3.9.2.4. Improving the Quality of Clinical Care

Most studies that compare generalists and specialists suggest that condition-specific quality of care provided by specialists is better when the condition is in the specialist's area of special interest. In this situation they use quality care indicators, like success of disease-specific preventive procedures or of indicated laboratory tests, for monitoring disease status (Harrold et al, 1999).

Studies designed by specialists to compare the quality of care of specialty and generalist practices often find that specialists are better at following guidelines. For example, gastroenterologists used antibiotic therapy for *Helicobacter pylori* earlier than generalists did (unless they were in a group practice working alongside gastroenterologists) (Hirth et al, 1996); asthma management was better in practices of specialists dealing with asthma (Bartter & Pratter, 1996).

3.9.2.5. Primary Care as the First Point of Contact

When primary care is used as the first point of contact, it facilitates entry into the rest of the health system. In a study comparing visit rates in two group practices (Starfield, 1983), children in the group practice plan who required a referral from a primary care provider before visits to other specialists, had fewer visits to these specialists than children in the plan not requiring referral. There is no indication that the additional visits in the latter plan led to better health of the children.

Canadian studies by Roos (1979) showed that tonsillectomy and/or adenoidectomy were more often present in children who had been referred from a paediatrician or from someone who had received paediatric contact than in those children who had just visited an ear, nose, and throat specialist. The children's care outcomes were also better for those seen first by a paediatrician – these children had fewer postoperative complications, a greater decrease in respiratory episodes following surgery and a greater decrease in episodes of otitis media following surgery.

3.9.2.6. Comprehensiveness

Comprehensiveness is a feature of primary care that enables a team to assess all the health needs of an individual and subsequently fund care that is tailored to that person's needs. Hickson et al (1988) found that the third most common reason for patient dissatisfaction (after lack of response to treatment and inconvenient location of offices) was the failure of physicians to be interested in the behavioural problems of their children. Another study found that comprehensiveness was the second most important characteristic of care (after continuity) for patients at a primary care clinic for adults (Fletcher et al, 1983).

3.10. Primary Health Care Challenges

The universal values of PHC have remained unchanged over time however, implementing PHC must respond to global population increase, changes in life expectancy, economic developments, environmental changes, and changes in quality of life. Some examples of the factors that are affecting the way PHC systems can operate are set out below.

3.10.1. Demographic Changes

Primary health care services must operate differently to respond to the changing health needs of growing populations. Urban populations make up more than 50% of the world's total population, although rural populations boast the lowest incomes. The world's population has increased by over two billion in the past 30 years and will continue to increase. In developing countries, the largest increases are within the older person's category and young families (WHO, 2008).

3.10.2. Economic Growth and Crisis

Primary health care should be a key way to protect the health of people who face economic challenges (WHO, 2008). Such challenges include the rise in oil prices, food crises, and the possibility of a global economic recession. The gap between rich and poor continues to widen particularly as a result of economic growth experienced by the minority. In the 1980s, some middle- and low-income countries faced economic collapse because of the debt crisis and global economic recession. This has forced them to cut expenditure in a variety of public services including health services, and thus threatened PHC.

3.10.3. Globalisation

There are many challenges, risks, and opportunities that we face in this new era of globalisation. Trade agreements will limit the range of policy instruments that governments can use to access essential health services or medicines (WHO, 2008); these instruments include intellectual property rights, health and health related services, domestic regulation, and tariff reduction.

The new Global Health Governance discussions are complex yet vital in relation to the way PHC develops in the future. Global goals, movements and alliances, the Millennium Development Goals, social determinants of health, health as a human right, and Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) are all initiatives that will impact strongly on the future of PHC.

Communication is one of the largest impacts on the way PHC is delivered throughout the world. Mobile phones and the internet can link remote health centres/communities and warn of emergencies. There are also commercial interests that challenge the influence of public health bodies; companies are using sophisticated marketing methods to persuade some isolated rural communities to smoke, or eat new (potentially unhealthy) types of food or find new entertainment – thus changing their lives for -ever – and not always for the better.

3.10.4. Worldwide Health

Although there has been an improvement in the world's health over the past thirty years (fewer children died in the 2000s than in the 1980s or 1990s), and overall life expectancy has increased by seven years, this has facilitated a rise in the number of private sector providers – which has not been regulated effectively. This trend needs to be monitored and controlled.

The movement of qualified staff from the Third World to more prosperous countries is also becoming a problem, leaving much needed gaps in the skill base of these poorer countries (WHO, 2008).

3.10.5. Primary Care Practice

Primary care practice faces some specific challenges including recognising and managing two or more coexisting medical conditions at the same time (comorbidity), maintaining the best practice characteristics of PHC, improving equity in health populations (Starfield, 2001), and preventing any undesirable effects of medical care.

3.10.6. Environmental Changes

Effective PHC systems are vital if the world is to cope with the environmental changes and challenges that it is facing. Primary health care can help prevent malnutrition, promote healthy eating, and agriculture (WHO, 2008). The Eastern Mediterranean Region is experiencing terrible drought conditions and a decline in agricultural biodiversity. There are also major climatic disasters that are being experienced more frequently by countries throughout the world.

It is ironic that climate change is partially caused by (and exacerbated by) the existing environmental problems that began due to the increasing demand for resources and the purchasing power of most of the world's population.

3.10.7. Civil Society's Role and Contribution

Civil society comprises the voluntary, civic and, social organisations in our society, as opposed to the state structures and private institutions, which often carry most power and control. There is a strong movement whereby partnerships and the 'voice' of the community are developing strength and gravitas. This voice can be an advocate for the values of PHC and support its development through developing skills, recruiting volunteers, providing training, undertaking research, and developing the ability to provide health services. This service provision should not be a cheap option, but a way to provide sensitive and appropriate services even to hard-to-reach individuals (WHO, 2008).

3.11. Summary

Primary care is defined as a set of functions that can be combined to provide unique care; it is usually based in the community and enables people to access the health system easily for any new or chronic health need. Models of PHC can vary depending on local social, economic, political, or environmental circumstances. Primary health care provides a person-centred service over time and it can respond to most conditions. Primary care provides preventive, curative and rehabilitative services to assure health and wellbeing.

Primary care ensures individuals receive integrated care. It forms the basis for, and determines the work of other levels in the health system. However, it also shares some characteristics with other health system levels for example, quality, accountability, access, cost, attention to prevention as well as therapy, rehabilitation and teamwork. It does not represent short-term consultative care (secondary care), nor does it provide long term disease management (tertiary care). Primary health care also coordinates care when there is more than one health problem; in addition, staff in the team can manage resources to promote, maintain and improve health in light of the local economic conditions (Starfield, 1998). Ultimately, PHC can provide a sensitive, quality service that responds to the holistic needs of the individual.

Chapter Four: The History and Characteristics of the State of Kuwait

4. Introduction

This chapter will give a brief overview of the state of Kuwait, its welfare arrangements and particularly the health system.

4.1. Facts

Kuwait is located in the north eastern area of the Arabian Peninsula, bounded on the east by the Arabian Gulf, on the north and west by the Republic of Iraq, and on the south west by the Kingdom of Saudi Arabia(as shown in Fig.2). It comprises an area of 17,818 square kilometres (CIA, 2010). Between 1899 and 1961, Kuwait had a binding agreement with the British Empire whereby Kuwait was guaranteed security and protection, and assurances that it could conduct its own domestic affairs. After this agreement ended on February 25, 1961, the state of Kuwait drafted its own constitution and became a fully sovereign, independent, democratic Arabian state where (among other things) its official language became Arabic and its official religion became Islam; laws were based on the Islamic Shari'a (Ministry of Information, 1965).

Figure 2: Kuwait Map
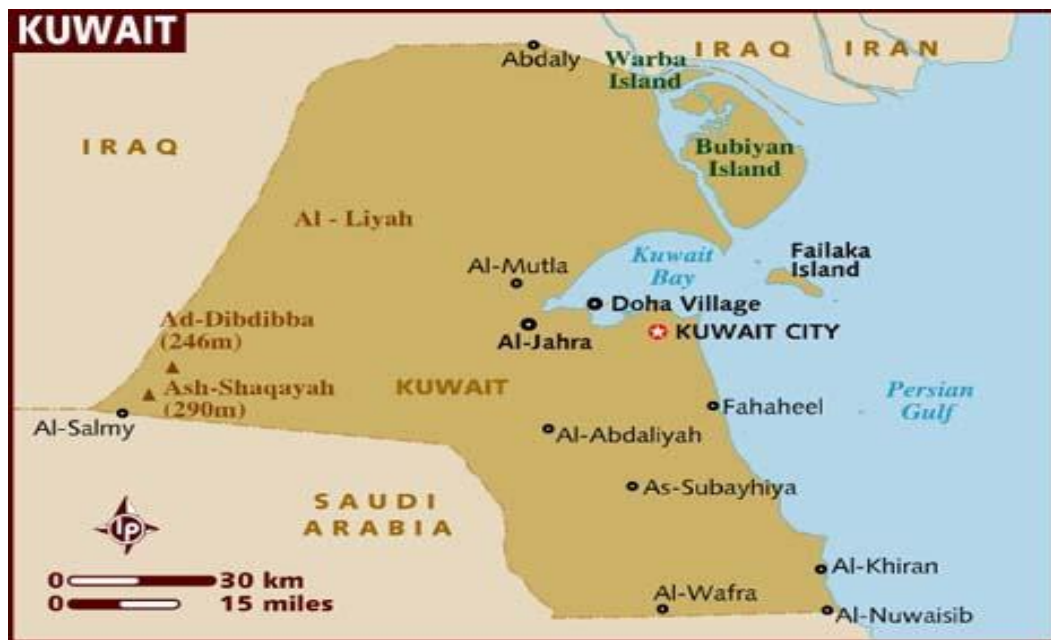
4.2. Demographics

In 2009, Kuwait's population was 2,789,132; 54% were Kuwaitis and 46% were non-Kuwaitis. Kuwait has one of the fastest growing populations and is ranked fifth in the world. There is a high proportion of foreign immigrants (15.65 migrant(s)/1,000 population), probably because of the high unqualified skilled workers within Kuwait society; it also has a high proportion (69%) of expatriates (Kuwait Times, 2010). The birth rate in Kuwait is 21.64 births/1,000 population, which ranks Kuwait 82nd in relation to other countries. The death rate is 2.29 deaths/1,000 population, which ranks it 225th in relation to other countries. Total infant mortality rate is 8.75 deaths/1,000 live births (male is 9.35 deaths/1,000 live births, whereas female is 8.13 deaths/1,000 live births). These mortality rates rank Kuwait 160th in relation to other countries. The life expectancy is 77.89 years (males is 76.64 years; females 79.18 years). The total fertility rate is 2.7 children born/woman, making Kuwait 77th in relation to other countries (CIA, 2010).

4.3. Education

Education for all Kuwaiti children (6-14 years) is free and compulsory (UNICEF, 2003; Oxford Business Group, 2010), and is ranked twenty-nine in the United Nation's Development Programme (UNDP) Human Development Index, which makes it the leading Arab nation in the provision of education (Oxford Business Group, 2010). Saad Akashah, a senior adviser at the Arab Fund for Economic and Social Development said: 'We have been financing health and education longer than anywhere in the region. This is the foundation on which the country was built.' As a consequence, Kuwait has strong indicators of educational achievement (Oxford Business Group, 2010: p.180).

Excluding expatriates, school-aged Kuwaitis represent 40% of the local population, or 426,000 potential students, which is a large number for any education system. In 2006/07, there were 703 Government schools providing education to 340,000 students, and there were 458 private schools teaching 178,284 students. For both public and private schools, education is controlled by the Ministry of Education, and attendance at the state schools is restricted to Kuwaiti children, the children of teachers working for the Ministry of Education, and the children of expatriates who obtained residence prior to 1960 (Oxford Business Group, 2010). In 2006/07, 65.6% of students were educated in state schools, although private education is now becoming more popular, especially for expatriates (Oxford Business Group, 2010).

The percentage of Gross Domestic Product (GDP) spending on education increased by 10% between 1997/1998 and 1999/2000 (UNICEF, 2003), which is in line with international trends in education. Mubarak Al Adwani, Assistant Resident Representative for the UNDP in Kuwait said: 'Kuwait's education sector is quite remarkable. Enrolment in primary schools is high and female enrolment as a percentage of male enrolment (114.9%) is very high. We have reached the Millennium Development Goals in this area.' (Oxford Business Group, 2010: p.180–181). In 2008/09, Government spending on education focused on salaries. However, in the following year, the focus moved to equipment and facilities as the Government aimed to open 16 new schools in 2009/10, and a further nine in 2011. Technology and information and communication technologies (ICT) have also become important, propelled by Moudhi Al Humoud, the 2009 Minister of Education and Higher Education. In June 2009, the Ministry of Education proposed a budget of KD2.226 billion ($7.92 billion) for 2009/10, which was a slight increase from 2008/09 (Oxford Business Group, 2010).

4.4. Economy

Over the last two centuries, Kuwait's 'simple' economy relied on trading livestock, fishing, hand-harvesting pearls, and trade with Basra, India and East Africa. However, after oil was discovered, the per capita GDP in Kuwait became one of the highest in the world. The oil sector is the main source of national income in Kuwait, accounting for 80% of the Government's income. Kuwait exports can be categorised as oil exports, which include oil and natural gas, and non-oil exports, which include exports of national origin and re-exported goods. In 2004, the oil exports totalled $26.65 billion, whereas the non-oil exports equalled $1.95 billion (Merza, 2007). In the twentieth and twenty-first centuries, economic development grew and despite the losses of the 1990–1991 Gulf War, Kuwait has been transformed into the modern state we recognise today (Merza, 2007). Much of the income from high oil prices has been invested in a sophisticated welfare system, particularly in education, public health, employment and housing.

4.5. Welfare Regime

There are a variety of different mechanisms provided by the Kuwaiti Government that aim to support Kuwait's citizens. However it should be noted that expatriates pay about $175 per year to access health care in the public sector (Oxford Business Group, 2009). The Kuwaiti Government provides welfare support include: providing free health services; helping people find employment; encouraging home ownership by subsidising mortgages and household utility costs (Ryan, 1984); expanding public housing; providing payments to families based on numbers of children in order to increase the population (Merza, 2007); making payments to couples when they marry and for every child born (Al-Bustan & Batistella, 1988) and subsidising utilities like water, gas, electricity, and telecommunications. It is interesting to note that Government support for older people, divorced women, and orphans is complemented by Kuwaiti tribes, clans and extended family networks; therefore there is not too much poverty among Kuwaiti citizens (Bertelsmann Stiftung, 2009).

As oil generated such an enormous economic growth, it led to a gradual rise in the labour force – particularly in the form of expatriates working in the country. This growth also caused the Government and the private sector to spend more on development projects and programmes. As a consequence of these Government activities and of the economic growth, Kuwait has seen its working population increase from 47% in 1995 to 59% in 2005. It is worth noting that Kuwaiti women have increased as a proportion of the work force from 29% in 1995 to 40% in 2005; this reflects the increased educational levels among Kuwaiti females and gradual shifts in societal perceptions of women (Merza, 2007).

4.6. Summary

Before Kuwait became an independent sovereign state in 1961, it had a simple economy based on trading raw materials with Basra, India, and East Africa. After oil was discovered, the income it generated transformed the state into a more developed country with an array of public and private development programmes and a comprehensive welfare system, supporting public health, public education, housing and employment. Because of strong social welfare, that is provided by Kuwait government, there is strong growth in the population and in the work force – with a societal shift regarding perceptions concerning the employment of women.

4.2. Development of Kuwait's Information Technology

4.2.1. National Information Technology Strategy

Kuwait's Government decided it wanted to improve its information technology (IT) capabilities in order to support government development and public demand. This initiative was prompted by the 2004 National Strategy for Building an Information Society, in conjunction with authorities in Singapore. The plan was developed in coordination with the World Summit on the Information Society (WSIS) regional action plan of West Asian countries. Therefore in 2006, Kuwait's government set up the Central Agency for Information Technology, which was affiliated to the Government cabinet. This Agency set nationwide IT policies, implemented the e-Government project, managed the Government's official portal, trained national technical human resources, ran general awareness campaigns on IT, coordinated IT development actions and plans with other Governmental institutions and set methodology, standards and patterns (United Nations, 2007).

4.2.2. Information Technology Infrastructure

Kuwait's Information and Communication Technology (ICT) infrastructure is gradually growing, both in terms of wireless and wired capabilities. Factors that have supported clear ICT connectivity in Kuwait include: ICT application needs, IT system requirements, services offered by internet service providers (ISPs) and mobile phone companies, the relative increase in e-services offered by the private sector and Governmental institutions, operation requirements, transactions, monitoring and IT security. The infrastructure that has been generated from these elements comprises (ISPs), mobile phone companies and the Government's own Ministry of Telecommunications.

In Kuwait, four large ISPs provide comparable services. With the help of ISP-driven incentives and promotions, Wi-Fi is used widely in households using a digital subscriber line (DSL), which provides a high capacity, low cost service and covers urban areas – this is popular with families. Wi-Fi is also provided in public places, like shops, service stations and cafes, leading to a decrease in the number of internet cafes.

Kuwait boasts three mobile phone companies (with a fourth pending). They can compete with traditional ISPs because they own a share of the internet market and can provide greater capacity for data transfer and internet connectivity (up to 256 and 512 kilobytes) from their upgraded mobile phone networks (third generation (3G) technology). Although coverage is good and it is portable and mobile, this service costs more than DSL, has a smaller capacity, and is linked to only one user instead of a household.

The Ministry of Telecommunications controls the wired network in Kuwait, which has grown in capacity due to the rise in demand for all types of services. Mobile phone companies and ISPs rely on the Ministry of Telecommunications' services to operate their own services, as they lease from the Ministry electronic circuits and sites. There are 31 main switchboards in Kuwait with a capacity of 776,000 lines; 518,000 of which are in use (65% of the total lines). In 2008, the Ministry increased phone numbers from seven to eight digits in order to meet landline demand and make numbers adhere to international standards. At a cost of KD45 million ($165million), the Ministry plans to develop and upgrade the landline network so that the phone, internet, and TV can be used on the same cable, by linking residential and commercial units directly with switchboards through fibre optics.

According to the International Telecommunication Union's (ITU) statistics, the number of personal computers (PCs) in Kuwait in 2005 reached 600,000 (22.3 per 100 inhabitants) compared to 400,000 in 2003 (16.10 per 100 inhabitants), reflecting public demand. Sales in software grew in 2006, whereas pirated copy sales decreased. Government institutions have increased their use of financial credits to provide IT hardware, applications and services whilst expanding their use of ICT applications and mass licensing agreements (United Nations, 2007).

4.2.3. Accessibility and Usability of Information Technology

E-Government services are being developed by the Central Agency for Information Technology to ensure there is a central electronic method or portal allowing the public to access services. The hope is that information on public services will not only be published, but that the relationship between the public and Government services will shift to become interactive and finally achieve transaction status.

Currently, Government websites only provide information on the services they offer. Some enable users to track queries or applications, but these mostly follow-up enquiries submitted in person or provided in electronic files downloaded onto PCs. The increasing use of the short message service (SMS) can also facilitate public access, which is a cheap interactive form of information exchange.

The ICT transaction stage has still to be achieved. Electronic transactions between administrations and employees are limited and do not have any official or legal status, although payroll and payroll deduction systems for Government employees are quite sophisticated. However, only a few documents are being exchanged electronically. Successful experiences in document management systems at Government level include the 'Tasaheel' system, which was developed by the Ministry of Defence for document archiving and recovery. The ministries of Defence, Social Affairs, Labour and the Interior have worked together to implement the same system (United Nations, 2007).

4.2.4. Training

Training is another element that is needed to ensure Kuwait's capabilities in information technology can develop successfully. More training is needed to improve the skills of people with poor IT literacy. Work progresses on an e-citizen programme, which aims to train people to become advanced information workers (United Nations, 2007); partner agencies involved are the Central Agency for Information Technology, the International Computer Driving Licence (ICDL) of the Gulf Cooperation Council and the Cambridge IT Skills Certificate.

4.2.5. Information Technology Security and Privacy

Kuwait's Government agencies do not maintain a sufficient number of electronic transactions to warrant the development of technical measures to protect data and privacy in the public sector. However, as a preventative measure, the Government has set out some basic rules in the suggested draft law on electronic transactions where lists or legal frameworks are applied to the circulation and confidentiality of documents (United Nations, 2007).

Information and network security includes measures that focus on software and hardware program operations, the supply of computers, servers and network components and services that provide connection to the internet and other government institutions. Regarding databases, secured socket layers and encryption technology are utilised.

Kuwaiti Government administrators have electronic document management systems, with electronic protection and data backup provision. Security measures for ICT systems are regularly updated and systematically checked, however, there are still large gaps in human resource capabilities so training is seen as a high priority.

4.2.6. Examples of Information Technology Applications

In Kuwait, information technology applications are controlled by the state; there has been little unrestricted development, in comparison with the general economic development sector. The Government provides certain economic activities like e-booking with airline companies, e-trading, online banking and e-payment.

Crucially, the health sector has seen the potential for information technology to improve its effectiveness and efficiency. At Kuwait's Ministry of Health, the information system department is responsible for computerising the country's primary health care centres and secondary hospitals, as well as registering births and deaths, wireless networking and developing a database.

There are three departmental sections or functions within the information system department: 1) system development; 2) operations and 3) technical support.

1. The system development section includes a focus on projects, programming and monitoring.

2. The operations section is accountable for planning operations, implementation, collecting statistics and image processing.

3. The technical support section is responsible for operating the system, developing the database and training issues.

The information department has succeeded in computerising all the primary health care centres' so that when a patient visits a clinic, their identity card is entered into the computer and their data can be retrieved from the server. The doctor is able to examine the patient and enter their health information into the system; this includes diagnosis information, which is linked to the pharmacy system in order for patients to collect their medication. The birth and death registration system has also been computerised and the information system department is in the process of computerising the country's regional and specialised health care facilities (WHO, 2005).

The Ministry of Health (MOH) wants a health care system that sustains an information system, which can automate the workflow in dispensaries, dental systems, medical centres and the six health areas and their respective hospitals. There are plans to develop an online portal for its health and medical activities and for supporting job applications for public sector online positions (United Nations, 2007) within the e-government system mentioned above.

Similarly, the Ministry of Education has developed e-learning and e-teaching. The Ministry will implement the e-learning project in partnership with Microsoft and the Regional Software Centre. This project has developed a staged process for pupils, teachers, and parents to access elements of the curriculum online and on CD-ROMs and to access special software (known as e-bags) to aid the learning process. Each student is assigned an e-mail account to facilitate the process and track progress. Schools have also been encouraged to create their own websites through the site of the Ministry of Education (United Nations, 2007).

4.2.7. Summary

In 2006, the Kuwaiti Government founded the Central Agency for Information Technology, in order to set a strategic direction for the country's information technology development. The ICT infrastructure still has some way to go, but there are growing wireless and wired capabilities, including four leading internet service providers, three established mobile phone companies, and the Government's own Ministry of Telecommunications (which operates the wired network across the country). There are a range of measures set to improve the country's infrastructure capabilities, for example, plans to improve the landline network at a cost of KD45 million ($135million) so that the phone, internet and TV can be used on the same cable, by linking residential and commercial units directly with switchboards through fibre optics.

The Central Agency for Information Technology is trying to improve public access to its services through developing the e-services available. It wants to shift the relationship between the user and the services; from the Government publishing information in a passive manner, to developing an interactive process, and finally achieving a system that facilitates the use of transactions. The Ministry of Defence and the ministries of Social Affairs, Labour, and the Interior are currently working together to develop and implement the proven 'Tasaheel' system (United Nations, 2007).

To ensure an effective development and usage of information technology, it is clear that training is imperative both for the wider public who need to use the technology (perhaps to access public services), and also for the staff who are running the systems. There are particular training gaps in maintaining and developing security systems, which is extremely important in relation to confidentiality and protection from viruses. The Kuwaiti Government has set out some basic rules in a draft law on electronic transactions where lists or legal frameworks are applied to the circulation and confidentiality of documents (United Nations, 2007).

In terms of how information technology can be used in practice, there are many examples as to its importance throughout all areas of life. Crucially, the health sector has seen the potential of information technology to improve its effectiveness and efficiency. The Ministry of Health (MOH) is already harnessing its potential. In addition, the Ministry of Education is beginning to develop ways for e-learning to become a core element of its strategy.

4.3. Development of Kuwait's Health Care Delivery System

Before the 1900s, traditional medicine was practiced in Kuwait with herbs and plants used to prevent and cure illness. Initiated by the then ruler of Kuwait, Sheikh Mubarak Al-Sabah, an American mission was founded in 1912, providing primary care services; in 1917, a new dispensary and a new Government clinic for women were established. Although there were few skilled practitioners, health services and vaccinations against some diseases were provided by the Department of Health, which was established in 1936.

A key step in building a more structured health delivery system came with the founding of the first hospital in 1949 – the Amiri hospital. Two other fundamental developments were the school health programme and the Emergency Medical Services initiative. By 1960, there were 16 clinics in Kuwait meeting the health needs of the population, including the Maternal and Child Health (MCH) Centre and locality-based centres in Qibla, Murqab, Hawalli and Dasman. By 1964 there were 11 MCH centres plus a psychiatric hospital and a hospital specialising in chest diseases; this was the beginning of a comprehensive health delivery system.

The Ministry of Health (MOH) was created in 1961 with Kuwait's long-awaited independence. Kuwait's experience in delivering health services stood it in good stead to identify the need for two separate departments to be established; a department of curative medicine and a department of preventive medicine. With the number of hospitals growing (11 by 1980) and a range of clinics established throughout the country, the health delivery system had expanded so much that it was clear it needed to be organised differently to cope with demand (Naim et al, 1986).

4.3.1. Health Care Legislation

Legislation rooted the principles of health care in Kuwait and this stemmed from the Constitution. There are four articles that provide the principle behind Kuwaiti health care (Kuwait Constitution, 1965, Part II):

'Article 9: The family is the cornerstone of the community. Religion, morality and patriotism of the homeland form the foundation for the family. Its existence is preserved by law which strengthens its ties and consequently protects the mother and child.

Article 10: The State provides care to youth and protects them from exploitation and from moral, physical and spiritual neglect.

Article 11: The State ensures aid to citizens in old age, illness or inability to work and provides them with services of social security and health care.

Article 15: The State is responsible for public health and the means of prevention and treatment of diseases and epidemics.'

It is clear from this extract that Kuwait conceives a health care system as responsible not only for the prevention and curing of diseases, but also recognises the need to meet the moral, emotional social, and ethical needs of the whole population – with ease of access whatever people's status, economic, age, cultural, religious, racial, gender, ability/disability etc. It recognises that the health system must be planned strategically and within the context of the overall national development plan, with clear policies and most importantly, in partnership with the citizens it serves and in response to locality needs.

The Constitution also legislates for standards of health care delivery, ensuring it is effective and efficient and meets the highest professional standards. Government control is a priority, especially when private companies deliver services. The MOH is required to liaise with other countries and to collaborate in cutting-edge research and technology to ensure high standards are reached at all times (Naim et al, 1986).

4.3.2. Ministry of Health

The Ministry of Health (MOH) is a government body that controls the private and public sectors. Broadly speaking, its objectives are:

- To maintain and promote the health of the population.

- To improve physical, mental, and social wellbeing.

- To reduce morbidity, disability, and mortality as far as possible.

These are long- and medium-term goals and they are split into different focus areas, like rehabilitation, buildings, prevention, diagnosis and treatment (Naim et al, 1986); regional planning and delivery is also a central component. A political appointee runs the MOH, and the chief executive or Under Secretary is an experienced medical doctor. Assistant under-secretaries lead different health areas, for example, medical care, finance, drug control and dentistry.

4.3.3. Health Care in Kuwait

4.3.3.1. Health Regions

Regional planning and delivery of health care in Kuwait enables services to meet the needs of the local population. There are six health regions that provide a complete range of health care programmes, including prevention, curing and health promotion; the districts comprise Capital, Hawally, Al-Jahra, Al-Ahmadia, Al-Farwaniya, and Al-Sabah health. They provide care to about 300,000 people (although there is capacity within the service to provide for 500,000 people).

Naim et al (1986) states that each district:

- Identifies and researches health needs and problems in partnership with other agencies and citizens.

- Develops strategies to tackle the health needs of the local population.

- Provides and monitors primary care services, ensuring they are easily accessible.

- Raises awareness of health issues, including treatment, emergency services and family planning.

- Provides social, rehabilitation and psychology services for families and individuals.

- Provides effective and accessible referral, assessment and follow-up processes.

- Provides appropriate hospital services to complement primary care services.

- Provides paramedic services and effective administrative services.

4.3.3.2. Health Care Facilities

As stated above, the Ministry of Health provides services in the six different health regions including primary, secondary and tertiary care. General practitioners, child and family services, maternity care, diabetes care, dentistry, preventive medical care, nursing care and pharmaceuticals are primary care services provided by a range of regional health centres and clinics.

Outpatient services, emergency and casualty services and specialist inpatient care, like general surgery, gynaecology and obstetrics, paediatrics and trauma care (for Kuwaiti and non-Kuwaitis), are examples of secondary care services provided in six general hospitals across the regions.

There are over 20 specialist centres and hospitals scattered across the regions, providing tertiary care services, including for example the Sulaibikhat Hospital for Physical Medicine and Rehabilitation, the Kuwait Centre for Cancer Control and the Kuwait Dermatology Centre (Naim et al, 1986).

Naim et al(1986) point out that these facilities would develop over time to meet the needs of the population, as the number of older people will gradually increase and healthcare services will shift from responding to communicable to non-communicable diseases, which constitute more than 60% of total needs.

Therefore, funding priorities of the Kuwait government has increased to meet the shifting needs, such as the growing prevalence of diabetes and cardiovascular disease, through a range of realigned facilities ; Kuwait was ranked as seventh in the world for rates of obesity (Shukri, 2009). As an example, in 2001, the cost of care for diabetes in Kuwait was KD6.09 ($21.2 million), or 2.16% of total health care expenditure. In the same year, the cost of hospitalisation for breast cancer was KD318,054 ($1.1 million) and KD749,153 ($2.6 million) for essential hypertension. These sorts of costs will continue to increase as the incidence of non-communicable diseases increases (Oxford Business Group, 2010).

The MOH would reassess its' strategies to ensure population and individual needs are assessed effectively and strategies are developed to meet them. One example where this is occurring already is in the Dasman Centre for Research and Treatment of Diabetes, founded in 2006 and funded by the Kuwait Foundation for the Advancement of Sciences (KFAS), which researches different aspects of diabetes care (Ontario Ministry, 2009).

4.3.3.3. Health Expenditure

Like other developed economies, Kuwait has steadily improved its socio-economic situation in the past two decades, in healthcare sector, about 6.9% of the national budget is allocated to healthcare, the per capita health expenditure was estimated at US$ 572 in year 2005 and the government is financing about 80% of health care (Al-Jarallah et al, 2009).

Since 2002, there has been relatively little development in the basic health care infrastructure. The number of government hospitals (15) remained constant from 2002 to 2008, though the number of private hospitals increased from 8 to 11, government clinics increased from 74 to 78 and private clinics decreased from 128 to 115.

During that same period, the compound annual growth rate (CAGR) of the Kuwaiti population was 5.9%. The number of public and private hospital beds decreased only slightly. In 2007, the MOH said it would spend $173.7 million on hospital infrastructure and increase expenditure in 2008 to $3.1 billion to build eight new hospitals (Oxford Business Group, 2010). While hospitals are being improved and expanded, the MOH has also improved patient care by increasing the number of community-based resources.

4.3.3.4. Demographics of Ministry of Public Health Professionals

As the health needs of the populations have changed over the last three decades, so too have the ways services have been provided – particularly in relation to the numbers and skills of the health professional providing the care. The social and cultural changes experienced by Kuwait have reflected the types of people employed in the health sector, particularly in relation to:

Kuwaitis and non-Kuwaitis: for example, there were 4,352 doctors working in MOH hospitals and the total number of employees of the MOH was 33,990. Of this total number, 49.5% were Kuwaitis and 50.5% were non-Kuwaitis; Kuwaiti physicians represented 39.3%, whereas non-Kuwaiti physicians represented 60.7%.

Ethnicity: there are over 70 Asian, European and Arab nationalities employed by the MOH. After Kuwaitis, Indians form the second largest nationality, and Egyptian employees represent 16% of the total expatriate workforce in the Ministry. Filipinos constitutes 5.4% of the total. European manpower is the smallest sector among the nationalities; 0.4% or 121 European health professionals are employed by the Ministry (Ministry of Health, 2006).

Gender: cultural and social changes have particularly affected this issue (Al-Jarallah & Moussa, 2003). Over the past 20 years (Brooks et al, 2003; HRSA, 2006) 'feminisation' has influenced the way services are provided because work and retirement patterns differ for men and women. Women are more likely to work fewer hours in patient care, choose non-surgical specialties, and tend to retire earlier than their male counterparts. Over the last 10 years, the number of female medical graduates increased from 10% to more than 50% (FOM, 2008); one physician in two in Kuwait is now female.

In workforce planning, it would be sensible for the MOH to take into account socio-cultural barriers (e.g., family life, gender-segregation policies), which prevent women entering the workforce, such as difficulties with women caring for men and 24-hour shifts (Joyce et al, 2006).

Wages: an increase in wage attracts appropriately qualified people to a given job. In February 2008, the MOH raised the level of pay for health workers to overcome some of the barriers to attracting a varied array of appropriately qualified people; for example, married doctors' wages rose from KD2000 ($7120) per month to KD4000 ($14,240) per month (with appropriate qualifications). One Kuwaiti health professional commented:

'This has halted the brain drain to some extent. It has also improved the quality of manpower, as people are looking to get the right qualifications to earn the associated financial benefits. Consequently, there has been a migration back from the private sector to the government and there will likely be more rises soon.'

(Oxford Business Group, 2010: p.176)

4.3.3.5. Health Indicators

4.3.3.5.1. Health Statistics

In this section, we highlight the more notable health statistics, using comparisons between health indicators in Kuwait between 2002 and 2006. It is particularly interesting to note comparisons between Kuwaitis and non-Kuwaitis (MOH,2006b).

Birth rates: there was a 21.3% rise in the number of live births between the years of 2002 and 2006. Overall, both gender and nationalities showed this increase. In which the male-female ratio among live births has been around 104:100 in 2006.

Death rates: for Kuwaiti, the death rate was comparatively higher for the male gender, where as for non-Kuwaiti was higher the female gender.

Causes of death: in 2006,circulatory conditions, heart diseases, external causes (transport accidents), and neoplasms were the three major causes of death. The causes of death was recorded higher among Kuwaiti than non-Kuwaiti. Gender-wise, higher mortality rates were observed among males than females in case of heart diseases and external causes. However, higher death rates due to malignant neoplasms were noticed among females than males among non-Kuwaiti population (Ministry of Health, 2006).

Primary care visits: more people sought primary health care services (e.g., general health care, child care, preventative care) from clinics in 2006 than in 2002 (a 27.5% increase). For example, rates increased for dental care from 0.95 million visits to 2.94 million visits and for maternal and gynaecological care, visits increased from 0.33 million to 0.38 million.

Expenditure: in 2005, the per capita health care cost decreased from KD131($475) in 2002 to KD128.5($ 465).

4.3.3.6. The Health Information System

4.3.3.6.1. Previous Health Information System Applications

An effective information system in any large organisation is vital if it is to succeed and grow. This is particularly the case in health care because of the varying stakeholders that depend on consistent and accurate information, for example politicians, service commissioners, planners, service providers, inspectors, service users and their carers, and potential service users. As increasing numbers of people have needed support from Kuwait's health care system, the MOH decided to identify a comprehensive information strategy to respond to the information needs of the organisation through the development of an organisation-wide health information system (HIS). Over the last 20 years, the development of this system has made slow progress.

The original weaknesses identified in the information provision included ineffective medical records, incompatibility between departments' referral systems, disparate demographic data, non-standard/illegible documentation, excessive use of emergency and X-ray facilities, uncontrolled dispensing of medicines (Al-Jarallah, 1996), sub-standard recruitment procedures, ineffectual standards to measure staff performance and no accreditation programmes to evaluate hospitals' performance.

In the first instance, the MOH realised that it needed to find resources to improve patient information and data collection in order to evaluate current services and thus plan future services. Tentative progress was made between 1979 and 1990 when the MOH began to introduce computerised information with the help of some research companies (Naim et al, 1986). Early 1980 saw a new but rather fragmented English-language system functioning in two hospitals and providing information relating to admission, discharges, transfers, and room/bed availability. This initiative progressed and, by 1990, a more integrated and strategic planning-orientated HIS was proposed, whereby all departments would use a common database. All data were to be kept in a single database and there were rules for its maintenance (Naim et al, 1986).

Although development plans were impeded by the Iraqi occupation, development of the new system began again after Kuwait's liberation. The plan was to introduce an IBM-run data management system devised by an Egyptian company. Through the introduction of different 'modules', it included ways of monitoring different processes, such as administration (a master patient index (MPI), tracking medical records, outpatient/inpatient appointments, registration, admission, discharge, hospital statistics etc. (Mandil et al, 1994) and medical functions (laboratory reports, pharmacy inventories etc.). The new system was piloted in two hospitals, the Al-Farwaniya Hospital (462 beds) in 1992, and the Al-Amiri Hospital (408 beds) in 1994.

It was soon clear that the new system was not effective. End users found it complex and hard to use and there was no guide to help them through the procedures, which meant a specialist from the Egyptian IT company had to be paid to train staff every time there were difficulties. There was no ownership of the new system because staff had not been involved in its development. This dissatisfaction caused the information system plan to be frozen in 1992 and, in 1994, a World Health Organisation (WHO) team assessed the weaknesses in the plan, summarising that there was a lack of strategic direction and knowledge from previous experience, confused implementation ideas and lack of staff training (Mandil et al, 1994).

In March 1995, the then Minister of Health, Dr Al-Muhailan, proposed the development of 'Afya Net', a national HIS for Kuwait based on a population-wide patient database, including Kuwaitis and non-Kuwaitis (Razzouqi, 1995). At an estimated cost of KD28 million, a nationwide project furthered this original proposal, aiming to form a secure, fully computerised Health Care Management Information System (HCMIS) supported by trained staff, which would finally integrate all health care functions across the country. Although the implementation of the project was planned for August 1997, it was suspended because of a lack of resources and an inability to agree on to whom to award the contract.

In a report in 2004, the WHO made it clear to the Kuwaiti Government that a national HIS, supported by effective information technology, was ranked ninth in the strategic priorities for the MOH in Kuwait (WHO, 2005–2009).

4.3.3.6.2. Current Health Information System Applications

The lack of a successful implementation of a Health Information Strategy prompted a new approach by the MOH. At the Saudi e-Health Conference 2010, Dr Ali Al-Fodari, advisor to the undersecretary of the MOH, said that the Government wanted to integrate electronic communication networks linking all MOH sectors/departments, for example, hospitals, medical centres and clinics using the e-file system (Al-Hazami, 2010). An electronic patient file system would also help the MOH to create and maintain a main database, which could be shared between all hospitals (United Nations, 2007).

As a consequence, the MOH began to take control of all the health records previously maintained by the regions and coordinated them centrally within the MOH's Information Technology Department. These included three initiatives (Al-Askari, 2003):

- The Primary Health Care Information System operating in all Kuwaiti clinics (implemented)(as shown in fig3,fig.4,fig5).

Fig 3: Physicians Module

Fig4: Pharmacy Module

Fig5: Nursing Module

- The Health Insurance System, registering, issuing cards, and a maintaining a database (under development).

- Hospital Management Information Systems, including admission, discharge, transfers etc. (under selection).

The MOH also hoped that there will be a secondary Health Care Information System for regional hospitals (under development). This system will use fibre optics and wireless technology to achieve high-speed broadband to transmit data (and eventually databases) among all the regional hospitals and health centres in Kuwait. In addition, the system will support patient enquiries and research projects. This project will eventually lead to a master database of all hospital patients, which will be kept and maintained by UNIX servers (United Nations, 2007).

4.4. Kuwait's Health Care System: Challenges and Barriers

Although Kuwait has made much progress in relation to public service development, access and socio-economic health status, there are still many challenges ahead, which need to be addressed. Some of these challenges are outlined below (Shukri, 2009).

4.4.1. Public Awareness and Health Education

At present there are limitations as to what can be achieved in terms of educating the public through health promotion activities. These need to be developed further. There are related issues concerning lack of knowledge about the obligations and rights of patients and limited communication between service users and professionals. There even needs to be promotional work undertaken with medical and dental staff regarding disease prevention, medical laws and ethics (Shukri, 2009).

4.4.2. Public Expectations

Public expectation is quite high among the educated public in Kuwait, which will be a major challenge to health policy makers. People desire high quality services that meet all their needs (even secondary care services) and want them to be provided near to their homes in primary care settings (Shukri, 2009).

4.4.3. The Health Economy: A Burden of Costs

Medical advances and unmet needs are increasing due to the growth in the population, and costs are thus rising. A fundamental discussion needs to take place among politicians regarding funding cost effective health care. These decisions need to take account of the non-Kuwaiti population (63%) and workforce (80%), who are living and working in the country. The potential for using social insurance is the obvious option for a wealthy country like Kuwait, in order to provide health services free at the point of delivery. Any insurance system would need to: ensure efficiency and equity for citizens and non-citizens; reduce the health budget and develop regulations and monitoring bodies(Shukri, 2009).

4.4.4. Demographic Changes

Kuwait, along with governments worldwide, will have to make some radical strategic funding and priority decisions in the future. This is because there will be a persistent increase in demand for services that treat chronic diseases, such as cancers, coronary heart diseases and mental illness. These increases will result from the increase in the population of Kuwaitis over 60 years, which will increase to 8% by 2030 and to 25% by 2050 (Shukri, 2009).

4.4.5. Burden of Chronic Diseases

The incidence of chronic diseases is increasing, particularly obesity and diabetes. The WHO predicted that non-communicable diseases will constitute more than 60% of the burden of diseases by 2010. These types of diseases will demand continuous funding for services, which is an issue that needs to be addressed. This changing pattern of diseases will require considerable investment in public health and primary health care, including an increase in the number of practitioners with the provision of more and improved training programmes (Shukri, 2009).

4.4.6. A Shift from a Curative Approach to Improve Health

In Kuwait, the Government continues to focus on expensive programmes that will expand hospital services – in the public and private sectors. This approach only deals with the *outcomes* of ill health, rather than trying to *prevent* ill health at the outset. If there is to be a strategic shift in focus on to curative public health services (like prevention of chronic diseases), then resources need to be shifted away from the hospital development programme (Shukri, 2009).

4.4.7. Shortage of Medications

There are some indications that there is a shortage of vital medicines, which means patients/families are buying these medications from private pharmacies. In addition, there are some complaints that doctors are prescribing medicines that are not available in state-run community clinics and hospitals. Another problem appears to be that patients are not able to receive medication from a health region other than from their place of residence (Shukri, 2009).

4.4.8. Poor Infrastructure of Government Hospitals

As mentioned above, the hospital development programme is costly, particularly as many current hospitals (the most recent was built in 1981) do not have enough space, have poor foundations, have underdeveloped information technology and inappropriate transport facilities. Thus, there are renovation challenges if they are to be redesigned to become world class medical facilities (Shukri, 2009).

4.4.9. Manpower Development

Non-Kuwaiti health professionals currently dominate the health workforce. Any expanding health system will require more health practitioners who are trained to the high standard of current non-Kuwaiti health professionals. Variations in staff training, qualifications and capacity building are major challenges that need to be resolved, perhaps through the development of more medical schools and residency programmes (Shukri, 2009).

4.4.10. External Health Care Market

The Ministry of Health (MOH) needs to develop advanced health care facilities through a mixed economy of care. It needs to attract highly-paid and highly-qualified professionals to help develop this economy, as in countries like Saudi Arabia, the United Arab Emirates (UAE) and Qatar who are already one step ahead in advanced medical care and privatisation; the UAE, Bahrain, and Qatar are even moving into medical tourism (Shukri, 2009).

4.4.11. Health Service Management and Quality

There is an urgent need to invest in the management capacity of the health system, through leadership programmes and training. There has been a general neglect of such programmes, along with a lack of investment in information technology. This neglect has caused a lack of strategic direction and consequently, an ineffective use of resources and lack of knowledge regarding the health needs of the population (Shukri, 2009).

Quality is a particular issue which needs to be addressed. Investment in quality will reduce unit costs in the medium and long terms and increase patient, public and professional satisfaction and should minimise litigations. Public safety is an important element of any good health system.

4.4.12. Management Structure

The organisational structure of the MOH has not been modernised since 1980, and old rules and regulations persist; many 'old school' managers are still in senior positions within the agency, which ultimately affects the quality of patient care and resource allocation. There are also costly, laborious, and bureaucratic channels of communication between frontline staff and senior management. This creates distance and a lack of understanding among staff and managers, which is detrimental to the aims of the organisation as a whole (Shukri, 2009).

4.4.13. Lack of a Strategic Plan

To ensure the development of an effective health care system with progressive primary health care facilities, the Government needs to develop a strategic vision and plan for the future. The country is fortunate to have the resources to achieve a strategic shift in services and to develop the failing infrastructure (in 2007/2008 there was a large budget surplus of KD 6.3 billion). However, without the political will and effective operational leadership, this strategic shift will not occur; some Government officials even seek treatment in private clinics or go abroad because they know the public system is failing (Shukri, 2009).

4.4.14. Code of Ethics and Medical Law in Kuwait

There are no methods to assure ethical standards in the Kuwaiti health system. There needs to be an independent and formal body that sets appropriate and clear regulations. This lack of a clear vision regarding ethics has caused many disillusioned physicians and dentists to move to other countries over the past five years. At present, no clinical trials or studies can be performed by clinical staff; instead, researchers have to be studying or working within an academic institution to undertake such research. This means there is no distinction between academic and clinical staff in relation to research, which is clearly inappropriate (Shukri, 2009).

4.5. Summary

During the twentieth and twenty-first centuries, major health care developments took place in Kuwait. In 1961, the State of Kuwait gained independence and in the same year, the Ministry of Health was established. The Ministry of Health set up some legislation with four articles in the Constitution that set the foundations to embrace the philosophy of health care, conceiving a system not only for prevention and cure, but also to meet the moral, emotional, social and ethical needs of the whole population.

Six health regions, with populations of 250,000 to 300,000, were identified to provide a comprehensive range of programmes for each region. There are three levels of health care: primary; secondary and tertiary health care, which provide health care centres, general and specialist hospitals. About 6.9% of the national budget is allocated to health care, the per capita health expenditure was estimated at US$572 in 2005, and the Government is financing about 80% of all health care.

In recent times, more emphasis has been placed on identifying and collating statistics about the workforce within the MOH, the demography of the population, and people's health characteristics. In 2006, the MOH employed 33,990 people from an array of backgrounds (49.5% were Kuwaitis and 50.5% were non-Kuwaitis). Increases in wages have helped to improve the capacity within the system by attracting appropriately qualified professionals. A comparison of vital indicators in Kuwait between 2002 and 2006 shows a increasing trend in most areas, except the neonatal mortality rates (which show a slight decline). In 2006, the most important cause of death among both genders and all nationalities was heart disease.

Recognising the need to collect information to help provide, monitor/evaluate, and plan services in a more strategic manner prompted the MOH to attempt to develop a Health Information System that would respond to the organisation's needs. Over the last forty years, there have been a number of attempts to implement an effective system – some of which were more successful than others. In March 1995, a 10-year plan to establish a National HIS called 'Afya Net' was proposed; it aimed to ensure that all clinics and hospitals in Kuwait would be fully computerised and linked together to form an integrated health information system. Due to expense and contractual issues, the proposal was shelved.

In addition, the MOH is working in setting up an integrated electronic communication network to link all sectors and departments of the MOH including clinics, hospitals, and medical centres. These e-files would help create and maintain a central patient database that would be used by all stakeholders for service planning, providing, evaluating, and quality monitoring. Finally, improving the health of the population is the primary responsibility of the Kuwaiti government, represented by the Ministry of Health. The Ministry of Health need to set strategic plans that will overcome these barriers and challenges affecting the health care mission.

Chapter Five: Electronic Health Record System

5. 1. E-health: An Introduction

5.1.1. Definition of E-health

E-health is an umbrella term used to refer to the implementation and use of information technologies within a health care system. It is often defined as information and communication technology (ICT) within an eco-system comprising patients and other stakeholders that deliver health services (Agbele et al, 2010). E-health has also been defined as the amalgamation of a health care system and ICT, which aims to improve health and health care (Nykanen, 2006). Eysenbach (2001) defines e-health as the intersection of medical informatics, public health and business in relation to health services, where information provision is enhanced through the Internet and similar technologies. The World Health Organisation (WHO) (2005) suggests that e-health applications use digital data transmitted, sorted and retrieved electronically to support health care.

Information and communication technologies, or ICT, are defined by Gagnon as 'digital and analogue technologies' that 'capture, process, store and exchange information via …electronic communication' (Gagnon, 2009: p.1). Information technology can re-focus health care on the prevention of disease and the improvement of health status and services. Eysenbach et al, (2003) suggest that the key features of e-health are the development of information and services, that enable consumers to take more responsibility for their own health care and to participate in decision-making processes. Coach (2003) confirms that ICT can enable better communication and information flow between health providers, patients and policy makers (Coach, 2003 as cited in Enkin et al, 2005: p.58). Thus, e-health focuses on the patient and uses ICT to support the implementation of policies for the better management of identities, health records and secure transactions between stakeholders.

E-health uses wide-reaching technologies like the Internet, computer telephony, interactive voice response and wireless communication to improve information flow between health care providers, care managers, services and health promotion services (Deluca & Enmark, 2001). It encompasses a whole range of functions, such as medical diagnostics, digital data transmission of medical signals and images, laboratory reports, patient histories, purchase orders and insurance claims (Blake, 2001).

5.1.2. Essential Elements of E-health

According to Eysenbach (2001), e-health has '10 essential Es'. The list includes: efficiency, enhancing quality of care, evidence-based health, empowerment of consumers, encouragement of a new patient–health professional relationship, education of physicians, enabling health care information exchange and communication, extent of the scope of health care, ethics and equity.

Efficiency: The avoidance of unnecessary diagnostics and therapy with the more active involvement of the patient (Eysenbach, 2001: p.20).

Enhancement of the quality of health care provision means the patients have the power to choose between different health care providers and specialists who should be evaluated according to their quality and performance (Eysenbach, 2001: p.20).

Evidence-based health means that proven science and evaluation must form the basis of e-health interventions (Eysenbach, 2001: p.20). It is often difficult to prove the effectiveness of the role of e-health in long-term health conditions.

Empowerment refers to patient-centred health care, patient choice, collaboration, quality, participation and knowledge with better access to patient records and health care information on the Internet. These elements mean that the patient has more responsibility for their own health and is expected to make healthier decisions (Eysenbach, 2001: p.20). According to Beckman (1996), disease and doctors are no longer important in diagnosis (Beckman, 1996 as cited in Wilson, 2009: p.4). Wilson suggests that understanding the patient's 'needs and shaping health care services towards them is the basis of the new doctor–patient relationship (Wilson, 2009: p.4).

Encouragement of the patient–health professional relationship develops shared decision-making and evens the power balance between the two roles (Eysenbach, 2001: p.20).

Education of health professionals and patients is essential. Physicians can access online medical education and patients (or consumers) can obtain individualised health education alongside prevention information (Eysenbach, 2001: p.22).

Exchange and communication: Standardised interoperability enables better communication between different health care establishments (Eysenbach, 2001: p.20).

Extending the scope of health care: This means patients can use the Internet to access and obtain health services on a global level including advice and information regarding pharmaceutical products (Eysenbach, 2001: p.20).

Ethical challenges: The transforming patient–professional interaction brings new challenges, such as: online professional practices; informed consent; privacy and equity issues (Eysenbach, 2001: p.20). The importance of ethical and equity aspects should not be underestimated as they can undermine the trust between patients and health care professionals. One example of how e-health can affect the equity of health care is in relation to people without the money, skills and access to computers and networks. These patient populations (which, ironically, could benefit the most from health information) are those that are the least likely to benefit from advances in information technology, unless political measures ensure equal access for all. It is worth noting that there appears to be inequity between rural and urban populations, rich and poor, young and old, male and female and between neglected/rare and common diseases (Eysenbach, 2001: p.20).

5.2. The Development of E-health

5.2.1. Historical Overview

 The electronic health record (EHR) has been considered a critical and important application of E-health systems. Since the 1950s, systems of health care began to use electronic health records. This process was particularly motivated by the needs of academics. Research in the twentieth century provided evidence for the potential of computer-based records to improve patient care and placed more emphasis on the benefits of electronic health record systems that were able to share information with other health care providers. At this time, the varied terminologies among various organisations began to be resolved and by the 1980s, the administration of health care systems became increasingly automated.

Some early models of (EHR) systems were used in the 1960s and early 1970s, like the US-developed COSTAR (Computer Stored Ambulatory Record) system, was used jointly by the Massachusetts General Hospital and the Harvard Community Health Plan (Barnett et al, 1978; Huffman, 1990). Another system, known as The Medical Record (TMR) was also developed in 1970 at Duke University and was used in outpatient, inpatient and intensive care settings (Hammond, 2001).

The use of EHR systems slowly spread to many other organisations. In the 1970s, universities began to work with hospitals to develop computer systems that could be used in patient care, policy decision making and diagnosis. One example of this type of collaboration was the work of researchers at the Georgia Institute of Technology and Emory University; they developed a database to support the decision-making processes at Grady Memorial Hospital in Atlanta (Colleen, 1995). Electronic health record systems then became commercially viable and companies began to partner with health care institutions to develop different applications that could be used in varying sections of the public and private health care sectors.

An example of this commercialism is the collaboration between Stanford University, El Camino Hospital and the Lockheed Corporation; these companies developed a clinical information system, which is still available in a newly-developed form from Eclipsys, Inc. Another example of an early commercial partnership was the Health Evaluation through Logical Processing (HELP) system. This was first created in the US, in the Latter Day Saints Hospital (now Intermountain Health Care) and improved and marketed by the 3M Company (Kuperman et al, 1991; Amatayakul, 2007).

By the 1980s, the focus moved to computerising hospital administrative and financial systems, which were relatively simple and cost effective systems to automate. As clinical systems improved, computer technology began to be developed for secondary areas, such as in laboratories, for radiology and in pharmacy (Amatayakul, 2007). The first version of the HL7 standard was created in the early 1980s, which resulted from the need to identify standards for the exchange of health care data; these improvements were well received and progress accelerated. During the late 1980s, health care institutions began to combine their respective laboratory computer systems so as to integrate them into 'clinical information systems'. From a single terminal or personal computer (PC), which was located in an office or hospital ward, health care workers were able to retrieve all their patients' test results, including microbiology information, blood chemistry, radiology and biopsy reports (Stein, 1997).

In the US, in the late 1980s, a conference at the National Institutes of Health (NIH) led to a report by the Institute of Medicine (IOM) dealing specifically with electronic health records. The report called for a total rethink of the way medical records were developed, maintained and accessed in order to meet the developing needs of health care. The report, written by Dick and Steen in 1991 was called *The Computer-Based Patient Record: An Essential Technology for Health Care*, and it explored three key areas of health care; technology, policy and uses and users.

Thus, a new record was developed and given the name 'computer-based patient record' (CPR). The report (Dick & Steen, 1991) described 12 ways in which the new record could be used; in addition, it stressed that CPR should focus on the patient rather than on treatments and medical terminology. In 1996, the IOM created the Quality Initiative Series, which focused on assessing and improving the nation's health. The Series suggested that the health care system was weak and fragmented, providing poor quality health care because services were not being used effectively.

The next decade saw, another series of reports published, focusing now on the quality and safety agenda, and including *To Err is Human: Building a Better Health System* (IOM, 2000) and *Crossing the Quality Chasm: A New Health System for the 21st Century* (IOM, 2001). In this Quality Initiative Series, *To Err is Human* raised the profile of the huge number of errors being committed by health care institutions; it said the system needed fundamental improvements in delivery, and put no blame on the misconduct or negligence of individuals. *To Err is Human* focused on how weakness and mistakes could be managed, suggesting a strategic way to reduce errors. It identified the need for a culture of safety, trust and knowledge sharing at all levels of health care provision and processes (IOM, 2009). The IOM called for improvements in patient and provider safety through more streamlined workflows, as well as a better understanding of how IT could reduce human error. The IOM also proposed voluntary, confidential reporting systems that did not punish individuals; it suggested the need for local legislation to use peer-review protection in data collection and analysis. After 2000, the IOM published several other reports, which described the health care system as fundamentally broken.

In *Crossing the Quality Chasm* (IOM, 2001), the IOM proposed care should be evidence based and system oriented. It suggested the objective of care for nurses and clinicians should be to provide safe, effective, patient centred, efficient, timely and equitable care, supported by IT.

The IOM put forward other possible ways in which health care information technology (HIT) could improve quality of care. They included *safety* (through electronic order entry systems), *effectiveness* (using automatic reminders to achieve best practice by evaluating outcomes in a systematic and scientific way), *being patient-centred* (providing up-to-date clinical data), *timeliness* (immediate access to tests and diagnoses), *efficiency* (e.g. reducing redundant medical tests) and *equity* (improving and increasing options for access and communication).

In Crossing the Quality Chasm (IOM, 2001) mapped 10 new ground rules for the redesign of the health care system. The report recommended that this redesign should incorporate all health care stakeholders (i.e. patients, clinicians and others). The implementation of these rules in the redesign of health services had implications for health care professionals as it meant they had to work in new ways to meet new standards. The 10 new redesign rules were:

1. Care is based on continuous healing relationships.

2. The patient is the source of control.

3. Care responds to individual patients' needs and values.

4. Shared knowledge and free flow of information.

5. Evidence-based decision making.

6. Safety as a system priority.

7. The need for transparency.

8. Anticipation of needs.

9. Cooperation among clinicians.

10. Continuous reduction of waste.

The third phase of the Quality Initiative Series focused on how health services should operate on the ground. The quality of health systems was discussed in the following reports: *Health Professionals Education: A Bridge To Quality* (IOM,2003a), *Key Capabilities of an Electronic Health Record* (IOM, 2003b), *Patient Safety: Achieving a New Standard of Care* (IOM, 2004a), and *Keeping Patient Safe: Transforming the Work Environment of Nurses* (IOM,2004b)

It was clear that many of the professionals who subscribed to these views believed that:

'All health professionals should be educated to deliver patient centred care as members of an interdisciplinary team, emphasising evidence based practice, quality improvement approaches, and informatics'. (IOM, 2003a, p.45).

The reports produced five criteria that were expected of health care workers, i.e. interdisciplinary team working for providers, use of evidence-based practices, provision of patient-centred care, use of informatics and quality improvement mechanisms. There were three overlapping levels of systems within this set of reports by the IOM. They offered elements of reform that combined an environmental level, an organisational level and a level of interaction between health care providers and patients (IOM, 2009). In summary, the IOM reports produced a vision to transform the views of policymakers and health care leaders, which included redesigning the structure of the health care system and a method of implementation; the development and use of health information system was central to the success of this vision (Greiner & Knebel, 2003).

Moreover, there were further health information systems developed in Europe. These included the Diogene system at the University of Geneva, which was conceived by Professor Jan Scherrer in 1977-8 and developed over the past 20 years under his direction (Borst et al.,1998) ; the BAZIS (HISCOM) HIS is originated from a government-sponsored project at the Leiden University Hospital (1972-6) and resulted in an operational system with 100 terminals (Bakker and Leguit,1999); and in the UK, computers first appeared in UK general practice in the 1960s as *ad hoc* systems developed in university research departments by pioneer enthusiasts, with early commercial systems appearing in the late 1970s sponsored by the Department of Health.

UK general practice now has one of highest level of computerisation in Europe (Kalra,2002). Computerisation has had a major impact on primary healthcare practitioners, with systems allowing them to gain greater insight into their list of patients, and an ability to respond to their preventive health care needs (Kalra,2002).

5.2.2. Definitions of an Electronic Health Record System

Electronic health record definitions suggest that the EHR is a tool that allows health information to be produced in an electronic format enabling authorised users only access to it in several locations at any time. Waegemann (2002) suggests that the use of the term EHR remains widespread; however, it is useful to note that several other terms for EHR still exist, such as: Electronic Patient Record (EPR); Electronic Medical Record (EMR) and Computer-Based Patient Record (CPR). Even though there are many different ways to describe the EHR, its general function and clinical relevance remain the same, for example, it is usually used for billing, reporting outcomes, quality management, strategic planning and public health disease reporting (Middleton et al, 2005).

There have been many definitions of electronic health record systems, but there is no single world-wide definition. This is because different health organisations throughout the world have developed their own respective meanings, which reflect the range and scope of their activities. Some examples of the terms that were developed originally include the electronic personal health record (EPR), electronic health care record (EHCR), electronic medical record (EMR) and computerised patient record (CPR). The literature reveals a range of definitions for the EHR that differ slightly in their detail, but all have a similar thrust in meaning. Some examples follow:

- A longitudinal collection of personal health information of a single individual, entered or accepted by health care providers, and stored electronically. The record may be made available at any time to providers, once authorised by the individual, and can be used as a tool in the provision of health services. The individual can access their record and can request changes to its content. The transmission and storage of the record is rigorously controlled (Advisory Committee on Health Infrastructure (ACHI), 2001).

- An electronic longitudinal collection of personal health information usually based on the individual, entered or accepted by health care providers, which can be geographically distributed or kept at one particular location. The aim of the record is to support continuing, efficient and quality health care. The record is controlled by the 'consumer' or patient and is stored and transmitted securely (Briggs et al, 2000).

- A structured set of clinical, demographic, environmental, social and financial data and information in electronic form. The record documents the care given to a single individual (American Society for Testing and Materials (ASTM), 1996).

- An electronic patient record system designed to support individuals by producing access to accurate data, practitioner alerts, clinical decision support mechanisms, links to bodies of medical knowledge and other aids (IOM, 2003a).

- A health care record in computer readable form (ASCX12, 2009).

- A set of components that form the mechanism by which electronic health records are created used, stored and retrieved. It includes people, data, rules and procedures, processing and storage devices and communication and support facilities (Dick &Steen, 1991).

- A set of health data about a person across their lifetime, including facts, observations, interpretations, plans, actions and outcomes. Health data can include information on allergies, history of illness, injuries, diagnostic studies, assessments, prescriptions, consultations, treatment records, etc. Health data can also include wellness data, such as immunisation history, environmental information, administrative data, health insurance and legal data, such as consent history (Computer-based Patient Record Institute (CPRI), 1995).

- A longitudinal electronic record of patient health information resulting from interactions with different health care organisations. Information can include patient demographics, progress notes, problems, medications, immunisations or radiology reports, etc. (Health Information and Management Systems Society (HIMSS), 2006).

- One or more repositories, physically or virtually integrated, of information in computer processable form, relevant to the wellness, health and healthcare of an individual, capable of being stored and communicated securely and of being accessible by multiple authorized users, represented according to a standardized or commonly agreed logical information model. Its primary purpose is the support of life-long, effective, high quality and safe integrated healthcare(ISO/TC215,2011).

The International Standards Organisation (ISO)/TC 215 (2005) report described the electronic health record in terms of its content and structure, which reflects what the ISO has termed the 'sharable EHR' (SEHR); this has a wider function than the ISO's term, 'generic' EHR. The ISO defines the generic electronic health record as a 'repository of information regarding the health status of a subject of care, in a computer processable form' (2005: p.2). Therefore, according to the ISO a 'generic' EHR could exist in isolation, without communicating information to other stakeholders, or even within its own organisation. However, this concept is not as good as the electronic health record for integrated care (ICEHR) definition, which required data to be:

'stored and transmitted securely and accessible by multiple authorised users, having a standardised or commonly agreed logical information model that is independent of EHR systems and whose primary purpose is the support of continuing efficient and quality integrated health care.'

(ISO, 2005: p. 2)

Healthcare Information and Management System Society (HIMSS) Analytics (Davis, 2006) discussed the concept of ICEHR as including, 'the subset of each care delivery organisation's EMR presently assumed to include summaries such as ASTM', Continuity of Care Record (CCR) and HL7's Care Record Summary (CRS), and possibly information from pharmacy benefit management firms, references labs and other organisations about the health status of patients in the community. The ICEHR contained data on services received by a patient over a period of time and which were provided by differing agencies in a particular location or country (Davis, 2006).

This means that the ICEHR was not controlled by any one provider. However:

'Whilst the ICEHR is the target for interoperability of patient health information and optimal patient care, it is of note that the large majority of EHRs in use at present are not even shareable let alone have the additional characteristics required to comply with the definition of an Integrated Care EHR.'

(ISO, 2005: p. 5–6)

For a record to be shared, an EHR must have 'a standardised or commonly agreed logical information model' (ISO, 2005: p. 11). It is worth noting that if an EHR is to be shared with other stakeholders, providers are more likely to submit data to the record. A shareable EHR must meet certain standards in order to ensure its contributors can operate their systems between and among each other.

This interoperability is necessary to ensure the various disparate departmental systems within an organisation can communicate. For example, it is likely that if a hospitals aims to ensure its own systems are interoperable, then it will inadvertently move toward an EHR that is 'shareable' with other agencies. The ISO defines the relationship between the shareable EHR and the ICEHR as follows:

'The shareable EHR… will contain mainly detailed information required for patient care within a single location and it will be created and maintained on a local EHR system… When the object of the EHR is to support the integrated care of patients across and between health enterprises, it is called an integrated care EHR (ICEHR).'

(ISO, 2005: p. 10)

The ability to share information among several providers began to characterise EHRs in 2008. On April 28, 2008, a report to the Office of the National Coordinator for Health Information Technology, the National Alliance for Health Information Technology (NAHIT) proposed definitions for an EMR and EHR, as follows:

'Electronic Medical Record: An electronic record of health related information on an individual that can be created, gathered managed and consulted by authorised clinicians and staff within one health care organisation.

Electronic Health record: An electronic record of health related information on an individual that confirms to nationally recognised interoperability standards and that can be created, managed and consulted by authorised clinicians and staff across more than one health care organisation.'

(National Alliance for Health Information Technology, 2008 as cited in Wager et al, 2009: p.111)

An EMR refers to an organisational system that includes at least four key functions: health data and information; results management; order entry and decision support. In comparison, the EHR includes eight key electronic health record functions (IOM, 2003a as cited in Wager et al, 2009: p112).

For the purposes of this research, we will define EHR/EMR to reflect the definition provided by Upham (2004); this definition suggests that an EHR can:

- Be integrated with practice management systems for scheduling and billing.

- Ensure transparent access to decision support systems to support diagnosis and treatment.

- Warn health workers about medication errors, drug interactions and patient allergies.

- Improve data collection to enable quality management mechanisms.

- Provide access to electronic data exchange to produce electronic health information for other health care providers.

5.3. The Motivation to Adopt an Electronic Health Record

5.3.1. Limitations of Paper-based Medical Records

The literature has demonstrated that there are many problems associated with paper-based medical records (Burnum, 1989; Hershey et al, 1989; IOM, 1991). Some limitations of a manual record system include: storage problems; lost/misfiled charts; ineffective data management and written errors (Al-Farsi & West, 2006). Handwritten records can be badly written, inaccurate, incomplete, poorly structured and even lost altogether; this can make it difficult to validate, collect and analyse data, to make decisions and to ensure quality of care (Young et. al, 1998; Maghazil, 2004).

In an analysis of some US Army outpatient clinics, Tufo and Speidel (1971) found 20% of the charts had missing information, e.g. radiology reports and test results, which is a finding shared with more observations from other research (Romm & Putnam, 1981; Korpman & Lincolon, 1988).

Maghazil (2004) has summarised the main reasons why data could be missing from a record:

- *Omission*: The responsible clinician might not have asked the appropriate or necessary questions, or conducted the correct exams/tests.

- *Delays*: Delays in recording patient information or delivering it to another member of staff.

- *Misplaced information*: Once provided, data is lost in transit.

Below is a summary of the results of a study conducted by the Institute of Medicine on a sample of 1,149 patient visits to five outpatient US Army facilities (IOM, 1997a):

- Between 5% and 205 of the charts were found to have missing information. Out of these samples, 75% had missing laboratory results and 25% were missing data (data were either lost, incomplete, or unreadable).

- 13%−79% of laboratory results were not placed in the paper record.

- 10%−49% of the visits were missing a clear statement of the problem.

- 11% of the patient visits contained no previous clinical data.

- 6%–49% of the visits were missing a clear course of treatment.

- 10%–73% of the records were missing general medical information useful for health prevention.

The IOM report (1997) demonstrated that records were not available in up to 30% of the patient visits. The report summarised reasons for this lack of availability (IOM, 1997a), as follows:

- Patients often seen in more than one clinic in the same day.

- Physicians retaining patient records in their offices.

- Charts not being forwarded to clinics in time.

- Physicians removing patient records from their offices.

- Records being misfiled.

The physical location, extent and lack of accessibility of paper records can be a serious limitation. When there are different service providers with differing management structures and personnel, patients may receive care in one location, yet their medical records remain in another; records then have to be transported to the patient causing delays and errors – the process thus becomes cumbersome and unworkable (Lin, 1999).

The nature of work- loads and management practise in a large, busy hospital means that paper-based records can be unavailable for days – perhaps because a consultant is awaiting discharge notes or they are hidden under other papers (Shortliffe et al, 1990). As well as having lost and inaccurate data, paper records can also be damaging if there are too much or redundant data. The records of some long-term patients can become exceptionally long and heavy, making it difficult to find information and this also creates logistical and storage problems.

The patient record must be able to provide and coordinate care for an individual patient so it must describe care provided by multiple providers. It should also support population-based services for example, vaccination regimes, routine cervical smear tests etc. (Committee on Tasks of the General Practitioner, 1983; Dutch College of General Practitioners, 1990). It is clear that traditional paper-based patient records are unable to provide such population-based functions, for example, searching a practitioner's paper records for more than 2,000 patients is time consuming and boring (van der Lei et al, 1993).

5.3.2. The Need to Adopt an Electronic Health Record System

Adopting an EHR will increase the accessibility and sharing of health records among authorised individuals (Barrows & Clayton, 1996). In recent years, the need for transportability of patient information has also become an important factor; this initiated a set of transportability standards to be developed. It was clear that there was a need for the transportability of records, enabling other providers to access easily the latest information about a particular patient. There was also a need for the development of a personal health record (PHR), which contained information that the patients themselves entered into the system. Finally, costs had to be controlled through the development of a more structured approach to health care information transportability, whereby all professions could work together towards a recorded, integrated approach centred on the individual patient (Chheda, 2005).

Garfield (2002) pointed out that the need for an electronic health record was addressed by Dr. Charles Boelen at the Dublin 1998, the World Organisation of National Colleges and Academics(WONCA) conference, in his keynote speech:

'We have to address the *galloping fragmentation* between the different parties and players on the world stage of health care delivery.'(as cited in Garfield,2002,P.1)

In 1999, Dr. Peter Branger form the Erasmus University Hospital in Rotterdam, highlighted the issue further at the TEHRE conference (London). He suggested that not only did an EHR improve the administrative and economic capabilities of health care organisations, but it also had a direct impact on the quality of the care provided to the patient – and thus to patient outcomes (Garfield, 2002). Branger (1999, as cited in Garfield, 2002, p2) said:

'The quality of communication between health care professionals greatly influences the *quality of patient care*.'

5.3.2.1. The overall Challenges, Driver, and Applications of Electronic Health Record

There are many challenges for health care organisations when developing electronic health record. It is important for strategic managers to understand the long-term and widespread benefits of this transition and ensure an infrastructure is in place to create intra-network connections. Networked access is achieved via a range of devices across the health care system. Some examples of the challenges health care organisations face include:

- *Enhanced Quality of care*: There is a strong tradition of paper-based health care records being maintained across many health systems. Information needs to be gathered more efficiently to capture a range of data including: correspondence; patient meetings; treatments and prescriptions. This knowledge-based data can then be used to identify best practice and improve services through quality assurance mechanisms.

- *Improve productivity and efficient organizational workflow*: The success of health care organisations depends on how well providers deliver services and the efficiency of care staff. There are frequent examples of skilled providers wasting time on paperwork instead of treating patients. In addition, maintaining paper-based records can take up much time and resources as medical staff find themselves dealing with duplicate or lost records and charts.

- *Dependable information and bettered Communications at provider centres:* There are numerous organisations providing a range of services in a variety of locations. It is common for patient records, test results and other critical information to be unavailable or inaccurate or even lost. A better e-health system would solve these issues.

- *Reduce Costs*: The costs of inefficient and ineffective manual data collection and communication techniques are high. There is constant political and economic pressure put on organisations to reduce the costs of management and administration and spend more on patient care.

- *Protect privacy of medical records*: There are rigorous requirements for health care providers to maintain standards of security and privacy regarding patient records. When developing electronic methods for sharing patient information with other providers and patients, these standards must be upheld (Deewan & Grag, 2006).

The challenges outlined above indicate how health care organisations can benefit greatly if they develop and apply electronic communication systems. Health care services are characterised by the production and reliance on information and the need for effective communication among a diverse set of stakeholders. Ganesh (2004) suggests that a range of elements can drive the development of e-health; they include:

- *Consumer preferences*: Increasingly, consumers access health-related information from the Internet, which supports equity and ensures the correct information is provided in a timely manner.

- *Technical capabilities*: Speedy connectivity and improved access through electronic communications; availability of portable network-enabled health monitoring and diagnostic equipment.

- *Health system policy*: Strategic and comprehensive provision of health services using integrated services to enhance existing capabilities, and to optimise the use of scarce resources.

- *Economic considerations*: This includes the need to shift care from hospital to community settings to reduce costs and the need for a comprehensive yet cost effective means of achieving the national health policy set out by the government.

Increasingly, health care organisations view state-of-the-art information technology (IT) as fundamental when providing health-related information services, monitoring quality of care and supporting policy decisions, as well as managing costs and developing organisational structures, training staff and promoting wellness (Raghupathi & Tan, 2002). Internet-based support groups exist for almost every disease and condition, and there are blogs concerned with many disease categories (Forkner-Dun, 2003). To help understand the areas in which electronic health applications can be used, it is useful to set them into specific groups: consumer health; clinical care; financial and administrative transactions; public health; professional education and biomedical research (Ganesh, 2004).

However, despite the obvious benefits of e-health, a number of barriers still impede the widespread adoption of such technology by health organisations and consumers. Many consumers continue to be unaware that they can access specialist knowledge from the Internet (Kedar et al, 2003). In addition, the use of electronic communication in the medical field means a variety of legal issues become important, including patient confidentiality, the patient's right to informed consent, medical record information, custom and practice standards, licensing, and advertising (Spielberg, 1998). Anderson (1997) also suggests that clinical information systems can sometimes interfere with traditional practice routines and that physicians can find this difficult to accept.

Ganesh (2004) points out that e-health technologies can be integrated fully into a health care system only if certain issues are overcome first, such as:

- *Technical problems* (e.g. design and reliability constraints, the need for adequate support infrastructure).

- *Knowledge* (e.g. lack of end-user training, inadequate dissemination of evaluation outcomes and sharing of expertise and lack of awareness of what online health resources exist).

- *Organisation* (e.g. the need to satisfy a diverse range of stakeholders with differing and often conflicting agendas, varying requirements and expectations, the need for a timely and flexible response to service needs, unpredictable demands, resistance to change and the need to integrate services in response to the working arrangements of all staff).

- *Regulation and policy* (lack of concrete standards for maintaining privacy and confidentiality of medical records, licensing, accreditation of professionals, liability, lack of suitable payment mechanisms).

- *Social and economic* (e.g. variation in culture, how people behave when they are ill, language, lack of continued funding, updating technology while controlling costs).

5.3.2.2. The Categories benefits of Electronic Health Record

All health care organisations use some form of health information technology. Most of these organisations could benefit more if they extended their current e-health applications. Three general categories of potential benefits can include:

- *Quantitative benefits*: Measurable financial benefits achieved directly from a particular technology (e.g. time and cost can be saved by using electronic data interchange technology to send live surveillance data or to submit medical claims).

- *Qualitative benefits*: These are more difficult to measure, however they can be directly and indirectly linked to certain technology (e.g. accurate data, wider accessibility, fast transfer of data and linkage of data elements). Benefits are measured in terms of the impact of the technology on the performance of the systems and their efficiency.

- *Strategic benefits*: Electronic medical records support the current and long-term needs of health care (Al-Shorbaji, 2001) (e.g. data collection and analysis can provide operational information on a short-term basis, but in the long term, this data forms the foundation for medical and health research and strategic planning.

5.3.3. Data Management

5.3.3.1. Data Accuracy

Accuracy and availability are important when managing data within a database of any kind in order to achieve effective and efficient information retrieval (Hoffer et al, 2004). Inaccurate data can generate problems when trying to identify patients, produce correct prescriptions, identify health care trends and undertake other operational issues. Inaccurate patient identity causes health care information to be duplicated and kept at numerous different locations causing confusion and inappropriate service provision or treatment for an individual – as well as wasted expenditure. This unmatched information creates multiple records for one individual, which then exist within one or across several health care institutions (Bell & Seth, 2001). To elaborate; laboratory results or other information about a patient may not be matched to the correct patient record.

Thus, a provider may be unable to view a patient's entire health history before making life-altering decisions about current and future medical treatments. Some patients even provide deliberate or accidental false identification (e.g. social security numbers) and use aliases or nicknames in order to avoid health care procedures requirements.

Another problem is the large amount of adverse drug taking that can injure or kill people (Kohn et al., 1999). Such situations include patients receiving the wrong medication, receiving the wrong dose of the correct medication or receiving medication that has an adverse reaction with other substances or other issues specific to that patient (Leape et al, 1993; Leape et al, 1995).

The paper-based drug-ordering process is complex and involves the physician or provider writing an order and then an assistant transcribing the order for the dispensing department. Finally, the medication has to be delivered and then administered. Each step in the process involves the possibility for human error. Studies have shown that 39% of drug mistakes occur with the physicians' ordering the wrong medication because of lack of information about the patient (Leape et al, 1995). Finally, data accuracy problems can cause health care providers to submit missing or inaccurate patient billing information to insurance companies and government health organisations (Post0n et al, 2007).

5.3.3.2. Data Availability

There are many problems associated with data being unavailable to those who need it. This usually occurs when a person's identity has been consistently recorded inaccurately, which can make it difficult to locate at a late date. For example numerous duplicate health care files may exist for one patient and each file could use a different 'identifier' for the same patient. This may mean that files cannot be located or there may be a large time lag in obtaining the medical history of a patient during a consultation. In addition, it is likely that much data, which are stored in health records, are out of date meaning current decisions about a patient's medical treatment could be based on old information and therefore incorrect. Comprehensive past history of patients can easily be wrong if personal details are not updated, e.g. job, address, specialists, service providers etc. It is unfair to expect individual patients to remember all the details about their medical conditions and treatments, so if medical records are not updated accurately, it means service providers never receive a complete history of their patient.

Another issue concerning availability relates to information being available at the right time. For example, during a hospital visit, a patient's file may not be delivered on time, making the consultation useless and patients may not be able to begin their treatment when needed (Poston el al, 2007).

5.3.4. Advantages of an Electronic Health Record System

Numerous studies have revealed the advantages of the electronic health record (Beynon-Davies, 1998; Southon et al, 1999; Anderson, 2000; Berg, 2001; Laerum et al, 2001; Giuse & Kuhn, 2003; Reussa et al, 2004; Ruland, 2004). Studies have shown that using EHRs can reduce medical mistakes, increase communication between users, reduce paperwork, increase safety, help to detect adverse health events, enable more appropriate use of health care services and (potentially) lower costs. Such advantages have been discussed widely, for example, by Hunt et al (1998) and Balas et al (1996). On other hand, there are many perceived advantage of using electronic health record systems to acquire, organise, and view health record data. The electronic health record system would lead to avoid the duplication of data (e.g. data entry), and maintain and communicate securely and consistently in line with clinical needs. The electronic health record system can deliver real-time alerts and decision support on the basis of medical knowledge and information previously document about each patient healthcare (Kalra, 2002)

Clarity is another key advantage of using an EHR system. Electronic records are far more readable than handwritten paper documents stuffed into old folders; this clarity can reduce medical and medication errors. Searchability is another reason why electronic records are useful because they can be scanned for drug interactions or for consistent patterns of symptoms. On a social level, EHRs are searchable for patterns of disease, prescription use (or abuse), treatment outcomes or even the costs of therapy (Terry & Francis, 2007). Electronic records can also be matched with evidence-based protocols to identify treatment strategies that do not meet the standard of care, or they can be used to recommend better methods of managing patient care.

Electronic records also allow for timely access to services and increased physician efficiency (Kaplan & Lundsgaarde, 1996). Increased accessibility is important: EHR information does not sit in paper 'silos'; instead it can be combined or linked to other records to maximise the coordination of care for an individual; EHRs can also be made available to providers throughout the world – potentially following patients as they move for work or recreation.

Using an EHR means health systems are able to maintain permanent chronological histories of patients' medical problems, treatments and care plans because each 'event' is recorded with the time and date. Thus, the record develops the capability to display data in flexible ways, such as

flow charts and graphs (Dick & Steen, 1991). Electronic data can also enable decision support systems to improve quality and monitor the process of health care delivery (Elson et al, 1997; Roesch et al, 2003).

EHRs allow access to health records from a range of different locations simultaneously and enable electronic transmission of health records for data sharing. EHRs also ensure a certain level of standardisation and consistency in the delivery of health care because they require and highlight interventions that should or should not be taken. Thus, they help drive health care delivery toward a more evidence-based care system (Reussa et al, 2004).

Sometimes, EHRs are perceived as stand-alone systems operated by physicians in offices or hospitals. Ideally, however, EHRs should be integrated into a national health information infrastructure that enables the secure transfer of health care data for authorised purposes; during this process, electronic records can support personal health management, public health and population health management and research, in addition to supporting clinical care (Collins, 2000; Lorenzi et al, 2004). Slack (1998) suggests that computers offer tremendous opportunities to place in control of health care.

Ramsaroop and Ball (2000) point out that patients, as consumers of health care, are increasingly expecting to exercise personal and informed autonomy over their health. In 1997, the Eurobarometer Survey found that over 40% of Europeans are interested in on-line access to health information and some services(Flash Eurobarometer97,1997). Moreover, a report done by the Information Society found that 23% of Europeans surveyed had searched for health information on the Internet within the past three months(Eurobarometer Special Report 141, 2002). Ball and Lillis (2001) indicated that the Internet can facilitate crucial components of healthcare delivery, including consumer education and disease management.

5.4. Characteristics and Role of Electronic Health Record

5.4.1. The Characteristics of Electronic Health Record

An electronic health record (EHR) is only as good as its commissioners, designers and its users. As Papagounos and Spyropoulos (1999) indicated, the medical record is not a reflection of the life and health of patients; it is, in fact, created by professionals working in institutions who are tasked with managing the treatment or prevention of illness. An effective EHR does not include reams of meaningless health-related patient data; instead, it provides information about a growing and evolving story, through which its 'authors' are accountable for health care actions that have been performed or not performed.

According to Kalra (2001: p.51) "at any point in time, a patient's health record provides the information basis against which new findings are interpreted, so its integrity, completeness and accessibility are extremely important. An EHR system must be able to offer a flexible framework to record the patient–doctor consultation process, and to reflect the diverse approaches of clinicians and the complexity of each patient encounter. An electronic health record must be underpinned by a common terminology that can communicate clinical content and reflect how different practitioners express themselves. Yet it must also be able to support the need for a structured (or semi-structured) interpretation of each entry". Rector et al (1993) emphasised that the medical record needs to be 'faithful', which implies that it needs to be: attributable, permanent, authentic and able to reflect negative, uncertain and conflicting statements.

5.4.2. The Role of Electronic Health Record

The health record is an important tool supporting the quality in clinical care. Just as there will be many different parties by whom it is accessed, the record can play many roles in the provision of care to individuals and to populations. The following list of roles (table 2) for the EHR is a consolidated set derived from Barnett and Shortliffe ,(1990), the GEHR project (Ingram, Southgate et al. 1992), Health Online (Health Online: a Health Information Action Plan for Australia 1999), the ScopeEPR project (Pringle and Purves 1997), collated by Heard et al. (2000).

Table 2: Roles for the electronic health record

Supports consumer involvement Protects personal privacy and reinforces confidentiality Provides a consumer view of information Accommodates consumer decision support and self care Ensures accountability of health professionals Accesses information for the consumer
Supports consumer health care Forms the basis of a historical account Anticipates future health problems and actions. Describes preventative measures Identifies deviations from expected trends Accommodates decision support
Supports communication Supports continuing, collaborative care and case management Accesses medical knowledge databases Allows automatic reports Supports email generation and electronic data interchange (EDI) Enables record transfer Enables record access when and where required Supports selective retrieval of information
Supports management and quality improvement Enhances the efficiency of health care professionals. Supports continuing professional assessment Facilitates management tasks and reduces routine reporting Demonstrates and improves cost-effective practice Accommodates future developments Provides a legal account of events Provides justification for actions and diagnoses
Supports population health care Supports policy development Provides evidence for development and evaluation of programs
Supports enquiry and learning Supports clinical research Assists with clinical audit Supports medical education

5.5. Key Capabilities and the Adoption of Electronic Health Records

5.5.1. Key Capabilities

It is important to understand the functions of EHRs if we are to understand how such technologies can benefit health care systems. In 2003, the Institute of Medicine stated that the key functions of EMRs or EHRs should aim to achieve certain goals: improve patient safety; support the delivery of effective patient care; facilitate management of chronic conditions and improve efficiency (IOM, 2003b). These core functional capabilities can be divided into eight categories:

1. *Health information and data*: The electronic documentation, storage and retrieval of patient data, which is needed to make decisions about their care, such as medical history, tests results, allergies and medications.

2. *Results management*: Managing the results of all types of treatments or assessments, such as electronic reports of laboratory results and radiology procedures with automated displays of previous results.

3. *Order entry and order management*: A computerised order entry system that can provide information to support decision making. This sort of system can delete lost orders and illegible handwriting, generate related orders, monitor duplicate or contradictory orders and reduce the time taken on paper work.

4. *Decision support*: A way to enhance clinical performance by providing reminders, warnings and other tools to help providers and staff make appropriate clinical decisions and improve patient care.

5. *Electronic communication and connectivity*: Supporting electronic communication among health care team members, external care partners (such as pharmacists) and the patient. This also relates to connectivity to data sources that are external to the EHR for the purpose of sharing data.

6. *Patient support*: Tools that can be used to support patient self-care and the management of chronic diseases. It includes educational materials and patient web portals.

7. *Administrative processes*: Including scheduling, billing and claims.

8. Reporting and population health management: The tools and clinical logic/business rules necessary to view and analyse data from the EHR and to manage populations of patients (IOM, 2003b).

The literature mentions that there are two specific functions recommended by the IOM to improve the quality and safety of health care: 1) computerised provider order entry (CPOE) and 2) clinical decision support (Ash et al, 2003; IOM, 2003; Smith, 2004). Computerised provider order entry is defined as the: 'process by which a clinician with order writing authority sits at a computer to directly enter patient care orders' (Ash et al, 2003: p. 229). Computerised provider order entry eliminates lost orders and illegible handwriting and generates related orders automatically; this helps to improve safety and quality (e.g. laboratory tests needed to monitor a specific medication), monitor for duplicate or contradictory orders and helps to reduce paperwork (Ash et al, 2003; IOM, 2003).

Computerised provider order entry also help to prevent medical error through improved communication, easily accessible knowledge, requiring specific information (e.g. the a drug dose), help with calculations, checks performed in real time, help with monitoring, support to make evidence-based decisions and rapid response to and tracking of adverse events (Bates & Gawande, 2003). Health-related electronic systems can include other general support functions including help with finance, accounting, patient registration clinical information, human resources management, pharmacy, radiology, communication, education and reference resources (Smith, 2004). Additionally, Zuber (2002) pointed out that EHR systems should be able to validate any information contained in the electronic entry, provide a back-up mechanism, offer protection from a disaster and include contingency plans to access patient information if the system crashes (Zuber, 2002). Essential functions for EHRs are the ability to exchange information when care services are being handed over from one organisation or staff member to another.

They should be able to exchange information between central and regional facilities and data sets (Dougherty, 2005) as well as respond to administrative, research and quality improvement queries (Dyck, 2002).

Clinical decision support also improves safety and quality by providing automatic reminders about preventive practices, such as vaccination regimes, drugs alerts for dosing and it provides electronic resources for data interpretation and clinical decision making (Ash et al, 2003; IOM, 2003; Smith, 2004).

An example of a very successful EHR system that has integrated applications like pharmacy, radiology, laboratory, dietetics, progress notes, billing and patient administration into a single system, is the Veterans Health Administrations (VHA) and VistA (Veterans Health Information System and Technology Architecture). The VistA system has wiped out nearly all paper record keeping in the VHA health facilities (Graham et al, 2003).

However, the functions of an EHR in Massachusetts were assessed by Simon et al in their study in 2007. This research questioned 1,884 physicians and assessed the availability and use of 10 EHR capabilities: electronic prescribing transmittal; laboratory order entry; alerts, warnings and reminders; radiology order enter; clinical messaging; problem lists; medication lists; radiology test results; visitation notes and laboratory test results. The results demonstrate that the most commonly reported functions were the ability to view test results (84.8%) and to document visitation notes electronically (84.0%), but a much smaller number reported being able to order laboratory tests electronically (46.8%) or transmit prescriptions to a pharmacy electronically (44.7%) . For each of the 10 assessed functions, fewer than 75% of physicians reported using the function most or all of the time if it was available in their system.

Regarding the availability and use of the clinical decision support system (alerts, warnings and remainders), 53% of the physicians reported having this function but only 31.2% of them used it most or all of the time; finally, 73.6% of the physicians who could access radiology tests used this function most or all of the time.

In another study in 2008, a survey of ambulatory care physicians was reported in the *New England Journal of Medicine* (DesRoches et al, 2008). The researchers defined two levels of an EHR system which are:

-*Basic System* : Health information and data including patient demographics, patient problem lists, electronic lists of medications taken by patient and clinical note. Order management view laboratory results and imaging results.

-*Fully Functioning*: Health information and data listed above as well as a notes system including medical history and follow up. Order entry management of prescriptions as well as laboratory tests, radiology tests, prescriptions sent electronically and orders sent electronically. Results management listed as well as electronic images. Clinical decision support including warnings of drug interactions or contra indications provided out of range test levels and reminders regarding guidelines based interventions or screening.

5.5.2. Adoption of Electronic Health Records

There have been numerous instances of researchers examining the number of health care providers adopting EHRs. In general, these studies have demonstrated that the rates of EHR use in the early 1990s remained the same. More recently, a number of researchers and professional organisations have tried to estimate the adoption rates of EHRs. They found that measuring adoption rates accurately is difficult for a number of reasons. First, health organisations may be at different stages of developing their EHR. Second, there has been no agreed definition for an EHR (CPR or EMR), which has been used consistently among researchers. Third, different organisations will use their respective technologies to differing degrees, so there are no comparable examples (Wager et al, 2009).

In a study by Loomis et al (2002), 14.4% of family doctors said they used an EMR. A study by Miller and Sim (2004) found that less than 13% of over 1,200 practitioners from smaller surgeries who responded to the survey were using an EMR system, while 32% showed an interest in developing and using an EMR in the future. In 2005, a study done by Burt et al for the National Centre for Health Statistics showed that of the 1,281 participants, 23.9% reported using a full or partial EMR system in their practice. It is important to note that a higher percentage of respondents using an EMR were in larger practices and were located in the western US as compared to other regions.

In 2006, Jha et al (2006) analysed 32 other research studies, which had measured the usage of EHRs between 1995 and 2005. They found that between 17–25% of physicians in ambulatory care settings utilised an EHR system. This study also found that between 13–16% of single practitioners utilised EHRs and 19–57% of a large office of physicians (20 or more physicians) utilised EHRs. However, the study could not identify general EHR use in hospitals, though it did find that computerised physician order entry (CPOE) systems were in use in 4–21% of hospitals (Jha et al, 2006).

In 2006, a survey was undertaken by the Commonwealth Fund to examine primary care physicians' uptake of electronic health records in Australia, Canada, Germany, the Netherlands, New Zealand, the UK and the US. The study was published in *Health Affairs* (Schoen et al, 2006) and found that when compared with other countries, primary care physicians in the United States and Canada were far less likely to use EMRs (28% of US physicians and 23% of Canadian physicians, compared to 98% of physicians in the Netherlands, 92% in New Zealand, 89% in the UK and 79% in Australia).

The New England Journal of Medicine recently published the results of a nationwide study of 2,758 physicians. The survey intended to provide clearer estimates of the adoption rate of EHRs (DesRoches et al, 2008). In this study, 4% of the doctors reported using a fully functioning EHR, while 13% reported using a basic system that had limited function. Physicians in large practices, hospitals or medical centres (and in the western region) were more likely to use an EHR (DesRoches et al, 2008). This study demonstrated when a practice uses an EHR to its full extent, the system has a positive effect on the quality of clinical decisions (82%), communication with other providers (92%) and patients (72%), prescription refills (95%) timely access to medical records (97%) and avoidance of medical errors (86%) (DesRoches et al, 2008).

Despite the limitations in interpreting EMR/EHR adoption rates, it is suggested that 10–15% of hospitals in the US have implemented fully an EMR or EHR (American Medical Association, 2007; Fonkych & Taylor, 2005; Poon et al, 2006), and 20–25% of physicians in ambulatory care practice use some form of EMR applications (Poon et al, 2006; Jha et al, 2007).

5.6. Electronic Health Record System Applications

There is increasing evidence to show that health care physicians' decisions and actions are affected positively by the knowledge that clinical decision support systems can provide. There are numerous intelligence systems that link medical information to EHRs with advanced computerised clinical decision support systems (CDSSs). These systems have been designed to improve the quality and safety of patient care by ensuring care guidelines are followed, medication dispensing mistakes are avoided and appropriate services are provided (*Healthcare Financial Management*, cited in Glasser, 2008). The overall goals of CDSSs are to maximise the efficiency and efficacy of patient care. They aim to define software packages that are created to aid clinical decision making by using the characteristics of individual patients and matching them to a computerised knowledge base in order to improve individual diagnoses, treatments and care packages (Hunt et al, 1998; Menachemi & Brooks, 2006). It is suggested that such clinical decision-making systems will eventually develop capacity and broaden areas of expertise, as EHRs become more popular (Thomas, 2007: p.109). In primary care setting, the adoption of CDSSs such as e-prescribing, have reached high level rates in different countries(Protti,2005; Benson,2002). CDSSs can distil and integrate individual patient information, perform evaluations, link treatments to evidence-based practice guidelines and provide results to health care workers at appropriate times. They can also decrease drug costs, improve preventive care, reduce the length of stay in care services, improve the way drugs are dispensed and decrease the time needed to order treatments (Menachemi & Brooks, 2006). There are many different types of CDSS applications including supporting adherence to clinical guidelines, providing drug alerts, creating clinicians' work lists and there are systems designed to improve chronic disease management (Aspden & Corrigan, 2003). They can even move beyond simple warning systems and assist in ad hoc querying and diagnostic assurance (Krohn, 2004). The most common applications of CDSSs are in relation to Computerised Physician Order Entry (CPOE) and electronic prescribing system (E-prescribing).

5.6.1. The Computerised Physician Order Entry

A Computerised Physician Order Entry (CPOE) enables physicians' orders to be processed electronically rather than using handwritten or verbal orders and prescriptions, and they provide physicians with decision support capabilities at the point of ordering. CPOE systems are designed to be proactive, for example, in reducing medical errors, checking orders (e.g. duplications, doses, allergies, patient histories etc.) and reducing potential errors that would occur if all relevant information were not available at the time of ordering (Ormond, 2005). For instance, if a doctor orders an expensive test or drug, the CPOE system might show the cost and offer alternatives; or a drug order might alert the doctor to a patient's allergy; or an order for a laboratory test might trigger a warning to show that the test has already been ordered and the results are pending. One CPOE study found that 80% of studies report significant reductions in total prescribing errors, 43% in dosage errors and 37.5 % in adverse drug events when a CPOE system rather than handwritten orders was used (Shamliyan et al, 2008). CPOE systems can also suggest alternative, pre-programmed drug therapies, based on approved facilities or protocols (Metzger & Turisco, 2001; Wager et al, 2009). One report suggested that CPOE systems can significantly reduce medication errors in outpatient settings and prevent 28% to 95% of adverse drug events (Healthcare Research and Quality, 2001).

In addition, Johnston et al (2003, 2004) studies point out that CPOE system can provide other types of support in decision-making processes, including financial and organisational support as well as helping to improve patient outcomes, for example:

- Adherence to clinical protocols.

- Monitoring the process of making diagnoses and subsequent actions.

- Reducing medical errors, decreasing morbidity and mortality and improving rates of recovery.

The financial benefits provided by CPOE systems can also be invaluable, such as requiring fewer administrative and clinical staff, ensuring accurate and timely billing and quicker transaction processes (Johnston et al, 2004). Some studies have also shown that waiting times for medicines can be reduced, along with a reduction in transcription errors and better methods of countersigning orders (Ahmad et al, 2002; Jensen, 2006). There are different ways that a CPOE can be applied and incorporated into health care organisations. Metzger & Fortin (2003) identified modules 13 models that can be integrated into an existing health information system that has been developed by a single vendor. Other applications can be used to 'wraparound' existing systems. For example, a simple CPOE system can offer a selection of drug names and doses or predefined orders. Other applications restrict/control choices by offering only certain drug dose options, while others automatically provide more guidance by offering templates and values. Pull-down menus sometimes provide definitions or information about the use of different drugs. Some functions are 'passive' and expect the prescriber to search for a particular field; other functions are 'active' and automatically provide required data. More sophisticated applications can even integrate electronic health record information with warning systems that alert care workers to any changes in patients' vital signs and other clinical issues. Each CPOE works differently in different organisations because its functionality depends on the way in which the system has been integrated with existing information technology and has been developed, supported and monitored after implementation.

5.6.2. E-prescribing

Essentially, electronic prescribing systems (e-prescribing) provide printer-generated, easily readable prescriptions that are less likely to be misinterpreted or misread by a pharmacist. They are computer applications designed for clinicians to use in order to generate paper or electronic medication prescriptions (Bell et al, 2006). The most complex e-prescribing system can provide comprehensive support to a clinician and the decision-making process. Such a system can also streamline office procedures like prescribing and repeat prescriptions; it can support insurance problems and improve prescribing safety (Halamka et al, 2006). E-prescribing uses computers to enter, modify, review and communicate drug prescriptions (eHealth Initiative, 2004) making prescribing safer and administration more efficient, which are the two major motivations for the adoption of such systems. The Institute of Medicine (IOM), the Institute for Safe Medical Practice (ISMP) and the Leapfrog Group, and others, are involved in trying to improve the quality of medical care and reduce medical errors; they have endorsed e-prescribing systems as a major tool for reducing medical mistakes (Nash, 2007). One significant cause of medication errors has been the misinterpretation of physicians' handwriting. The National Hospital Ambulatory Medical Care Survey suggests that the prescription illegibility rate may be 1% to 2%. Five illegible orders may account for 30% of errors (Karadenis & Cakmakci, 2002).

The benefits of e-prescribing are numerous; they can have a positive impact on public health, the patient, the insurer/pharmacy manager and the physician, and include:

Public benefits: reduction in medical errors and associated costs to society; reduction in drug diversion and improved efficiency and reduced costs.

Patient benefits: include a reduced chance for medication mistakes and improved patient satisfaction.

Pharmacists' benefits: improving the use of formulary prescribing, so reducing drug costs and workflow efficiencies.

Physician benefits: include improved office efficiencies for repeat prescriptions, reimbursements for following a formulary programme and improved record keeping and documentation (Gerstle et al, 2007).

A survey of electronic prescribing sponsored by the American Medical Association (AMA, 2008) found that 22% of the physicians responding to the survey used an e-prescribing system; of those respondents, 63% used the functionality through an EHR system, 17% used an Internet-based system, and 16% used stand alone e-prescribing software (AMA, 2008). The results show the benefits of e-prescribing to be: reduced risk of medical errors, streamlined workflow for physicians and streamlined repeat prescription requests and authorisation (AMA, 2008). E-prescribing systems have been studied extensively and it has been suggested that there are a variety of graduated levels that e-prescribing can be provided to a health care information system, (as shown in Figure 6).

Figure 6: E-prescribing Graduate Levels
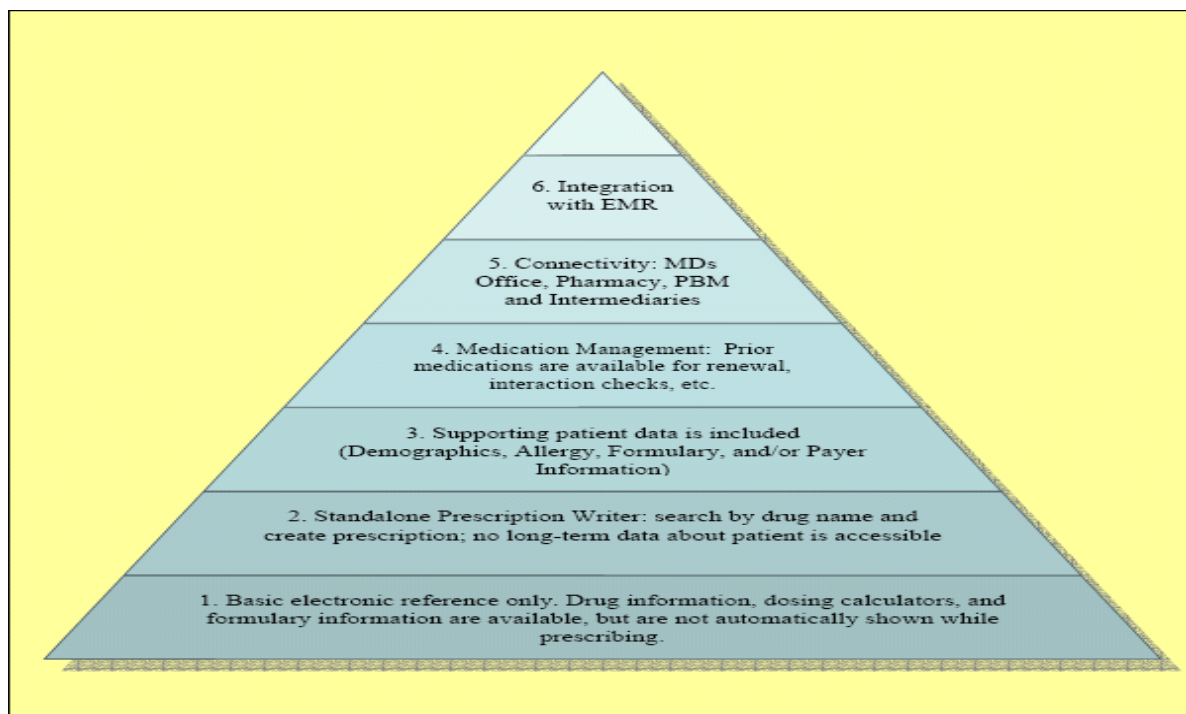
Source: eHealth Initiative (2004)

1. *Electronic prescription, reference only*: No prescription-writing capability; its functionality is supplied by commercially available software programs, for mobile personal digital assistants allowing access to drugs, contraindications, adverse effects, and drug interactions. It is important that reference data be updated at least monthly.

2. *Standalone prescription writer*: No medication history or supporting data; it provides computerised printing of prescriptions that are then given to the patient or faxed to the patient's pharmacy.

3. *Patient-specific prescription writer*: Including supporting data regarding individual patients, such as allergies, demographics, past prescriptions and formulary information, which can be used to generate alerts; it allows the application to incorporate clinical decision support, but requires the input of information, often manually, depending on existing technology systems, laboratory systems, EHRs and insurer formulary databases.

4. *Medication management*: Long term tracking and monitoring of each patient's active medications; this level contains the previous functionality and maintains a database of the patient's previous prescriptions and repeat prescriptions. These applications automatically monitor for drug–drug interactions. The systems should also allow for the manual entry of other medications taken by the patient. Some applications allow for the entry of alternative and non-prescription medications. Some vendors offer the ability to check for drug interactions with alternative medications.

5. *Connectivity*: From practices to pharmacies, purchasers, pharmacy managers; this type of system usually provides the previous functions and also allows for the electronic transmittal of prescriptions to pharmacies and can often include subscriptions to electronic versions of insurance formularies to identify preferred and tiered drugs and alerts for non-covered medications. This requires that patient insurance information be entered into the e-prescribing system or transferred from practice-management systems.

6. *Integration with EHRs*: Systems integrated with an EHR allow for a wider range of clinical decision support without the need to re-enter data manually into the e-prescribing system. They also automatically update the patient's current medication list within the EHRs (Gerstle, 2007).

There are different commercial E-prescribing systems, which can provide different combinations of these feature levels, although most commercial systems at least provide significant features at levels 2, 3 and 4.

Benefits can be seen all at levels, but systems at the more complex levels provide better strategic planning information, opportunities for quality improvements to be achieved, along with reduced rates of mistakes and improved workflow efficiency. Other advantages provided by e-prescribing include safety, quality and cost, including patient's direct access to personal medical files, ways to suggest corrections and changes, methods of submitting repeat prescriptions and other renewals. Systems can collate aggregated databases to provide strategic data regarding the impact of prescription drugs on public health as well as additional information about changes in benefits, formulary updates, drug-use reviews and other important information (eHealth Initiative, 2004). These opportunities are created because throughout the process, there is better communication among stakeholders and data providers as well as more relevant information about the patient.

5.7. Standards and Interoperability

In order to collect validated and valuable health information within a secure framework that can be exchanged and used by a range of different stakeholders, certain standards need to be followed to ensure effective transmission, operational use and interoperability. Standards are usually developed by a professional body or authority (a *de jure* standard), or widely used and agreed by general consent (a *de facto* standard). In health care informatics, a standard defines a commonly agreed way to collect, maintain and transfer data (Murphy et al, 1999).

Standards for informatics in the health care field are vital because of the complex nature of the environment, which has highly heterogeneous data processing needs. There are many different professions and organisations (both public and private sector) that are involved in health care in a region or country. Therefore, there is no single technology that can cope with the information demands of the myriad of processes taking place within the system. In fact, most hospitals have computer systems that deal with admission, discharge and transfer, clinical laboratories, radiology, pharmacy, billing and accounts and other functions.

It is common for health care providers to select different systems to meet the information needs of separate departments or services within an organisation. This selection process can be termed 'best of breed'; it means that rather than using a single system, the best system from each application group is chosen to respond to the needs of the activities of that particular service. It is also quite normal for most hospitals to allow the system to develop organically and slowly over time, rather than purchase a comprehensive system right at the beginning.

In the health care sector, where information must follow individual patients across many different organisations, locations and services, an EHR must be able to exchange data between different systems. The same data (e.g. patient demographics) may be needed for different applications at a single location and between applications at different sites. It is also necessary to interface these systems, which may be built on different platforms, using different programming languages and different data formats; this is time consuming and costly. To respond to these complex needs, the main purpose of EHR standards is to facilitate improvements in five main areas; interoperability, safety/security, quality/reliability, efficiency/effectiveness and communication (Murphy et al, 1999).

5.7.1. Types of Standards

To understand what standards need to be developed to respond to the health care sector's complex requirements to exchange information, it is useful to divide the standards into four categories: structure and content, vocabulary, messaging and security.

5.7.1.1. Structure and Content Standards

Structure and content standards are needed to give a clear description of the data elements that will be included in an electronic health (e.g. blood pressure and temperature) and to standardise the field length, data type and acceptable content of each data field (Murphy et al, 1999).

5.7.1.2. Vocabulary Standards

Vocabulary standards require there to be common definitions for medical terms to ensure that information and descriptions are represented and collected by all practitioners consistently for an individual's health record. If different terms' encodes are used to indicate the same conditions or procedures, this will complicate the collection of data and reduce its reliability and consistency. Codes are therefore abbreviated representations of medical terms, which are usually numeric or alphanumeric.

However, developing vocabulary standards is a difficult task because of the complexity of medical terminology; the profession does not yet have an agreed set of codes and there are many differing encodes being used by different practitioners with little agreement among them (Murphy et al, 1999).

5.7.1.3. Messaging Standards

Messaging standards enable the electronic exchange of data between two or more computer systems by establishing the format and sequence of data during transmission. The use of standardised messages allows disparate computer systems to interconnect and share information with each other (Murphy et al, 1999). A comprehensive set of standards includes more specific standard for medical messages and general computer messaging standards. Medical message standards describe the segments in one specific transmission of medical information.

5.7.1.4. Security Standards

In the health care field, it is essential to maintain privacy and confidentiality. Therefore, security standards are necessary to ensure that patient health information remains confidential and is protected from unauthorised or mistaken disclosure, alteration or destruction. These standards are particularly important because electronic health records deliberately make information accessible to many users in many different locations. Computer systems also make it possible to copy, print or delete large amounts of data quickly and easily, so a single security breach could impact thousands of patients. Access to health information is a sensitive issue, so standards are required to balance the patient's right to privacy with the legitimate needs of health officials, health services researchers and others. These standards are developed by HL7 and ASTM (e.g. E1869) (Murphy et al, 1999).

5.7.2. Current International Standards

In 1991, a study conducted by the Institute of Medicine discussed the need for information standards in health care; *Computer Based Patient Records: An Essential Technology for Health care* highlighted that 'a variety of standards must be developed tested and implemented before the computer based patient record can realise its full potential' (Dick & Steen, 1991: p.4). In 1994, the American Medical Informatics Association (AMIA) said that one of main obstacles in the adoption of information systems in health care was the fact that organisations did not develop consistent standards (AMIA, 1994). In 1996, a report, *Highway to Health: Transforming U.S. Health care in the Information Age*, reinforced this view, stating that

'…the development of universally accepted standards for the definition, collection, communication, and storage of administrative and clinical data is a prerequisite for creating an integrated health care delivery system from disparate participants.'

(Council on Competitiveness, 1996: p.51)

Further discussions on the need for standards in health care highlight that standards should be 'established by consensus and approved by a recognised body that provides rules, guidelines for activities' (NIH, 2006: p.9). As electronic health records use both technical and clinical standards (NIH, 2006), there are three main international bodies that currently approve these standards; they are the ISO, the Committee for European Normalisation (CEN) and Health Level 7 (HL7)(Murphy et al, 1999).Standards that are used regularly are based on their practical application or functionality.

These standards can be categorised as either terminology or messaging standards (Government Accountability Office (GAO), 2004). Messaging standards refer to *how* electronic messages should be formatted (see Table 3), while terminology standards deal with the content, i.e. *what* the electronic health record data element is about (see Table 4) (McDonald et al, 2003). Examples of commonly used standards are listed in Tables 3,4, and 5.

Table 3: Messaging Standards

	Messaging Standards	
HL7	'Health Level 7' is a computer language that allows the transmission of a patient's basic demographic information, medical history, diagnoses and financial information between different clinical applications. HL7's Version 2.0 is the most widely implemented health care standard worldwide.	Clinical
RxNorm	RxNorm is a developing project of the NLM. It is a nomenclature that provides standard names for clinical drugs (active ingredient + strength + dose form) and for dose forms as administered.	Drugs
CPT-4	'Current Procedural Terminology' is a coding system for the billing of medical procedures.	Billing
ASC/X12N	Accredited Standards Committee governs the transmission of electronic claims data, such as external financial transactions, financial coverage verification and insurance transactions and claims.	Financial
ELINCS	The EHR-Lab Interoperability and Connectivity Standards is a standard that is currently under development; it will be used to transfer laboratory results from laboratory information systems to EHRs in the outpatient setting.	Lab

1.Source: The National Library of Medicine (NLM) with the Unified Medical Language System (UMLS) http://www.nlm.nih.gov/research/umls/, , 2. WHO, http://www.who.int/entity/ehscg/resources/en/ehscg_standards_list.pdf, 3/Murphy et al.(1999): Chapter Five: Standards for EHR content, System, and Data Exchange

Table 4: Terminology Standards

Name	Terminology Standards	Category
LOINC	'Logical Observation: Identifiers, Names, and Codes' is a code set that assigns universal identifiers to laboratory and other clinical observations, so that results can be pooled and exchanged.	Lab
SNOMED-CT	'Systematised Nomenclature of Human and Veterinary Medicine' is a nomenclature that provides a common language to codify the clinical information captured in an electronic health record (EHR) during patient care. It enables a consistent way of indexing, storing, retrieving, and aggregating clinical data across medical specialties and sites of care.	Clinical
ICD-9-CM ICD-10	'International Classification of Diseases' is classification systems that group diseases and procedures for easy retrieval by computers. They are useful for reporting or other instances where data aggregation is needed, such as measuring quality or processing claims for reimbursement.	Billing
NCPDP	'National Council for Prescription Drug Programs' is a standard that allows electronic transfer of prescriptions between pharmacies, and for physicians to submit prescriptions electronically.	Drugs

Source: The National Library of Medicine (NLM) with the Unified Medical Language System (UMLS) http://www.nlm.nih.gov/research/umls/, 2.WHO, http://www.who.int/entity/ehscg/resources/en/ehscg_standards_list.pdf, 3.Murphy et al.(1999): Chapter Five: Standards for EHR content, System, and Data Exchange

Table5. International Interoperability Standards

Name	Meaning	Issue By
EHRcom	It define a core hierarchy of reference model building blocks to which any EHR can be mapped, and reflects the stable characteristics of EHR. It support interoperability between heterogeneous and legacy systems and consider world wide EHRs communication standard.	ISO /EN 13606 Part 1
ADL (Archetypes Description Language)	It defines legal combinations of the building-class defined in the Reference Model. It express the rules by which useful clinical templates can be constructed from Reference Model in consistent and interoperable way. It is an information model and exchange syntax for communication archetypes.	ISO/EN13606 Part 2
CDA (Clinical Document Architecture)	It is a generic message structure for the communication of a clinical document, derived as a message model from the HL7 RIM. CDA 1.0 has an XML-based standard that comprises header with document authorship information, organisational origin and patient identifiers, and a body whose basic structure is defined at fairly high level. CDA 2.0 specifies the structural organization of fine grained information inside a document	HL7
IHE (Integration the Healthcare Environment)	It seeks to promote interoperability between systems within specialist departments such as radiology, and the conventional hospital system used to order such investigations and to receive imaging study reports	CEN and HL7

Source: Kalra (2006) Electronic Health Record Standards

5.7.3. The Importance of Interoperability

The provision of health care is a complex process. As we have explained above, any health system has to be able to follow patients through an array of services, treatments, assessments, and therapy, over long or short periods of time, through different organisations and in different locations – even different countries. Therefore, the primary benefit required from an EHR standard is system interoperability so that providers and other users of the health information can exchange data when needed. For health care providers, system interoperability is critical and fundamental to the aims of the organisations; service provision is driven by the inherent collaborative nature of health care. If the information system cannot transfer, update and exchange information, the risk to patients and the costs to the organisations will rise significantly.

For example, the risk to patients can be fatal if information is not exchanged during an urgent episode of care. Therefore, standardisation of the EHR has been identified as an urgent, national priority (Fearh, 2003). The Health Information and Management Systems Society (HIMSS, 2008: p.49) defines interoperability as 'the ability of health information systems to work together within and across organisational boundaries in order to advance the effective delivery of health care for individuals and communities.'

Brown and Reynolds (2000) say that interoperability exists between two applications when one application can accept data (all types of data including service request) from the other and perform the task effectively (as judged by the user of the receiving system) without the need for extra operator intervention. Bouhaddou and colleagues (2008: p.174) also define interoperability as: 'the ability of two or more health care information systems to exchange information and to use the information that has been exchanged'. These definitions illustrate that EHR interoperability is the ability of an EHR system to exchange patient appropriate information with other systems.

5.7.3.1. Syntactic Interoperability

Syntactic interoperability is the ability of an electronic record system to exchange health information through interfacing and messaging. The process can be described as having three levels.

1. Syntactic interoperability ensures the exchange of health information by mapping information between corresponding parts of an information system. It is done by using an electronic health record reference model standard, such as HL7, or by using an IHE XDs (cross-document sharing) profile. The first level can support the clinical shared-care approach where the human readability of documents organised by date is required; there is a small amount of filtering using coarse-grained properties.

2. Partial semantic interoperability can be achieved in one of two ways. Level 2a (unidirectional semantic interoperability) is achieved by using a deeper level of data structure (other than simple documents and headings), and the data are determined by the respective system. A mapping process is required in order for the system to receive data and match imported data items correctly with the corresponding equivalents in the local

repository. Level 2b (semantic interoperability of meaningful fragments) is achieved by agreeing and sharing a fine-grained data structure between sender and receiver.

3. Full semantic interoperability is when an electronic health record reference model is used, alongside data structure and clinical terminology. At present, Levels 1, 2a and 2b have been achieved to different degrees and in different settings within different countries. These approaches improve the quality and continuity of care, such as the management of long-term conditions where there is a need for a data set that is personal to an individual and not too large (European Commission (EC), 2009).

Below, are some examples of the standards that have been developed and are being used world-wide; all of them can store and exchange medical data.

openEHR (openEHR, 2007) is a standard for the implementation of EHR systems. openEHR started as a joint research project between the European Union and Australia. Today, openEHR is managed by a non-profit organisation called The openEHR Foundation. The standard defines the storage and management of patient data and is not influenced by the commercial aims of companies trying to sell the standard (openEHR, 2007). The main concept behind the openEHR standard and its data model is to ignore issues relating to the storage of patient data (e.g. relational database tables). This is achieved by using a model with two levels. The first level contains the reference model, which defines only the most generic terms of the health care domain, such as 'role' or 'observation'. The second level contains the archetypes, which are more specific medical concepts, such as laboratory results or diagnoses (Beale & Heard, 2007). These archetypes are data structures derived from the reference model and constrained with the Archetype Definition Language (ADL) (Beale & Heard, 2008).

The Clinical Data Architecture (CDA) (Health Level 7 International (HL7),is part of the HL7 Version 3 standard. Health Level 7 International is an internationally recognised organisation developing and supporting standards in the health care sector. The name HL7 refers to the application layers of the ISO Reference Model. The HL7 organisation's goals are to "provide standards for interoperability that improve care delivery, optimise workflow, reduce ambiguity and enhance knowledge transfer among all of our stakeholders, including health care providers government agencies, the vendor community, fellow SDOs and patients. In all of our processes we exhibit timeliness, scientific rigor and technical expertise without compromising transparency, accountability, practicality, or our willingness to put the needs of our stakeholders first"(Health Level 7 International,2010).

The CDA is 'an XML-based mark-up standard intended to specify the encoding, structure and semantics of clinical documents for exchange' (Health Level 7 International). The standard defines an XML syntax for medical documents of any purpose, and the CDA comprises a document, a header and a body element (Health Level 7 International).

The Continuity of Care Record (CCR) is a standard for health data and information exchange developed as a collaboration between ASTM International and the Massachusetts Medical Society (MMS) along with other health care related organisations and technology designers. The standard defines an XML schema for patient data, including sections for demographic information, insurance information, diagnoses, test results, medications, allergies and other patient related information (Ilvonen, 2006).

5.7.3.2. Semantic Interoperability

Semantic interoperability is the ability of systems to exchange data and interpret information while automatically enabling the information to be used across the systems without user intervention and without additional agreements between the different stakeholders involved (EC,2009). In other words, semantic interoperability intends to ensure that the precise meaning of exchanged information is understandable by any other system or application not initially developed for same purpose (Costa,2010). The goals of semantic interoperability are to recognise and process semantically-equivalent information uniformly or homogeneously, even if diverse or heterogeneous data are present. Therefore, syntactic interoperability must be agreed previously in order to obtain semantic interoperability. Semantic interoperability needs generic reference models to represent the clinical data of the EHR, an agreed clinical data structure (i.e. a shared understanding of clinical concepts, e.g. ontology and a data dictionary) and a shared system for clinical terminology. Recent recommendations from the European Commission, have stated that the semantic interoperability is essential to improve the quality and safety of patient health care, public health, improve effectiveness, reduce medical errors, clinical research, and health service management (EC, 2009). In order to manage this interoperability, the digitalization of electronic health record system needs a dual model architecture which is based on two modelling levels which are: information and knowledge. The information level is provided by the reference model and knowledge level by the archetype model (Costa,2010). An archetype is formal definition of prescribed combinations of building block classes defined in the Reference Model for particular clinical domains or organisations. An archetype specifies a particular hierarchy of record components sub-classes, defining or constraining their names and other relevant attributes values, optionality and multiplicity at any point in the hierarchy, the data types and value ranges that element data values may take, and may include other dependency constraints.

Archetypes express the rules by which useful clinical templates can be constructed from the Reference Model in a consistent and interoperable way. Archetype instances themselves conform to a formal model, known as an Archetype Model. Archetype may be used within EHR systems to govern the EHR data held within repository. However archetypes might be used as a means of ensuring a consistent mapping between EHR systems that themselves do not use archetypes internally (Kalra,2006). Archetypes are agreed models of clinical or other domain specific concepts. From a technical point of view archetypes are formal specifications of clinical content. From a clinical point of view, archetypes serve an intuitive means to define and discuss and present clinical content (Garde et al,, 2007) Basically, archetypes define clinical concepts and are usually built by domain experts. They are a tool for building clinical consensus in a consistent way and they are considered basic to deliver fully interoperable EHRs (Kalra and Tapuria,2008). Below, some examples of how semantic interoperability can be applied are listed.

The Systematised Nomenclature of Medicine Clinical Terms (SNOMED CT). This is the most recent version of the SNOMED nomenclatures. This is one of the largest available health care terminology standards. The International Health Terminology Standards Development Organisation (IHTSDO) manages and maintains SNOMED CT, and it cooperates closely with organisations, such as HL7 and ISO (IHTSDO, 2007). SNOMED CT consists of concept codes, descriptions (terms) and relationships. A concept code is a unique string of 6–18 digits that defines one meaning in the terminology and then identifies one or more descriptions, which are the synonymous terms used for that meaning. Relationships are then used to define hierarchies between the concepts (IHTSDO, 2007).

Logical Observation Identifiers Name and Codes (LOINC): This is a terminology that supports the explicit identification of laboratory and clinical test results. It is provided, maintained and managed by the Regenstrief Institute, Inc., which is a non-profit organisation. The LOINC standards are used to describe laboratory results and are referenced by other standards, such as HL7 (Murphy et al, 1999).

5.8. Confidentiality and Security of Electronic Health Record Systems

The development of EHRs has raised concern about the privacy, confidentiality and security of personal information of individuals, which is held on these systems. The terms privacy, confidentiality and security can have slightly different meanings in the health care sector, to their meanings in other sectors, and can therefore be misunderstood and misused (Carter, 2008).

- Privacy means a person's health right to prevent their health-related information from being shared with anyone and a right to control what information is revealed.

- Confidentiality means that health care staff and recipients of an individual's health data have a responsibility to use or disclose the information only as authorised.

- Security refers to procedures, techniques and technologies that are used to protect information from accidental or malicious access, alteration or destruction. Security mechanisms are used to implement privacy and confidentiality policies (Tan, 2005).

In relation to privacy, it is suggested the major threat in the EHR context is from the secondary use of individuals' identifiable health information. Secondary use is where information given to one party for one purpose is then used for other purposes, without the authorisation of the person involved (Brands, 2003). Brands (2003) suggests that other studies confirm that the most frequent breakdowns of patient information confidentiality do not come from unauthorised outsiders, but from uncontrolled secondary usage, like accidental disclosures, curiosity and misuse by internal staff.

Individual members of the public have a right to expect their personal information to be kept private; they have the right to decide who sees their personal information, and once they reveal it to someone, they expect it to remain confidential (Tan, 2005). If organisations are to take these concerns seriously, they would certainly influence how far an EHR system was adopted or whether it was adopted at all. Harris Interactive (2005) conducted a telephone survey in the US with participants who were asked to identify their level of concern regarding the potential negative impacts of an EHR (after they were informed about the EHR project and its definitions). Approximately 70% of the participants were concerned about data leaks, medical information being shared without their knowledge, poor security and the potential increase in medical errors. In addition, 65% of participants suggested that patients may not disclose sensitive but necessary information to physicians and other health care providers, because of worries that it might be entered onto permanent, computerised records. The same survey found 47% of respondents said that the risks to privacy outweighed the expected benefits of the EHRs (Harris Interactive, 2005).

In most countries, there are laws that protect patients' rights to privacy. Health care providers and users of health information must abide by these laws (Win, 2005). For example, in Australia, there is a privacy act and New Zealand has a health information privacy code (Ko & Liou, 2010). In the US, the *Health Insurance Portability and Accountability Act* (HIPAA, 2003) regulates the security and privacy of electronic medical information. This Act defines the standards of electronic health information exchange between health care providers, or between health care providers and insurance companies. HIPAA also advises that if the health information does not include the identity of the individuals, organisations or the researchers can use the information without the individual's permission (Tan, 2005). In Canada, the *Personal Information Protection and Electronic Document Act* (PIPEDA) (Health and the Information Highway Division, 2004) protects personal health information against use by commercial enterprises locally and internationally.

The *Privacy Act* applies to the public sector and the *Statistics Act* applies to identifiable health information (Health and the Information Highway Division, 2004). It is largely due to the fact that EHR systems involve the integration and networking of patient data via a set of heterogeneous and distribution hardware and software systems that sharing patient data is often seen as risky, leading to conflicting interests or potential breaches of security (Tan, 2005). This has meant that code-related security technologies have been prioritised and driven forward (Brands, 2003). The development of technology has increased access to patient information, so enabling patients to obtain health care services that are more responsive to their needs. Technological progress has also enabled privacy protection policies and more refined security measures to be developed to control/authorise access to sensitive, personal health data (Chilton et al, 1999). One of the ways in which personal data is kept safe is through developments based on the ethical need-to-know principle (Louwerse, 1998). Clark and Wilson (1987) and Bobis (1994) also suggest a right-to-know concept to describe levels of access that assess whether electronic health record users should have the right to access certain patient information.

However, it is worth assessing how these principles and technological developments are being implemented on the ground. In a 2008 study conducted by Kroll Fraud Solutions/HIMSS Analytics to examine the security mechanisms for patient data security in hospitals, researchers found that on a 1 in 7 ascending scale, the average level of 'preparedness' to deal with security breaches was 5.88. Only 56% of the hospitals had told patients that their information was at risk due to a security breach. Exactly 13% of the respondents reported that their organisation had experienced a security breach in the last 12 months, and the type of information that had most frequently become insecure were patients' names and diagnoses (HIMSS, 2008).

It is also interesting to note that in a survey of private medical contractors in 2004–05, 47% of Medicare Advantage contractors, 42% (fee-for-service contractors) and 38% of the TRICARE contractors reported experiencing a privacy breach (GAO, 2006). These results show that there are many challenges to implementing effectively information technology within the health care sector; it is suggested that much of the success or failure of implementation relies on human resources and staff training.

Other security mechanisms implemented to safeguard unauthorised modification and access to EHRs and to enhance information confidentiality include the distributed infant and maternity care system in Finland. This system adopted a combination of secure socket layer (SSL) and Internet protocol security (IPSec) procedures to ensure data confidentiality (Kouri & Kemppainen, 2001). The SSL is a protocol for exchanging information using a private key to encrypt data that is transferred over the Internet, such as Internet Explorer and websites that obtain confidential information from credit cards. The Internet protocol security (IPSec) is a framework used to develop standards for supporting network-level data confidentiality over Internet Protocol (IP) networks by using cryptographic security services (Kouri & Kemppainen, 2001). Another mechanism used to secure patient data transmission is the 'invisible' watermark method, which is a process of hiding information in a digital signal in such a way that it is difficult to remove (Chao et al, 2002). Another common security mechanism used to authenticate mechanisms of EHRs is the use of an 'identifier' and a password (Allaert et al, 2004). Of course, a firewall to prevent external access to data can be found in most health care organisations.

To ensure the security of confidential patient information, most health care organisations have concentrated on controlling access to their EHR systems (Barrows & Clayton 1996; Parnell & Fearon, 2002). Access is a key issue because EHRs have to be integrated with different stakeholders if they are to work effectively. One access control method is the 'role-based' mechanism. This can maintain a patient's confidentiality according to the consent of that patient. Each member of staff across the different stakeholders is given a specific role through which they may access the EHR. Each provider might have multiple roles and there may be a different range of services for different purposes for each role. Each role could include access restrictions associated with location or time (Parnell & Fearon, 2002). Audit trails are other mechanisms that have become data security tools, because some security breaches have been caused by misuse of access privileges by authorised personnel (Barrows & Clayton, 1996). However, Bilykh et al (2003) noted that the costs of implementing such audits in terms of human resources can often outweigh their practical use. Another example of a security mechanism implemented computer record systems in Alberta, Canada is where users have to punch in a unique identification number along with an electronic tag with a regularly-changing digital number (Cotter, 2003). Alternatively, using an RFID chip is another identification and authorisation mechanism for securing health information; however, inserting these under the skin is an invasive procedure.

Beta testing to assess user acceptance levels for these various security devices has begun in the US: about 40 people were surveyed in an initial test (Schuerenberg, 2005). Most users of EHRs thought that password checking included in the system will maintain system security. However, password checking to restrict access does not ensure adequate security for EHRs; therefore, programs with common password protection systems use 'subroutines' that check against the hashword of the password. Unfortunately, it has been found that 'debuggers' and disassemblers can reverse-engineer the binary program code to the human readable form and access the program's instructions. This capability can search and therefore modify the sub-routines that decide whether to reject or accept the password (Horst, 2001). This type of security breach puts EHRs at risk. Therefore, in addition to passwords, there should be some mechanisms to enhance further the information security.

To protect the confidentiality of data while it is being transmitted and during storage, symmetric cryptographic algorithms can be used. These algorithms can also be reversed, so using asymmetric algorithms will allow strong authentication of all people accessing the database (Quantin et al, 2000).

One effective authorisation process to protect patient information has been developed by the US National Research Council; it is called the Public Key Infrastructure (PKI) (Brands, 2003). It is a mechanism based on the idea of a trusted third party to ensure confidentiality, integrity, non repudiation and accountability during information sharing (Bourka et al, 2003). PKI technology can control access and can even guarantee user authentication by using digital identity certificates. If people are required to show their digital identity certificates whenever they request access, the service provider can find out their details and make an authorisation decision. The digital certificate is a useful mechanism to allow provider staff to access various online and offline databases (Brands, 2003).

Consent is important if patients' privacy is to be upheld, so obtaining appropriate consent for use of health information would enhance patient privacy. Informed consent means that a patient is fully informed of the implications of their health, and permits access to their health information (Win, 2005). Health care providers and other stakeholders have a duty to maintain the confidentiality of data and so any system must be able to deny unauthorised access unless patients give consent (Win & Fulcher, 2007).

There are varying degrees of consent that a patient can give. A 'subjective standard disclosure' ensures all information is available; a 'professional standard disclosure' gives out the type of information that a professional would provide (Kluge, 2004).

Using informed consent, the patient will know how information will be kept, who is able to access their records and for what purpose (Waegemann, 2000). There are some countries, like New Zealand and Norway that incorporate patients' consent into their EHR processes (Ko & Liou, 2010). These systems collect and store the data as well as provide protection for the security of the data by controlling access based on patient consent.

In Australia, the Commonwealth Department of Health and Ageing funded an electronic consent research project to develop consumer consent approaches in Electronic Health Data Exchange. The University of Tasmania, Queensland University of Technology, the Commonwealth Scientific and Industrial Research Organisation in partnership with the Distributed Systems Technology Centre and the Spherion Collaborative Centre for e-Health (University of Ballarat) were involved in this project; it focussed on capturing patient consent during consultations using Digital signatures, Public Key Infrastructure and Kerebos technology (Win & Fulcher, 2007).

Although confidentiality, privacy and informed consent are admirable principles in theory, consent mechanisms need to be practical and applicable to health care processes without impeding the workflows of health care providers. If this is achieved, the use of EHRs will assist in health service delivery and physicians will be better informed about the health status of patients, which will improve their decision-making capabilities (Win & Fulcher, 2007).

5.9. Evidence of Benefits from using an Electronic Health Record System

A range of factors influence what EHR systems are developed and to what degree they are implemented. If an EHR is to be developed effectively, it should have a set of clear aims, including to: improve efficiency, improve patient safety, reduce medical errors and reduce duplicate services (Wager et al, 2009). The California Health Care Foundation conducted a study in 2003, which found that certain factors increased the adoption of EHRs:

Administrative factors. Organisations were more likely to adopt an EHR if they wanted to achieve certain goals, such as wanting to share patient data among different sites, improve clinical documentation for billing, establish a more efficient and effective information infrastructure, reduce health care costs, meet legal/accreditation requirements and manage contractors.

Clinical factors. Organisations were more likely to adopt an EHR if they wanted to achieve certain goals, such as wanting to improve the ability to share patient health information, improve care quality, improve efficiency of clinical processes, reduce medical errors, improve clinical data capture, facilitate clinical decisions, improve health care providers' and patients' satisfaction (Brailer, 2003).

In a survey of 280 providers (42% of these being IT professionals or managers involved in administration, finance, data capture/review, updating capabilities and e-mail categories), respondents identified why they wanted to implement an EHR. Their reasons (those marked by 75% or more of the respondents) included: 1) improve clinical processes or workflow efficiency, 2) improve quality of care, 3) share patient record information with health care practitioners and professionals and 4) reduce medical errors (Medical Records Institute, 2005b).

Benefits to health care are clear when an electronic record system is implemented. In 2007–08, the Massachusetts Medical Society conducted a national survey of 2,758 ambulatory care physicians and reported in the *New England Journal of Medicine*. The study used a definition for EHRs that was based on expert consensus and on physicians' views who had used comprehensive EHRs. This survey reported a range of benefits from an EHR system, such as improving the quality of clinical decisions, communication with other providers and patients, prescription refills, timely access to medical records, avoidance of medication errors and others reported the positive effect of EHRs on delivery of long-term and preventive care (DesRoches et al, 2008).

It is clear that the literature supports the idea that EHRs are very valuable to health care. Many research studies illustrate that EHRs improve quality outcomes, improve safety, increase productivity and reduce costs, and they are also seen to improve service delivery and patient satisfaction (Wager et al, 2009).

5.9.1. Improved Quality, Outcomes and Safety

There are many examples and studies (some are set out in this section) that have shown that clinical information systems, like EHRs, influence patient quality, outcomes and safety. Based on these studies, three major influences on quality appear to be:

1. increased response to guideline-based care;

2. enhanced surveillance monitoring;

3. decreased medication errors.

A number of studies have shown that physicians who could access clinical practice guidelines and computerised reminders and alerts are more likely to provide preventive care than physicians who did not (Ornstein et al, 1991; Bates et al, 1999; Balas et al, 2000; Teich et al, 2000; Kuperman et al, 2001). In another study, it was found that 200,000 negative drug events per year were eliminated when a CPOE system was installed in all hospitals (Hillestad et al, 2005).

In a study on electronic alerts that were delivered to physicians via a decision support system, research results showed an important reduction in patient cardiac events, as well as physician compliance to electronic warnings remaining stable even as workload increased (Vashitz et al, 2004). In a study on the impact of health information system on health teams, Stead et al (2005) reported that access to regular (not episodic) health information can improve clinical decisions making. Also, Or and Karsh 2006 reported that evidence-based information can also help patients to manage their symptoms and treatments. Patient self-management through HIT is also reported to improve health literacy and communication via data tracking, questions and problem reporting (Bates et al, 2003; Tang et al, 2006). In a survey of attitudes toward EHRs of primary care physicians, the majority (51.4%) of respondents said they had increased knowledge of their patients' health conditions when using an electronic record system (Siteman et al, 2006).

In a systematic review of HIT, Chaudhry and colleagues (2006) found the most important improvements to be a reduction in the number of people needing care (number of events and services used). This is a result reflected in other findings (Bates et al, 1999; Bates et al, 2003; Bates, 2005; Liu et al, 2006). A reduction in mortality rates, measured after EHR implementation, when compared with mortality rates before implementation, illustrate how adopting an EHR can affect directly patient care (Pollak & Lorch, 2007). A number of other research reports have found positive outcomes when using various e-health interventions (Tate et al, 2003; Kypri et al, 2004; Wantland et al, 2004; Williamson et al, 2005).

Systems that use electronic health records are shown to improve the way drugs are prescribed and administered. This is because the system provides health care workers with information on the use of antibiotics (Berman et al, 1992), how to reduce adverse drug reactions (Evans et al, 1993; Burke & Pestotnik, 1999; Bates & Gawande, 2003), the accuracy of drug dosing (Duxbury, 1982) and alerts (McDonald et al, 1984; Litzelman et al, 1993; Overhage et al, 1997; Bates & Gawande, 2003). Bates and Gawande (2003) suggest that information technology can reduce the rate of medical errors by:

- preventing errors and adverse effects;

- facilitating a quicker response after an adverse event has occurred;

- tracking and providing feedback regarding adverse effects.

From the research highlighted above, it is clear that EHR systems can improve communication, improve access to knowledge, obtain key information, help with calculations (e.g. drug doses), check actions, provide alerts and assist with monitoring and decision making; all these elements will help to improve patient safety and quality outcomes.

5.9.2. Improved Efficiency, Productivity and Cost Reduction

There are a host of different ways in which EHRs can improve efficiency, increase productivity and reduce costs (Tate et al, 1990; Tierney et al, 1993; Barlow et al, 2004; Grieger et al, 2007). This is mostly achieved through more effective administration, monitoring and management activities. Recent research has shown that the use of electronic systems to retrieve and store medical records will reduce costs. For example, in their study of the Memorial Sloan Kettering Cancer Centre, Evans and Hayashi (1994) noted that a space saving of 2,000 square feet was achieved after implementing an EHR, which translated into a saving of about $100,000 a year.

An EHR can provide the data necessary to measure care processes and thus support quality improvement (Edwards et al, 2008); this can improve the quality of documentation and coding practices and subsequently increase reimbursement (Bleich et al, 1989; Wager et al, 2000; Barlow et al, 2004). Without this type of data, accurate feedback on outputs and outcomes is absent and quality cannot be improved systematically.

A number of different studies have provided evidence that electronic systems provide savings in relation to a range of administrative procedures. They are central to reducing paper work and saving time, for example, when reducing staff costs (like processing laboratory, radiology and pharmacy orders) (Schmitt & Wofford, 2002), and reducing the number of requests for patient charts and transcription charges (Keshavjee et al, 2001; Schmitt & Wofford, 2002; Soper, 2002; Smith, 2003; Wang et al, 2003; Miller & Sim, 2004). Sometimes, health workers, without access to an electronic system, will order duplicate test results just in case one set is lost; EHR systems will ensure test results are always to hand at no extra cost (Tierney et al, 1988; Tierney et al, 1990; Bates et al, 1999). In addition, transcription services can also be expensive so an electronic system enables these costs to be removed (Renner, 1996), while savings from lower drug expenditure improves utilisation of radiology tests and decreases billing errors (Wang et al, 2003).

In hospitals, illegible hand writing and mistakes about patient information can impede inter-departmental communications. These obstacles are eliminated when an EHR is used, thus reducing costs and improving quality (Ammenwerth et al, 2007). For example implementation of a hospital computerised physician entry (CPOE) system resulted in reduced charges (-12.7%) and costs (-3.1%) (Tierney et al, 1993). The hospital estimated that a projected annual saving of $44 billion per year would be achieved if a CPOE system was implemented nationally (Johnston et al, 2003).

Staffing and time costs are also reduced when EHRs are used because nurses spend their time recording patient information on systems instead of doctors doing so, at more expense (Deese & Stein, 2004; Hillestad et al, 2005; Poissant et al, 2005). In addition, the cost of drugs is always going to be very high for a health system. An EHR system can help doctors to identify and use generic formulary drugs through an alert mechanism, which will remind them of all the options available to them (Garrett et al, 1986; Donald, 1989; Karson et al, 1999; Levit et al, 2000; Bates & Gawande, 2003). All of these management and administrative costs are reduced when productivity is increased and efficiency is improved.

5.9.3. Reduced Errors and Increased Access

Health information technology changes the clinician–patient relationship because the patient can have access to medical records that are usually stored in inaccessible 'record rooms'. With a technological system, information can be accessed using two approaches: active use and secondary use. Both approaches mean that health information can exist in multiple locations (Wolter, 2007) and allows sensitive information to be transferred between health providers and commissioners to enhance operational continuity of care, monitoring and forward planning (Slack & Van Cura, 1968; Lucas et al, 1977; Kripalani et al, 2007). One study by Etheredge (2007) on secondary use of data through a rapid learning health system, reported that the technology could help to gather more individually-focussed information much faster, synthesise learning requirements and disseminate the information quickly to the service providers.

Bates and colleagues (1999) saw an 80% decrease in documentation errors over their study period when an electronic order entry system was set in place. More specifically, implementation of health information system applications has reduced errors in dispensing medications and improving patient safety (Bates, 2000). For example researchers have shown that older patients' use of a medication memory aids reminds them to take the correct medicine – so improving their health and safety (Lanzolla & Mayhorn, 2004). Consumer satisfaction was found to be high during a study of an early version of patient health records. Researchers reported that patients approved of the way workflows were increased due to the fact that physicians could spend more time with patients and share patient information and test results (Berman, 2004; Hier et al, 2005; Tang et al, 2006). In a similar study, 57.45% of health practitioners reported that communication within organisations and with patients had improved as a result of the implementation of a health information system (Siteman et al, 2006).

5.9.4. Improved Service and Satisfaction

Patients as well as EMR-system users have responded positively to physicians using an EMR in the examination room and to manage their care (Ornstein & Bearden, 1994; Ridsdale & Hudd, 1994). Patients welcome their health data (health history, allergies, medications, test results) being readily available when and where it is needed. Patients also view these physicians as being innovate and progressive despite the fact that some physicians were initially worried that using the EHR in the examination room might impede their relationship with the patient. In fact, studies have shown that EHR use has had no negative impact on the physician–patient relationship (Legler & Oates, 1993; Solomon & Dechter, 1995; Gadd & Penrod, 2000; Wager et al, 2005); sometimes it can be seen to enhance the relationship by involving patients more fully in their own care (Marshall & Chin, 1998).

The introduction of EHRs has empowered patients by enabling them to access their own records and be more active in their diagnoses and treatments. Health technology can help patients communicate with the health care services (Shin, 2005) and provide them with facts and advice, including information on clinicians, service providers, treatments, laboratory test results and health related histories.

A recent study, which evaluated patients' attitudes regarding online access to their EHRs, showed that responses were generally positive (Hassol, 2004 as cited in Shin, 2005).

EHR systems can also affect positively service provider and support staff satisfaction. EHR users such as nurses and support staff reported that the EHR improved their ability to respond to patient questions promptly. Support staff, who are usually responsible for filing paper reports, pulling paper records and processing bills, said that their time was more effectively and efficiently used through the use of an EHR system (Wager et al, 2000). Physicians who have implemented an EHR system successfully in their practice have reported that it has improved the quality of record keeping, improved efficiency and has had a positive impact on their job satisfaction and stress levels (Wager et al, 2000; 2005; 2008). They also reported that they are proud of the quality of their records and believe that the records are more useful in terms of diagnosis and billing and they are more complete, accurate and accessible. A majority of physicians in one study were generally more satisfied since the EHR was implemented and stated that it was because of its ease of use and reliability (DesRoches et al, 2008).

5.10. The Barriers to the Implementation of Electronic Health Records

Although the literature indicates a large number of benefits of EHRs, it has also identified a number of barriers to the widespread adoption of such technology. To discover the difficulties that hospitals face in adopting an EHR, the Healthcare Financial Management Association (HFMA) surveyed the senior financial executives in 2005. Some of the key barriers that were highlighted in the survey were the lack of national information standards and code sets, a lack of funding, concern about physician usage and lack of interoperability (O'Neal & Kevin, 2006).

It has been reported that the successful implementation of a clinical information system relies on physicians' support (Anderson, 1997; Ash et al, 2000; Rogoski, 2003); in fact, the inability of users to develop ownership of a system is a key reason why systems fail (Lorenzi et al, 1997; Lorenzi & Riley, 2000).

Like the implementation of any system within an organisation, staff must be involved in its design and development. Clinical leaders who have an interest in informatics can help to facilitate acceptance of the system with other practitioners. This type of leadership allows for regular feedback from physicians throughout the EHR implementation process (Doolan et al, 2003). Communication between physicians and opinion leaders is central, as is lack of good communication, which is another reported reason why systems fail (Anderson, 1997; Lorenzi & Riley, 2000).Other reasons for EHR system failure include: the value base of the system reflecting management rather than staff/users (Lorenzi et al, 1997), costs, disruption of workflow, clinician acceptance and lack of documentation standards (Ash et al, 2003; Bates & Gawande, 2003; Anderson, 2004; HIMSS, 2004; Miller & Sim, 2004; Valdes et al, 2004; Ford et al, 2005; Hillestad et al, 2005; Medical Records Institute (MRI), 2005).

5.10.1. The Cost of Electronic Health Record Systems

The costs of setting up a health information system have not been well researched (Kuperman & Gibson, 2003); although some of the research that has taken place, assesses the average cost of an EHR to be $25,000 per physician in a group (Carroll, 2000). Audet et al (2004) identified that this initial cost was the main barrier to physicians accepting such technology. In addition, many practices that have considered implementing an EHR system have cited cost as being one of the major factors that made them reconsider (Loomis et al, 2002).

5.10.2. Resistance to Electronic Health Record Systems

As pointed out above, one major barrier to successfully implementing an EHR system is whether clinicians accept the new system and the potential disruptions and changes that it brings. It has been suggested that health workers perceive an EHR system as interfering with clinical workflow, reducing productivity and introducing disruptive changes to the workplace (Chambliss et al, 2001; Waegemann, 2002; Wang et al, 2003; Ash & Bates, 2005; Ford et al, 2005; Hillestad et al, 2005).

Some of the EHR applications do not fit with the way some physicians practice – particularly in relation to the content and sequencing of the processes (Anderson, 1997; Gianguzzi, 2002; Walsh, 2004). Bar-Lev and Harrison (2006) found that health care providers experienced tension between responding to the rigid workflow of EHRs and functioning more safely and effectively. In addition, typing text can be time consuming and can require a higher cognitive load than handwriting text (Anderson, 1997; Walsh, 2004). Aydin (1994) reported that many physicians do not want to make their examination rooms impersonal, so they are concerned that computers can affect their patient relationships because they may be viewed as cold and technical.

Clinicians' reluctance to accept EHRs are also related to their perceptions that electronic decision support is 'cookbook medicine' (Sprague, 2004). Research has shown that the time taken to complete electronic documentation increases for physicians, which can create another barrier to accepting EHR systems (Miller & Sim, 2004; Poissant et al, 2005). They feel that it is not their role to input data into a system. One study described the use of CPOE on physicians' desks as highly inefficient because it increased their workloads between 98.1% and 328.6% (Poissant et al, 2005). Physicians expect information systems to support clinical processes without increasing workload or shifting work to other staff in order to be successful (Guthrie, 2001; Doolan et al, 2003; Rogoski, 2003; Hersh, 2004; Walsh, 2004). Physicians have traditionally used clinical information systems to access data and they do not expect to perform data entry. Computerised data entry by physicians is a significant barrier to EHR adoption (Pearsaul, 2002), and there will need to be a change in the cultural role of physicians and a change in their behaviour if health technology is to be introduced successfully.

5.10.3. Patient Confidentiality and Privacy

Many consumers are reluctant to share their personal data with health care providers – particularly as there are numerous reports and rumours in the media as to such data being lost or stolen (Gregory et al, 1995) and, as Dodek & Dodek (1997) suggest, patients increasingly understand that confidentiality is a right not a privilege. An IOM report regarding the privacy and security of electronic health information suggested that the issues fall into two general categories:

1. inappropriate releases of information from individual organisations;

2. the systemic flow of information throughout the health care and related industries (IOM, 1997b: p. 54).

It is suggested that health care organisations should ensure information can be accessed by staff, yet be secure enough to protect patient privacy; this means staff need to be trained and supported to understand confidentiality issues and adhere to privacy policies, and their integrity must always be assured (Dodek & Dodek, 1997; O'Brien & Yasnoff, 1999). To evaluate concerns about privacy and confidentiality, researchers conducted a survey of information accessibility with nursing staff in a major acute-care hospital in the US: of the respondents, 72% admitted to obtaining information about patients not in their allocated area while perusing the hospitals network (Curran & Curran, 1991).

The Health Insurance Portability and Accountability Act (HIPAA) sets the standard for medical records (electronic and written), confidentiality and security (Loomis et al, 2002). In particular, the HIPAA calls for the following (Simpson, 2001):

- making sure electronic patient information is not lost;

- controlling access to 'individually identifiable patient information' and implementing audit trails;

- making sure information is not corrupted in transit or storage.

For health care managers, there are enormous legal implications relating to breaches of patient privacy – as well as moral dilemmas relating to physicians who are bound by the Hippocratic Oath. It is understandable therefore, that managers and administrators might be unwilling to implement EHR systems if they think that they might pose a threat to patient privacy.

5.10.4. Security in Electronic Health Record Access and Use

As EHRs are developed and refined and access to their data becomes vital to the effective functioning of health care organisations, security issues also become more central. Increasingly, data is becoming more available to a range of stakeholders – once they have electronic access to the system. With the correct access code, a person can look at data on anyone in the system if they have access to a computer terminal (Marr, 1994; O'Reilly, 1995). Security concerns are therefore very high – and even more so in relation to systems that allow external access through the Internet.

Research suggests that access to such systems – especially in light of Internet capabilities – should be limited to people who are authorised to obtain the information; electronic communications, such as email must be encrypted and IT personnel should implement audit trails (Simpson, 2001; Gallagher, 2004). It has also been suggested that unauthorised gathering of information should be stopped along with firewall protection (O'Brien & Yasnoff , 1999).

Simpson (2001) proposed that software systems should provide the following elements if they are to be made safe:

- encryption software for health data transmitted over the Internet;

- authentication to validate the identities of information senders and receivers;

- authorisation such as unique user IDs and passwords to ensure the right access to the right people;

- audit trails to track who accesses what information.

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However, it has to be noted that if a system's security mechanisms are too complex and time consuming to access, the benefits of the system may be reduced (O'Brien & Yasnoff, 1999).

5.10.5. Lack of Adoption of Uniform Standards and Interoperability

Interoperability among EHR systems is recognised as essential to gain their full potential. This exchange is not be possible unless a nationally-based uniform standard data coding is adopted. Therefore, the development of standards for electronic health information development is very important for professional organisations and governments (Bates & Gawande, 2003). If progress is not made in this respect, it will impede successful implementation (Abbott, 2003; Bates & Gawande, 2003; Brookstone, 2004; Dougherty, 2005; Hillestad et al, 2005; Middleton et al, 2005).

5.10.6. System Maintenance and Down Time

Other barriers to the implementation of electronic medical record systems are issues relating to the software, the hardware and the commercial sale of the designs. Software issues include inability to view patient progress and care at a strategic level, lack of automatic prompts and poor system navigability (Smith et al, 2005). Hardware and connectivity issues include slow system response and computer speed (Chambliss et al, 2001; Poissant et al, 2005; Smith et al, 2005). Issues that relate to the sale of the software, the hardware and the design include the tendency of commissioners to wait for more advanced packages and products and anxieties over the ability of vendors to offer post-sale support (Schmitt & Wofford, 2002; Brookstone, 2004; Podichetty & Penn, 2004; Ford et al, 2005).

5.10.7. Electronic Health Record Software Quality and Ease of Use

An important obstacle to the implementation of such systems is the general quality of the software available for use, together with its perceived ease of use. Middleton et al (2005) found that one of the key reasons for implementation not progressing was due to the lack of definition of basic product features. In 1971, the World Health Organisation (WHO) listed the basic requirements for a health information system (Snyder & Paulson, 2002); these requirements included:

- the system should be able to identify people positively by name and place;

- the system should avoid unnecessary agglomeration of data;

- the system should focus on problems or trends;

- the system should be goal oriented to assist monitoring and evaluation;

- the system should employ functional and operational terms;

- the system should record all relevant data related to population groups, services provided, resources allocated and expended and outcomes of health services;

- the system should express information briefly, unambiguously and imaginatively;

- the system should have the capacity to provide feedback and share data.

It is important that health care staff and physicians in their examination rooms find the software easy to use – it should improve productivity rather than impede it, by using note-templates and order forms to speed data entry (Rogoski, 2003). Computer workstations should be provided both on and off site to ensure ease of access. It the system crashes, the ability to respond quickly is significant (Doolan et al, 2003). It is also important for the vendor to offer 24-hour support and technical assistance as soon as possible (Ash et al, 2000; Rogoski, 2003).

5.10.8. Lack of Awareness and Experience about the Usefulness of Electronic Health Records

There has been a lot of research focusing on users' lack of knowledge and experience regarding the use of computers and electronic systems. This lack of understanding of the potential of such systems (Johnson, 2001) and lack of confidence in using them can impede the successful implementation of EHR systems and even prevent physicians from thinking about using such systems. It has been suggested that quality problems in medicine are caused not by lack of knowledge but by the health care system's inability to apply that knowledge consistently and accurately (Kuperman & Gibson, 2003).

There is a traditional use of paper-based mechanisms, which means health staff do not see that there is a real alternative despite the weaknesses of manual systems e.g. volume of paper, costs, inaccurate information etc. Evidence has shown that a number of systems have failed because users were inadequately trained (Ash et al, 2000), so it is suggested that medical students should obtain a certain level of computer skills before they start clinical training, so that they can use these EHR systems (Baron et al, 2005). Some studies report that older people tend to have negative attitudes towards using computers (Dyck & Smither, 1994; Laguna & Babcock, 1997). In fact, one study by Brown and Coney (1994) evaluated physician attitudes toward clinical information systems and found computer skills and experience to be predictors of computer acceptance; gender and attitudes toward physicians conducting their own data entry were found to be non-significant.

5.11. Strategic Factors Affecting the Adoption of the Electronic Health Record

There is a clear link between the productivity of an organisation and its information system (Seddon et al, 1999; Seddon et al, 2002; Nolan & Farlan, 2005). The efficacy of an information system is dependent on the people using it and their work processes (Johns, 2001). Therefore, a speedy and successful adoption of an EHR is important, and relies on strong leadership and effective strategic planning alongside training and ongoing support.

5.11.1. Strong Leadership

Strong leadership is central to the successful implementation of any new policy or change within an organisation. Cooper (2005) points out that the successful strategic management stress on new school leaderships that have the characteristics as shown in table 6. Johnson and Scholes (2004) indicate that the literature relating to leadership issues highlights that successful leaders have particular and individual characteristics including: vision, team-building and team-working skills, self-confidence, ability to self-analyse and self-learn, mental alertness, ability to deal with complexity and ability to work alone. It is suggested that charismatic leaders are very effective at expressing complex ideas in a clear and simple way, creating loyalty and guiding the energy and motivation of individual staff members. Certon (2000) states that transformational leadership increases the awareness of organizational issues and their consequences, they build a vision of what the organization should be, raise commitment to that vision throughout the organization, and assist organizational changes that support the vision.

Table 6: Old Leadership Vs New Leadership

Old Leadership	New Leadership
Non-charismatic	Charismatic
Transactional	Transformational
Management	Leaders
Non-visionary	Visionary
Non-magical	Magical
Less Emphasis On	*More Emphasis On*
Planning	Vision
Routine	Change
Compliance	Commitment
Contract	Extra Effort
Reaction	Pro-action

Source: Cooper C.L (2005): Leadership and Management in the 21st Century
Business Challenges of The Future, Oxford University Press, Page17

If there is no executive support from the chief executive officer (CEO) or senior clinical managers or at board level, the introduction of a new clinical information system will fail because staff in the organisation will not trust the new initiative. Several studies have identified strong leadership and support from clinical leaders as the major reasons for EHR adoption (Ash et al, 2003; Smith, 2003; Podichetty & Penn, 2004; Poissant, 2005). Ash and colleagues (2003) also note that successful implementation will depend on long-term leadership from all of the different levels in the organisation, ranging from senior executives to clinicians to operational managers. It has also been suggested that leaders should recognise that the advantages of an electronic information system are not always immediate, and they should appreciate that benefits such as increased efficiency and fewer errors will ultimately improve quality, increase productivity and reduce costs (Schmitt & Wofford, 2002). Therefore, leaders must be persuaded to commit financial and human resources in the longer term if the adoption of an EHR is to succeed.

5.11.2. Vision

To implement successfully any fundamental strategic change within an organisation, leaders must have a 'can do' attitude with a vision that describes how the organisation will look in the future. The vision should set out at three levels: health; e-health; and electronic health record. The vision should state the advantages that will accompany the changes, which are improvements in quality, efficiency, and equity (Moor,2010), and define the challenges that will be faced (capability statements). As mentioned above, if staff members are to be empowered to support new developments, they need to understand the motivations behind them and be involved in their design. If potential users of the system do not understand why it is being implemented, its implementation will meet with resistance. Scott (2005) demonstrated that most people do not necessarily resist change automatically but they resist having change imposed upon them. Having a vision for the future is therefore an effective and persuasive tool that can be translated into workable and understandable action-oriented goals (Lorenzi & Riley, 2000; Poissant et al, 2005; Lorenzi et al, 2009).

However, it is worth noting that having a vision is not an end in itself – it is a means to an end. Visions risk falling into one of two categories (Moran, 1998):

1. A vision without substance: problems include vagueness about the future, lack of institutional vision, lack of knowledge about the organisation's current position and time limitations.

2. A budget without vision: problems include vagueness about what problem is being solved, what are the priorities and the definition of roles and responsibilities within the organisation.

These issues highlight the importance for a vision to be supported by a strategic plan and long-term resources that can sustain its implementation (Soper, 2002; Ash & Bates, 2005). Changing from a paper based medical record to an EHR is a strategic change that needs to begin with a vision and be followed by a strategic plan (Lorenzi & Riley, 2000).

5.11.3. Information Strategy

To ensure an electronic information system is integrated comprehensively into a complex health system and into the strategic plans of the multiple stakeholders, strong leadership and vision are essential, but there is also a need for an information strategy that can detail what resources will be needed and how they will be used (Glaser, 2005). A strategic information system plan must integrate any clinical information technology into both the management infrastructure as well as the technical infrastructure of each organisation (Wager, 2002).

An information strategy must prioritise the information needs of the health care system, for example, providing data relating to service quality, continuity of care, communication flow and patients' ability to access their own health records. In addition, the electronic health records should be able to respond to the expectations of administrators, managers and planners of health care services, as well as the requirements of policy and the politicians (Rasmussen, 2003).

A health information strategy should be designed in close partnership with healthcare practitioners such as physicians to ensure their differing informational support needs are taken into account (e.g. hardware/software functions, user interfaces, modes of data entry, flexible documentation tools) and to support their workflows (Miranda et al, 2001; Morton & Wiedenbeck, 2009). Although an information strategy should consider the design and implementation of an electronic information system, it should also ensure that the long-term implications of sustaining and maintaining an EHR are identified (Morton & Wiedenbeck, 2009).

5.11.3.1. Strategic Planning

In order to implement the complex institutional change from a paper-based record system to an electronic medical system within the health care sector, there needs to be a strategic plan that will set out what currently exists and the goals and expectations of the initiative. The plan should also identify the timescale for implementation, the resources needed and the team that will manage the process (made up of representatives from all departments affected, e.g. a clinical advisory team (Souther, 2001; Schmitt & Wofford, 2002; Smith, 2003; McLane, 2005). The plan should analyse current workflows and put forward proposals about how they will be redefined when the new EHR is developed (Ammenwerth et al, 2003; Ash et al, 2003; Deese & Stein, 2004; Poissant et al, 2005). Specific issues to consider should include work station modifications, hardware installation, software design, backup systems, entering historical data and managing the paper records that are not to be part of the new EHR (Smith, 2003). When multiple organisations are to use an electronic information system (as in the case of different providers in the health care sector), it is perceived as taking a risk. One way to allay the fears of partners in such an objective is to use a strategic roadmap, which can be used to develop a business case to lower the risk for health care providers who adopt and use EHRs health care (Dixon, 2007).

5.11.3.2. Roadmaps

A strategic roadmap can help e-health innovators to provide information about the business case for the development of an EHR and give examples of successful adoption of EHRs in other localities. Roadmaps help to develop a workforce that is able to implement the system and will outline methods to ensure the system's sustainability (Dixon, 2007).

A strategic roadmap enables the stakeholders, such as policy makers and decision makers, to gain a complete vision of the future and experiment with planning data to reveal the different outcomes of various planning scenarios – turning strategy into action. This enables organisations to link everyday planning and projects into business priorities. Therefore, the roadmap has the potential to link the tactical decision processes, different business functions and organisations with a common thread: time (Whalen, 2007).

5.11.4. Clinical Support

Physician and others with a clinical background need to be involved in the design and development of a medical information system (Anderson, 1997; Ash et al, 2000; Doolan et al, 2003; Rogoski, 2003). It has been found that one of the key reasons why an information system is not adopted is if clinical staff find it difficult to understand or support the initiative (Lorenzi et al, 1997; Lorenzi & Riley, 2000). In addition, it is always useful to encourage clinical leaders, who have experience or an interest in informatics, to provide feedback about the system as it develops (treating them as 'customers') to ensure its design is responsive to their needs (Doolan et al, 2003). This feedback is extremely important, because communication between physicians and opinion leaders is a core reason cited for system failure (Anderson, 1997; Lorenzi & Riley, 2000).

5.11.5. Communication, Training and Long-term Support

Another element that will facilitate the successful adoption of an EHR is effective communication within and between organisations of a health system. Jablin (1979: p.1202) states that communication is an 'exchange of information and influence between [an]…. Organisational authority…and organisational members'. It is also clear that communication has a significant impact on productivity (through staff members' job satisfaction) and organisational effectiveness (Jablin, 1979; Downs et al, 1988; Kramer, 1995; Miller, 1995).

People who are asked to use the new technology of an EHR will also need to be trained and supported to do so; if they are not, the system will fail (Ash et al, 2000). This training should be individualised to respond to varied learning styles and clinical schedules; for example, a person's qualifications, past computer experiences and computer skills may serve as barriers or facilitators to technology use, so training should respond to these capabilities (Dillon et al, 2005). Moor (2010) emphasised that "education and training programmes should be established at an early stages (ICT for health as part of medical curriculum"p.37, and he also emphasised on the "train the trainer " concept p.37.

Training programs should educate people on how to use the system, plus address attitudes and build enthusiasm for doing so (Lorenzi & Riley, 1995). Appropriate techniques, timing and high quality training materials are required for successful system implementation (Greenhalgh et al, 2004). Some physicians, in particular, may have insufficient computer skills, lack basic computer knowledge/ training and may not understand the benefits the technology can provide (Johnson, 2001; Baron et al, 2005). This is another reason why it is critical to get strong support of physicians and their representatives at the highest possible levels in order for training to be designed to meet their needs and to encourage them to participate (Lorenzi & Riley, 1995; Lorenzi et al, 1997). In most cases, physicians prefer to be trained individually by other experienced physicians; however, team-based training or staged training may be needed for complex systems (Lorenzi & Riley, 1995; Ash et al, 2000; Johnson, 2001; Greenhalgh et al, 2004).

Electronic health record systems are more likely to be adopted if people's skills have the highest priority during all stages of the project, and a training programme is designed to respond to skill gaps before, during and after implementation. This long-term approach to training and support that can be provided quickly, 24-hours a day – especially just after the system 'goes live' – is essential (Ash et al, 2003; Fenton et al, 2006). The recruitment of 'super users', who can act a resource for other users, is an effective on-going support strategy (Laing, 2002). To support the view that a comprehensive information strategy is needed to implement successfully electronic health systems, the *British Medical Journal* hosted some international meetings in 1994 and 1995, to look for ways to improve the dissemination of health information to, from and within the developing world. The meetings showed that the overall impact of providing health information would be greatly enhanced by increased coordination, analysis and funding (Kale, 1994).

5.12. Electronic Health Record Systems: Some National Initiatives

Improved health and better patient care are the goals for many developing and developed countries. Strategic policies and plans are essential if nations are to promote equity, respond to cultural and linguistic needs, promote capacity building, ensure interoperability and assure safety (Kay et al, 2006). The World Health Organization (WHO) has suggested that these strategies should incorporate the national development and implementation of e-health systems, such as electronic health records. It is useful and interesting to note how different countries have taken forward the adoption of electronic health record systems, such as Australia, Canada, Denmark, Finland, France, New Zealand, Norway, Spain, Sweden, the UK and the US (Hodge, 2011). Each country has implemented such systems slightly differently and is moving at its own pace; all have the same goals – to achieve better patient care.

5.12.1. Examples of National Initiatives

5.12.1.1. Denmark

Traditionally, the national strategy for the digitalisation of the Danish Healthcare Service was designed by a small group of professionals from the Ministry of Health and Interior, the National Board of Health, the National Association of Local Authorities and a range of hospital owners. The group's responsibility was to monitor any strategic developments, help disseminate the results and further develop the strategy. It was responsible for ensuring communication between national health care organisations, hospitals and other health care stakeholders that were providing services (Esterle & Kouroubali, 2010). From the 1990s, the Danish Ministry of Health pushed for the development of a health information system to improve the efficiency and effectiveness of the Danish health care system (Danish Centre for Health Telematics (DCHT), 2008). The government recognised that it wanted to achieve an integrated system that would provide a seamless service to patients and improve patient involvement in decision-making (Deutsch et al, 2010).

In 1994, *MedCom* was founded as the national coordination organisation for health information technology. *MedCom* defines electronic data interchange formats for the most important health information that needs to be shared securely; it also supports information exchange over the Danish Health Data Network (Deutsch et al, 2010). Danish e-health is also provided through *Sundhed.dk*, an e-health portal enabling Danish citizens and health care professionals to access information and communicate with each other (Doupi et al, 2010). In 2006, 89% of Danish general practitioners and all 73 hospitals and all 331 pharmacies shared data over the network and health care information was transmitted electronically (Deutsch et al, 2010).

5.12.1.2. United Kingdom

In order to achieve national health care reform, an EHR system was initiated in 2002 by the UK's Department of Health. The primary goal was to improve patient care. The EHR strategy was implemented at a very high level, and involved government official including the health minister at that time (Esterle &Kouroubali, 2010). In October 2002, the *National Programme for Information Technology (NPfIT)* was established and in April 2005, all IT-related activities were being led by an initiative called *NHS Connecting for Health* (Deutsch et al, 2010). The National Health Service (NHS) NPfIT includes the development of an 'NHS Care Records Service' (NHS CRS), which consists of detailed records on every patient, which are held locally, and a summary care record, which is held nationally and termed the national patient data 'Spine'. A study conduct by Trisha et al. (2010,p9) point out that SCRs have "significant social and technical barriers to the widespread adoption and use of such records remain, and their benefits to date appear more subtle and contingent than early policy documents predicated". Example of the barriers are: information domain presented by SCRs were inapplicable to the encounter; technical communication to Spine was not possible; physicians had not been trained to use the SCR; and physicians were unauthorized to access SCRs.

In 2003, the NHS announced that every NHS patient would have an individual electronic NHS care record by 2010. In addition, an electronic person record (EPR) system (compliant with the national standard) was to be implemented in hospitals by December 2007. By the end of 2008, 210,000 Summary Care Records had been uploaded to the Spine. At present, few hospitals have received the new EPR systems and the majority used the EPR for administrative purposes only. One health authority suggests that the Care Record Services implementation would not be completed until 2016 (Esterle &Kouroubali, 2010).

5.12.1.3. Australia

In Australia, health care is managed by a cooperation project called *HealthConnect*, which includes the government, the states and territories. It aims to empower patients and develop an efficient and quality health system. *HealthConnect* collects, stores and exchanges patients' health records within a safe and private framework (Dorda et al, 2005). An interoperable infrastructure was developed in 2004 by the newly founded *National eHealth Transition Authority (NEHTA)*, which consisted of members of federal, state and territory governments. It aims to set standards, terminologies, patient/provider identifiers and respond to any relevant legislation. The implementation of the national EHR system is planned for 2014. Certain elements of the infrastructure and standards have already been set (except for identifier and security issues) and the system has been tested in different locations in Tasmania and the Northern Territory.

5.12.1.4. Canada

A non-profit organisation was created in January 2001, called *Canada Health Infoway*; it aims to promote the national implementation of interoperable electronic health records, with the ultimate goal of achieving better quality and safer patient care, along with a better use of resources. Although overseen by the Ministry of Health, the implementation of the system is undertaken by the provinces (Deutsch et al, 2010), and aims to develop effective interoperable EHR operations (Dorda et al, 2005). *Canada Health Infoway*'s seven-year plan is to have interoperable EHRs established and to provide EHRs for 47% of the Canadian population (Deutsch et al, 2010). Canada Health Infoway's total capital budget is $1.2 billion (CDN) from the federal government. (Dorda et al, 2005).

5.12.1.5. United States

There has been a fear in the US about potential legal issues, a lack of reporting of medical mistakes, health service quality and transparency in pricing and rising costs of health care generally. It has been suggested by experts that the best way to improve health care quality and to reduce medical errors is to develop a comprehensive EHR. By 2014, the US government plans to provide most US citizens with EHRs. The strategy has been formulated by the Office of the National Coordinator for Health Information Technology (ONCHIT) and will cost approximately $4 billion (Dorda et al, 2005). ONCHIT has specified a 'Strategic Framework', which describes a 12-step process for the implementation of the plan. Its aims are:

- to certify the functionality of the EHR system;

- to achieve national EHR interoperability by developing regional information organisations to support local EHR data exchange and connect them to a national information network;

- to provide patients with access to their own EHRs.

The US government has not been involved directly in the development of a national EHR system. Although government legislation has focused on supporting the development of EHR systems within the private sector, federal funding has not been forthcoming and the government has not enforced its own legislation. For example, in 2005, the US Department of Health and Human Services (HHS) issued the Patient Safety and Quality Improvement Act, which aimed to develop patient-safe organisations and was supposed to collect and analyse data about health care facilities. So far, although US senators, the Joint Commission and the American Medical Association (AMA) all tried to make the Act work, the HHS has failed to enforce this legislation.

Therefore, the framework for the US EHR system has not been finalised, yet the federal government has tried to define an infrastructure by beginning to define functionalities, standardise data exchange and collaborate with stakeholders. Organisations, such as the Certification Commission for Health Information Technology (CCHIT), The Healthcare Information Technology Standards Panel(HITSP) and the American Health Information Community (AHIC) have been funded by ONC to encourage a national IT system to develop, but it is still struggling. However, at a local level, many independent clinical electronic ambulatory record systems have developed, though they have found it difficult to become interoperable because they are so disparate and managed by different vendors, which has impeded the effective exchange of data (Klein & Arnold, 2008).

5.12.1.6. Malaysia

In Malaysia, a Health Technology Assessment (HTA) Unit was founded by the Ministry of Health in August 1995. The aim of this unit was to provide input into health care policies, provide a good scientific base upon which to adopt and use technology and to promote the use of existing technology. The Ministry created a three-tier organisational structure in which expert groups firstly carry out technology assessments with the help of the HTA, secondly, a technology committee examined their reports and thirdly, the HTA Council made decisions based on their recommendations. Health care is provided by three large hospitals in Malaysia, which have the capacity to support a Health Information Exchange system. They are all based in the capital, Kuala Lumpur: Subang Jaya Hospital, General Hospital and Penang Adventist Hospital (Pupo, 2008). All patients who have received care in one of Malaysia's three hospitals are automatically enrolled in the three-tier system (Pupo, 2008).

The National Information Technology Agenda (NITA) was subsequently established in 1996 to provide a framework for coordinating and integrating three strategic elements into the developing technological system: human resources, infostructure and IT-based applications. In 1997, Malaysia developed the Telemedicine Blueprint of Malaysia, *Leading Healthcare into the Information Age*, which was the reference document for the development of the system named, *Telehealth*; it highlighted the advantages of information and telecommunication technologies. Malaysia thus began to develop an integrated Telehealth Flagship Application, consisting of four sub-applications: the Lifetime Health Plan (LHP), mass customised and personalised health

information and education (MCPHIE), continuing medical education (CME) , and the Telehealth Consultation Applications (TC) (National Health Information System for South Africa Committee (NHIS/SA), 2006). Overall, the Malaysian government has supported the development of a health information system as part of the strategy of developing a healthy nation. However, the country may find this a challenge as there are no self-referral laws. In a society where corruption in business is common, any attempt to reduce the self-interest of health care professionals may create a barrier to sharing information consistently.

5.12.1.7. Korea

In Korea, there is a comprehensive implementation of an Electronic Medical Record (EMR) system within the hospital sector. There are 11 hospitals that have implemented fully an EMR, including all inpatient and outpatient health care information. In terms of size, one hospital has a bed capacity of 300-399, two have a bed capacity of 500-599, two have a bed capacity of 600-699, and six have a bed capacity of over 700. In addition, there are three hospitals with over 500 beds with an EMR implemented for inpatients only, and two hospitals with over 700 beds with an EMR for outpatients only. Another , three hospitals that have partially implemented an EMR, and in one of the main hospitals, the EMR was introduced in October 2004 for both inpatients and outpatients. Most of the old medical records have been scanned and very recent ones are currently being scanned. For inpatients, data is entered at the bedside using notebook computers. For outpatients, doctors input data at the point of care using computer terminals, but if they are too busy, physicians' assistants enter data for them. The terminology being used for the EMR is SNOMED CT. In terms of privacy and continuity of care, signed consent forms for treatments are scanned immediately after discharge and connected to the EMR, as are letters from referring practitioners and hospitals. Some test results, which are produced from equipment not yet interfaced to the EMR, are also scanned immediately after discharge enabling users to view them via a monitor. A goal of the hospital is to share information with all the national hospitals and public health care facilities, but at present, they can only share data with one branch of the hospital (Phylis, 2006).

5.12.1.8. The initiative of EHRs in European Countries

In recent years, the European Commission (EC) has identified e-health as a priority. By the end of 2005, the EC announced that member countries must define national and regional e-health strategies including the deployment of e-health systems, the use of electronic health records and their interoperability and the re-imbursement of e-health services. By the end of 2006, member countries were required to have developed interoperability standards for health data messages and electronic health records, taking into account best practice and relevant standardisation efforts. By the end of 2009, EC members set the baseline for standardised provision of e-health services in clinical and administrative settings (Moor, 2006). In 2010, the European Union undertook a study, which was called *eHealth* Strategies (European Union, 2010). The study analysed policy development, planning, implementation and progress achieved at national levels. Table 7 below, which is eHealth Strategies, summarises the main issues that are considered relevant information for this research.

Table7: e-Health Strategies for European Countries

Countries	Initiation	Strategy/Roadmap	Goals
Finland	The Ministry of Social Affairs and Health,	Strategy for utilising information technology in the field of social welfare and health care in Finland	To secure access to information for those involved in care regardless of time or place, to enable the involvement of citizens and patients, to increase the citizens' access to information and to ensure a high quality of health information
France	The Health Insurance Act of 13 /08/2004	Dossier Medical Personnel (DMP), and the associated pharmaceutical care record	To improve the coordination of care, continuity of care and improve quality of health care
Italy	The Ministry of Health and the Conference of Regions	Health care Information System (NSIS)	To provide organisations within the health care administration and service with core electronic applications and to ensure that they conform to nationally agreed standards and are interoperable, to provide regions with reporting structures and data collection systems that would allow them to manage the planning and provision of health services more efficiently
Norway	Ministry of Health and Care Services	Teamwork 2.0 (2008-2013)	Consolidation and dissemination of existing messaging services, and secure access to health data such as patient summaries .
Spain	The Ministry of Health	Quality Plan for the National Health System (NHS)	To provide the citizens with assistance of the highest quality by making use of information technology
Sweden	The National and Regional Authorities	National Strategy for eHealth (2006)	All patients receive adequate, safe, secure health care and good-quality services
Switzerland	The Federal Department of Home Affairs (EDI)	Strategy for an information society in Switzerland, in 2006 additional chapter was add to the strategy called –Health and Health Services-Including eHealth applications	The ICT in health care can bring advantages regarding access to health services, efficiency, security and costs

Source: e-Health Strategies: European Country Reports http://www.ehealth-strategies.eu/database/database.html

5.13. Summary

In summary, strong leadership, vision, strategic planning, an information strategy and ongoing support/training are seen to be the driving factors behind the successful implementation of complex technology, such as an EHR (Moran, 1998; Doherty et al, 1998; Riley, 2000; Heeks, 2003, 2004; Khaled, 2003; Mugonyi, 2003). The literature shows that socio–technical interactions between the technological features of a health information system and the social dynamics of the health care workers' environment were found to have the greatest impact on system implementation (Ash et al, 2007; Ludwick & Doucette, 2009). These concepts suggest that there is a relationship between the mechanisms that facilitate the health care process and the interpersonal interactions needed to carry out the daily clinical tasks (Rosenbloom et al, 2006; Ash et al, 2007). To put it another way; when implementing an EHR, health care provider leaders must ensure the technology of the new system 'fits' within the organisation's culture and workflow (Ludwick & Doucette, 2009) and must allow it to grow organically and flexibly in an integrated fashion. If this is not achieved, it will not be sustained because the people who use it will not trust it or will not have the skills to make it work effectively. In summary, it can be seen that a combination of standardising and optimising workflows, effective leadership, comprehensive planning, training and ongoing support will lead to the smooth adoption of an electronic health record system.

Chapter Six: Research Methodology

6.1. Research Definition

The role of research methodologies is to steer the research through a range of procedures, adding to what is known (of the body of knowledge) by discovering new facts and relationships through a systematic process of scientific inquiry (Nachmias & Nachmias, 1996). Regarding the philosophical perspective of research, Cavaye (1996) suggests that research methods known as positivism and interpretism rely on different assumptions about what is knowledge. However, in case study research, both methods can be used to provide additional relevant information. Gill and Johnson (1991) said that 'research may be classified according to its purpose' (p. 8). In the past, a multidisciplinary approach was needed to gain a complete understanding of a phenomenon, and Lakhanpal (1994) observed that researchers would sometimes try and use theories from single disciplines to explain the complex relationships between information technology and organisations. Lowery (1997: p. 192) stated:

'Information systems research is difficult because it always involves people, technology, and the linkage and interactions between them. If we remove the technology, we are no longer studying information systems but are working in reference disciplines such as psychology, sociology, human communication, organisational behaviour, philosophy, epistemology, ethics, logic, anthropology, and theology. Similarly, if we remove the human aspects we position ourselves in computer science, electronic engineering, communication technologies, physics, chemistry, and other technological reference disciplines'.

6.2. Research Strategy

This research aimed to learn from how the electronic medical record system has been adopted and used in Kuwait in order to recommend the next priorities for electronic health record system function and infrastructure, in order that adoption can be improved and greater benefit obtained. The researcher was interested in the associated processes, benefits, and barriers that were faced during the gradual development of this EMR system or EHR system. The first year of research involved the study of various sources of literature relating to the EMR/EHR in order to formulate a research topic. To enable the researcher to explore and explain a contemporary system in a real-life setting, multiple case studies and various surveys were undertaken. The subject of the research was based on two strategy models and the researcher formulated a research hypothesis in order to involve a range of stakeholders. The first model was the Domain Theory, which was used to identify the stakeholders and their role in the research. The second model was a based on the Research-based Improvement Strategy, which outlines the aims of the study. The first study aim was to describe the main benefits and barriers that arose when adopting the EMR. The second study aim was to evaluate the current adoption of the EMR in a Kuwait PHC system. The third study aim was to improve the current adoption of EHR/EMRs by proposing a strategic roadmap based on a series of international and national surveys.

The following section discusses the research methodologies in the context of this research and outlines the nature of the strategies used in relation to the overall thesis.

6.2.1. Quantitative and Qualitative Methods

Research strategies or methods enable us to collect data, which are variables or facts from which conclusions can be drawn. Data can be collected from several sources using different methodologies. The data can be classified as qualitative if it is collected in word form, and it is termed quantitative if it is presented in the form of numbers (Blaxter & Hughes, 1996).

It is important to select data in a way that is appropriate to the research. It is also vital to the success of the research that the quantitative or qualitative data is applied properly within an appropriate scientific framework. The decision regarding the appropriateness of a particular method cannot be made in isolation from the context of the research problem, so the choice of a qualitative approach or a quantitative method as the most appropriate tool for a particular study has always been problematic (Downey & Ireland, 1979).

Quantitative Method: This method implies the application of a numerical approach to the issue under study as well as the need for data analysis. The main focus of quantitative methods is on structural measurement and analysis of relationships rather than on the more complex issues of process (Van Maanen, 1979). Therefore, quantitative methods have been characterised by some researchers as 'thin' but 'hard' and 'generalisable' (McClintock et al, 1979). Through the statistical analysis of data, quantitative methods are useful in providing precise measurements for social actions by justifiable causal relationships related to specific events using objective criteria (Nettleton & Taylor, 1990).

Qualitative Method: In contrast, qualitative methods aim to increase the richness of data that relates to social processes within a research problem (Bryman, 1995), and they tend to be subjective. Finch (1986) argues that qualitative study is an inquiry process that is used to understand observed associations between factors; it charts social or cultural phenomena based on a holistic picture of the people and the social and cultural context within which they live, and it details the different views of the participants. In qualitative research, the investigation aims to provide insights into organisational and social processes, which are both tangible and intangible (Van Maanen, 1979). Qualitative methods are usually used to provide a deeper insight into the issue under investigation, especially in the research context where a certain topic may not have been much researched (Van Maanen, 1979; Bryman, 1995).

6.2.1.1. Single or Multiple Case Studies

A case study is the analysis of a real-life phenomenon; it may include a single case or multiple cases, depending on the aims of the study. Case study research is an accepted research strategy in the field of Information Systems (ISs). Yin (1994,p.13) states that a case study from a research strategy point of view may be defined as follows: 'An empirical enquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used.'

According to Stake (1994), a single case provides the researcher with knowledge about that particular case, its complexities, and uniqueness. On the other hand, multiple cases provide the researcher with more convincing evidence; these studies are then more robust (Yin, 1994). A single case study is usually chosen when it represents a critical case in order to test a well-formulated theory and enables the researcher to look into its complexity and uniqueness. In multiple case studies, the underlying logic is based on replication where the analysis is primarily concerned with comparisons between cases. Each case has to be selected so that it either predicts similar results or produces contrasting results but for predictable reasons. From a given description, a researcher can derive factors to make comparisons for the reader (Kollberg, 2003). Multiple case studies were selected for this thesis.

Three central reasons for why case study research is a viable IS research strategy (Benbasat et al, 1987) include:

1. a researcher can collect data and obtain evidence from a natural setting and 'generate theories from practice' (p. 370);

2. a case study research strategy can answer subtle 'how' and 'why' questions;

3. case study research can navigate new emerging topics in the field of IS, from which valuable insights can be gained.

A range of factors need to be considered before deciding the best research method for a particular topic. Yin (1994) identified some of these factors; however, they should not be considered in isolation: they need to be complemented by a number of other factors (Irani et al, 1999). Some of the complementary questions that need to be answered to ensure an appropriate case study strategy is selected are listed below.

- Is 'rich' primary data needed?

- What is the nature of the data required, including its scope and sensitivity?

- Do the effects of the phenomenon need to be studied over a period of time?

- What is the researchers' personal experience and knowledge?

- Are there any resource constraints, such as time and finances?

Avison (1993) suggested that a case study's advantages are the opportunity it provides for a deep and comprehensive analysis and its capacity to examine natural situations. An additional advantage has been proposed; that the scope and sensitivity of a case study strategy can be 'extensive and may range from individual process to national level' (Irani et al, 1999: p. 191).

6.2.1.2. Survey Questionnaire

Conducting research using a survey method is often used to collect quantitative data in IS or information technology (IT) research (Straub, 1989; Pinsonneault & Kraemer, 1993), and it can be used to explore and describe a topic in detail. These researchers also argue that the purpose of explorative survey research is 'to become more familiar with a topic and try out preliminary concepts' (p. 79). Surveys usually investigate a particular phenomenon using a questionnaire or an interview (Leedy, 1974), where information is obtained directly from participants by posing questions. However, as the information is usually elicited from a large number of respondents, the survey results are often generalised to represent the view of the population.

The purpose of such research is to find out 'what situation, events, attitudes, or opinions are occurring in a population' (Pinsonneault & Kraemer, 1993). Survey research can be undertaken using a cross-sectional or longitudinal approach (Babbie, 1990).

The survey questionnaire can provide reasonably accurate descriptions of real world situations from a variety of viewpoints. Galliers (1992) argues that questionnaires are useful when examining a greater number of variables than is normally possible with experimental approaches. Bryman argues that the questionnaire is valuable when the aim of the research is to gather specific answers to questions, such as 'what', 'when', 'where', and 'how many', suggesting that it is an appropriate tool for collecting data under three conditions:

1. when quantitative data are required;

2. when the information sought is reasonably specific and familiar to the respondents;

3. when the researcher has considerable prior knowledge of particular problems and of the type of responses likely to emerge.

However, there are some drawbacks to survey research. Not much information or insight is obtained about the cause or the processes behind the topic under study. In such cases, an exploratory survey should be undertaken as this enables concepts and methods to be developed for a more detailed, systematic descriptive or explanatory survey (Babbie, 1990; Pinsonneault & Kraemer, 1993).

6.2.2. Domain Theory

Some researchers have argued that traditional research, which examines organisational topics, does not help us understand the distinctions associated with large groups of organisations known as 'Human Service Organisations' (HSOs) (e.g. schools, universities, or healthcare systems). Kouzes and Mico's (1979) Domain Theory originally aimed to explain anomalies in the scientific approach of organisational development, where it impacts on the public sector (Figure7).

In addition, Golembiewski (1969) maintained that research can become problematic when applied to non-traditional public agencies – those that have specific characteristics that include a large quantity of weaker connections between employees. Kouzes and Mico (1979) suggested that HSOs consist of a range of different and distinct domains (e.g. policy, management, and service domains). They argued that this domain separation results in a phenomenon known as the 'Rashomon Effect', which is often noticed in HSOs (Schon, 1971: p. 5):

'The actors in each domain collect information needed to perform their own roles, but in the process often selectively ignore or discount information available from other sources, thus frequently arriving at incompatible conclusions. All tend to define as problems only those things affecting their own measures of success, and often one domain's solution is another domain's problem. Although this selective perception distorts the organisational world, it also serves the purpose of preserving each domain's integrity.'

They thought that HSOs comprised three domains and each domain had certain characteristics (Kouzes & Mico, 1979):

- a struggle for power and control;

- different norms;

- separate identities;

- different rhythms of change;

- different perceptions of reality;

- uncertainty during periods of change;

- discordance between domains.

Thus, the more traditional hierarchy model of organisations does not always conform to reality, where organisations (particularly public health organisations) actually comprise a complex set of arrangements and characteristics.

Three clearly identifiable domains are present; the policy domain, the management domain, and the service domain.

The policy domain: This is at the highest managerial level of an organisation and involves mediation with the community at large. It is the organisational level where governing policies are formulated. Policy-makers are responsible for the public image of the organisation and how it is represented within the community – especially within the political arena. Yet at the same time, they must secure resources for the organisation as a whole and justify any costs. Therefore, policy-makers are concerned with organisational survival and look to the community as a resource provider and as a source of power. The functions of a policy-maker and the ways in which policy decisions are reached involve negotiating, bargaining, and voting (White & Wilson, 1984). In other words, this policy domain is concerned with translating public policy, bargaining, and negotiating for resources. In relation to health care systems, the policy domain stands for the policy makers at the Ministry of Health (MOH) in Kuwait, and it refers to the level of the organisation at which governing policies are formulated.

The management domain: This level includes workers or 'facilitators' that manage the technical or service function within an organisation. They are responsible for the delivery of services in relation to quality, adequacy, and character. Hierarchy and control tend to be the business-like principles that are high on their list of priorities. They try to rationalise the organisation, accept cost-efficiency and effectiveness as success measures, and believe bureaucracy is the appropriate structure in a successful organisation. This means that developing and maintaining the management domain becomes an internal process and is carried out using methodical and linear work modes, irrespective of their appropriateness to the workings of HSOs (White & Wilson, 1984). The management domain reflects the decision makers within the Kuwait Ministry of Health and its goals are to implement policies that are decided by national government.

The service domain: Every formal organisation has certain technical functions, providing some service to customers/clients. This domain focuses on the nature of technical tasks. Workers within this domain follow two clear principles: Self-autonomy and client orientation. Trained professionals believe that they have the expertise to respond to the needs and demands of their clients and to be responsible for their own actions. Principles of autonomy and self-regulation thus dominate the service domain within which 'quality of care' and 'professional standards' are the quality criteria for measuring the success of processes, though not products. Problem-solving that is focused on the individual client is the predominant way of working, with a loosely determined technology (White & Wilson, 1984).

The Kuwaiti health service domain consists of those who provide services to clients and is dominated by health care professionals.

The policy Domain

The management Domain

The service Domain
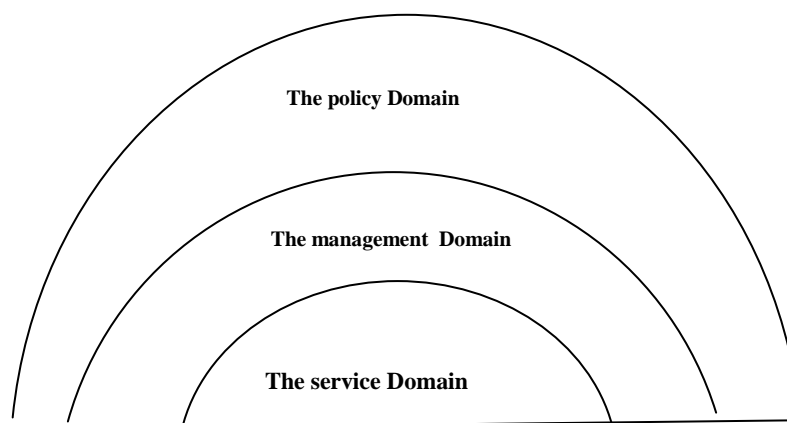
Figure7: Domain Theory(Kouzes&Mico,1979)

Domains are organised by what they do – their function, which reflects the performance of the central task. Each domain operates using different and contrasting principles, and the effectiveness of the structural arrangements and work modes is measured by their success. The policy-makers develop structures and working methods to meet the demands voiced by the community and to develop a good enough reputation in the community to ensure effective bargaining.

Managers are responsible for the efficient use of resources and for achieving goals, while professionals, who deal directly with clients, work at the service and technical levels and have to develop their own methods of working when faced with individual clients. These differences separate and disconnect the domains and promote separate identities that are associated with each domain.

6.2.3. Research-based Improvement Strategy

Priority setting, rationing, or resource allocation mean the distribution of resources among competing groups of people (McKneally et al, 1997). Priority setting occurs both at the macro (health system) level, the meso (institution) level, and at the micro (policy) level. Based on research, Martin and Singer (2003) proposed an improvement strategy called Describe-Evaluate-Improve; it is a transferable method that can be used by different organisations to improve they way they identify priorities (Figure8). Research structures that aim to develop improvement strategies comprise three methods.

1. Case study research to *describe* priority setting.

2. Interdisciplinary research to *evaluate* the description against 'accountability for reasonableness'.

3. Action research to *improve* priority setting in context.
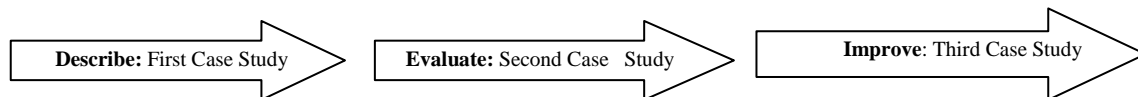
Figure8. Research-based improvement strategy (Martin&Singer,2003)

6.2.3.1. Phase One: Describe

A case-study method puts actual priority setting in context. This method is appropriate because priority setting in healthcare institutions is complex, and has its own particular characteristics and uniqueness, and involves a range of social processes. Thus, case-study methods provide a structured yet flexible approach to data collection and analysis. This phase was applied for the first case study, which is the International Perspective of the Electronic Health Record, benefits, and barriers. The finding from this study define the main barriers and benefits of EHRs.

6.2.3.2. Phase Two: Evaluate

Evaluating research must not be overlooked because what health care professionals do may not be what they *should* do. Rosenfield (1992) argued that in an interdisciplinary setting, researchers working jointly using a shared conceptual framework and drawing together disciplinary-specific theories, concepts, and approaches to address a common problem should use an ethical framework, referred to as 'accountability for reasonableness'. The 'input' to the interdisciplinary research phase is a description of the priority setting process developed in the case study. This must then be compared with the descriptions (what they actually do) of the conditions of 'accountability for reasonableness' (what they 'should do'). The purpose of this research is to narrow the gaps between actuality and aspiration, and improve priority setting in the context of 'accountability for reasonableness'. In the past, it has been used to evaluate priority setting at the 'macro' or health system (Ham & McIver, 2000). This phase have been applied for second case study, which is Kuwait Primary Healthcare Professionals' Perspective on the Electronic Health Record System, to evaluate the current EHRs adoption in primary health care centres. The results of this study have drawn out the functionality of EHRs at PHCs and its main barriers and benefits.

6.2.3.3. Phase Three: Improve

Change is not implemented if processes and structures are only described or evaluated. A third step is needed to improve priority setting, using action research to implement changes that flow from the evaluation. Action research is 'research conducted in partnership with members of the community or setting in question with the specific purpose of bringing about structural or cultural change' (LeCompte & Schensul, 1999: p. 83). It 'involves researchers and non-research partners in joint problem definition, selection of research methods, data collection, analysis, and plans and actions for use' (LeCompte & Schensul, 1999: p. 125). Action research can identify and describe new understanding and knowledge within an organisation, while also making changes. Good practice in action research suggests that strategies should be devised in partnership with the research participants so that they own the process and develop a commitment to act on the results.

To ensure involvement and thus ownership of the case-study outcome, the results and the interdisciplinary evaluation are normally summarised and distributed to the local participants, who then develop and implement strategies for improving priority setting in the local context in partnership with the research team. Accountability for reasonableness does not specify how to improve priority setting in specific contexts but it can identify strategies for improvement. This phase was used for setting the third study: the Kuwait E-health Strategic Roadmap. The outcome is a proposed strategic roadmap for improving the adoption of EHRs, from policy-maker perspectives.

6.3. Research Process and Implementation

For this research, a survey was designed, which aimed to obtain a comprehensive view of the Kuwaiti health system from the perspectives of various stakeholders. The case studies used designs that were based on a range of elements:

- Official documents from the Kuwait MOH and the MOH Organisation Chart (see appendix G and I)

- Unofficial meetings with the Senior Director of the Information Technology Department, the Senior Director of the Quality Assurance Department, and with three directors of some Primary Care Clinics within the Kuwait MOH

- Consultation with the PhD First and Second Supervisors

- EHR/EMR literature reviews (as shown in Table 8)

- The researcher's previous background as a Health Information Administration practitioner at Kuwait's MOH, and as an academic teacher in the School of Health at the Public Authority for Applied Education and Training (PAAET) in Kuwait.

The responses from the first case study have influenced the design of the other case studies, in terms of expanding on topics that arise during the course of a research. The surveys that were developed were: the International Perspective of Electronic Health Record, benefits, and barriers; Kuwait Primary Healthcare Professionals, Perspective on Electronic Health Record System, and Kuwait E-health Strategic Roadmap.

Table 8: Case studies Design Resources

First Case study: International Perception of the Electronic Health Record: Benefits & Barriers	*Adopted based on literature from EHR Chapter (Ch.5)*
Section 1-Demographic	As role base in every research to manage the research data during the analysis process
Section 2: Barriers effecting EHRs adoption	Section7, 8,10, 11.4, and 11.5
Section 3- Benefits of EHRs	Section 3.2.2., 3.4.,4, 6,7, and 9
Section 4-Adoption Approach of EHRs	Section 5, 6 , and Technology Acceptance Theory Model
Second Case Study : Kuwait Healthcare Professionals Perspective on EHRs	*Adopted based on literature from EHR Chapter (Ch.5)*
Section1- Demographic	As role base in every research to manage the research data during the analysis process
Section 2-EHRs Existence and Availability	Section3.3., 5, and 7
Section 3-EHRs Features	Section 5,6,and 7
Section4-Benefits of EHRs	Section 3.2.2., 3.4.,6, 7,and 9
Section5-Barriers of EHRs	Section 7,8,10,11.4, and 11.5
Section 6-EHRs Satisfaction	5,6,7,9,and 10
Third Case Study : Kuwait Strategic Roadmap	*Adopted based on literature from EHR Chapter (Ch.5)*
Australian National e-Health Strategy, 2008, Section11 and 12 of Chapter 5	

6.3.1. Piloting and Pre-testing

Piloting a research programme is defined by Gill and Johnson (1991) as 'a trial run through to test the research design with a sub-sample of respondents who have the characteristics similar to those identifiable in the main sample to be surveyed' (p. 89).

It is important to develop a clear, easy to use, and objective questionnaire. Therefore, all the surveys were piloted by the researcher with the coordination of first supervisor and second supervisor. The first case study was piloted at the Centre for Health Informatics and Multi professional Education, University College London. The second case study was piloted at two primary care centres at the Kuwait Ministry of Health. The third case study was piloted at Ministry of Health by senior policy maker at the Ministry of Health. The specific goals of the pilot test were to develop and validate the survey questionnaire for the wider study to be conducted at a later date, and to identify any weaknesses in the questionnaire. During the development of the pilot survey, we took into account that the surveys were presented in the English language and in Arabic for the healthcare professionals because of their nationality and academic backgrounds. English was maintained for the first and third surveys, as the professionals were policy-makers and are more likely to be able to read English; it was also retained for the management stakeholders, whose main professional language is English. The outcomes of the pilot test were used to improve the reliability and the validity of the survey instrument. The observations of the researcher during the pilot test led to minor modifications in the instrument's length and in the clarity of the questions. A number of changes were thus made to the original questionnaire in response to the pilot test recommendations. Questions were spaced equally and evenly, tables were given more space, and a larger space was placed between questions to make them more distinct. The general layout of the revised questionnaire was thus more readable and easier to comprehend.

6.3.2. Access Issues

When undertaking any case study, the researcher 'must learn to integrate real world events with the need of the data collection plan' (Yin, 1994: p. 68) because they deal with real-life situations and not a controlled laboratory environment. Before questionnaires were distributed, the covering letter from the research supervisor was submitted to the international stakeholders participating in the first study. In relation to the national stakeholders at the Ministry of Health, the researcher obtained the necessary approval from top management at three levels: the Undersecretary of the MOH, the directors of three healthcare sectors at the MOH, and the directors of the health regions. In order to get the necessary approval for the national surveys, the researcher adhered to the following procedures:

- complete the application form from the Standing Committee for Coordination of Health and Medical Research at the MOH;

- submit the research proposal;

- submit the survey copy;

- submit informed consent;

- submit personal consent from the researcher to ensure privacy and confidentiality of the study;

- submit a copy of student enrolment in the Health Informatics PhD programme;

- submit a covering letter from the research supervisor.

6.3.3. Summary of Responses

The response rate from each case study was very high. The rate for all responses from all case studies was 77%. This good quality response rate was due to strict follow-up and to monitoring from the principal and cooperate supervisors of the research, the researcher of the research and the Under Secretaries of the MOH. Table 9, indicates the response rates in more detail.

Case Study	Distributed	Returned	Response Rate (%)
International perspective of Electronic Health Record benefits and barriers	130	72	56%
Kuwait Primary Healthcare Professionals' perspective on Electronic Health Record system	390	327	84%
Kuwait E-health strategic roadmap	14	12	86%
Total	534	411	77%

Table 9: Summery of response rate

6.4. Reliability and Validity

Sarantakos (1998) suggested that reliability is the ability of a research instrument to produce consistent results, saying that it is equivalent to consistency. Therefore, reliability is important as it ensures consistency of results if the research is repeated by a different researcher with similar data collection procedures (Yin, 1994; De Looff, 1997). In a research context, validity can be internal or external. Internal validity is concerned with 'establishing a causal relationship whereby certain conditions are shown to lead to other conditions' (Yin, 1994: p. 33). For example, a researcher might try to assess whether variable X will lead, as consequence, to variable Y. Therefore, for causal or explanatory case studies, we need to use this type of testing (Yin, 1994). In this study, internal validity was achieved by using a survey questionnaire.

The domain within which case study findings can be generalised depends on whether the situations are sufficiently relevant or similar to the cases that are under investigation. The existing literature on EMR/EHR outsourcing supports the empirical findings of the survey questionnaire and interviews. Therefore, in relation to our research, this can be regarded as 'external validity' (Yin, 1994).

6.5. Ethical Considerations

Ethical considerations are essential in questionnaire-based research. They protect subjects' volunteer status and privacy, whether or not the subjects' consent to participate in the study has been obtained, and whether the due process of ethical review has been followed. While implementing the questionnaire, it was quickly apparent that the people of Kuwait were not familiar with research instruments; respondents found completing the survey extremely challenging, which became an almost insurmountable obstacle during this research programme.

To encourage people to take part and complete the questionnaires, the researcher had to emphasise to participants that the research was in the interest of Kuwait as a nation. All those at the MOH who responded were assured their identities would be confidential and their responses would be anonymous. There are a number of ethical considerations that are related to the researcher–respondent relationship, which had to be considered (Sarantakos, 1993).

- Right to privacy: the researcher will respect the respondent's privacy when entering their personal sphere, and when asking questions.

- Proper identification: the researcher will identify themselves to the respondents and will avoid giving false impressions of themselves or of the aim of the study.

- The right to anonymity: data collected by the researcher will be anonymous, that is, not related to names or other forms of identification.

- Free and informed consent: respondents will participate freely in the research and will not be pressured or deceived in any way.

- The right to confidentiality: information offered by the respondents will be used only by the researcher, and only for the purpose of the study.

The researcher had follow the ethical and legal procedure during the research process. The researcher submitted a copy of the survey and requested permission to conduct the research from the standing committee for coordination of health and medical research, at the Ministry of Health. Also, the researcher submitted a personal consent statement that the case studies did not require access to patient medical charts, and submitted an informed consent statement on the protection of participant responses. The overall aim of these consent statements was to ensure the privacy and confidentiality of the research responses. Trompenaars (1996) notes that in the Western World it takes a person, on average, one and a half hours to answer a questionnaire consisting of 58 questions. In Kuwait, an example of a developing nation, it usually takes around two hours to complete a similar sized questionnaire. Therefore, the difficulties of applying Western methods of social research in developing countries cannot be overstated.

6.6. Analytical Tools

Analytical tools help researchers to analyse or take a more in-depth view of a phenomenon – usually in relation to its effectiveness. Statistical methods that can be used for developing and presenting descriptive data have become increasingly popular in recent years. The data were entered and analyzed using Statistical Package for Social Science (SPSS version 16.02).

6.7. Limitations of the Research

As in all fields of study, there were some weak areas in this research project. One limitation was caused by the restrictions imposed by the MOH. For example, certain constraints on the survey process were set by the MOH, such as:

- A time period of only three months to conduct the study. As a consequence, the first and second studies were conducted during summer, July 2008, and the third study was conducted during early autumn, October 2010.

- Access to employees was only allowed during morning work shifts. The data was distributed personally by the researcher for the first case study, and the third case study, and collected by the secretary administrators at each department that was involved in each study. The second case study questionnaires were distributed and collected via a moderator at each healthcare centre, after approval from the head director of each centre and researcher of the study.

These limitations had some effects on the project's sample size, the selection of the case study, and the reactivity of participants, all of which had some negative impact on the research process. However, they did not adversely affect the validity of the results in relation to the strategic goals of the research.

6.8. Summary

This chapter has outlined the research methodology used for collecting data. A case study research approach was employed to enhance data collection procedures. A survey questionnaire method was the main data collection mechanism. It was found that this technique was the most appropriate way of collecting the data because of the large number of participating stakeholders. These stakeholders covered most healthcare professionals at the MOH, especially those based in the primary health care sector. The sample respondents included policy-makers, management decision-makers, and healthcare professionals. The selected sample was thought to be reasonably representative of the different sectors in the Kuwaiti health sector.

Different phases of the research process were discussed in detail. The first phase entailed piloting the questionnaire; the results suggested that a number of minor changes had to be made in order to finalise the design of the questionnaire, so these changes were incorporated. In the second phase, supplementary documents were provided to enrich data gathering. The third piloting phase, where the response rate was very high, concentrated on data collection responses. Different methods of judging the validity and reliability of the research were also taken into account. The next three chapters (seven, eight, and nine) present and analyse the results of the data that were collected during the research.

Chapter Seven: International Perception of the Electronic Health Record: Benefits and Barriers

7.1. Introduction

This chapter analyses the research data in relation to the way electronic health record systems are perceived throughout the world. We examine the benefits and barriers to data collection and our discussion is based on the methodology highlighted in the previous chapter.

In this research, a questionnaire survey was designed that aimed to obtain a comprehensive view of the Kuwaiti health system from the perspectives of various stakeholders. Once each questionnaire was assessed as being complete and usable, it was given a serial number and coded for the purpose of statistical analysis. As mentioned earlier, the survey was analysed using a SPSS (Statistical Package for Social Science) package, and a descriptive statistical analysis mechanism was employed. The descriptive analysis for this case study involved calculating frequencies, percentages and means. The existing literature on electronic health record/electronic medical record (EHR/EMR) outsourcing seems to provide significant support for the empirical findings of the survey questionnaire. This can be considered the 'external validity' (Yin, 1994) for the findings of this research.

The survey questionnaire was developed to examine the benefits and barriers of the decision-making processes in relation to the EHR system. Users' attitudes can impact on the successful implementation of an information system. In addition, attitudes towards information technology, its adoption, and its use in health care settings are strongly influenced by patterns of relationships among the individuals who make up the organisation (Anderson, 2002). Aydin (1989) discovered that attitudes towards information systems differ according to the occupation of the user; as user roles changed, the implementation of information systems also changed.

 Fishbein and Ajzen (1975) suggested that user beliefs link an object (such as an information system) or behaviour (such as use of the information system) to some attribute, characteristic, or outcome. Thus, when taking user involvement into consideration, the system (an object) is linked to the attributes of the person using or managing it, so the success of the system becomes directly related to individuals' personalities, characteristics and attitudes. These researchers also

proposed that a user's attitude towards an information system is related to the extent to which the user feels that the system is useful for evaluation purposes, or whether it actually impedes effective evaluation. These intangible benefits are difficult to measure because no standardised tools exist to measure such perceptions.

Davis (1989) was one of the first to look into developing standardised evaluation tools by investigating user acceptance of information systems. He proposed that once a user accepts a system, performance gains are possible. Therefore, he suggested that perceived ease of use and perceived usefulness of the application are basic determinants of user behaviour.

This case study aim to examine stakeholder attitude regarding the:

- Barriers that actually affect the implementation of Electronic Health Record in different countries.

- Possible or actual strategic solutions to overcome theses barriers.

- Benefits of the Electronic Health Record.

- Priorities for using the Electronic Health Record.

Perceiving the stakeholders' attitudes would have a positive impact on organization work, better user adoption and a positive user attitude toward successful implementation of Electronic Health Record system. Regarding selecting the stakeholders for the first case study, the international groups were volunteers participating in the study and were involved in developing the EHRs and developing EHRs standards, who were targeted in three conference: Delegates attending on ISO Health Informatics Standards development(2008) meeting at Turkey; Delegates Attending on HL7 Health Informatics Standards development (2008) meeting at Sweden and San Antonio conference (2008) meeting at US via the first supervisor of the research.

Whereas, for National (Kuwait) group, they were recommend from the minister of health at Kuwait, since they were part on development community of primary healthcare system that were elect by the information technology department, who were responsible primary for system development cycle. They were volunteer participates in the study. So due to time constraints, the researcher considered the recommended group from the MOH. The advantage of applying their

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recommend group, as a resource for the researcher, was that they were participating in primary healthcare system development life cycle committee such as design, implementation and test.

The survey questionnaire consisted of three categories and in each section there were varying number of questions related to the title of the category.

1- The survey questionnaire is divided into four sections;
   a. The first section related to contributor's demographic information, such as name, place of working country, professional background and job role with respect to EHR.
   b. The second section deals with Barriers Affecting EHR systems adoption. The user has to select one of the following: "Strongly disagree"; "Disagree"; "Uncertain"; "Agree" and "Strongly Agree".   The Electronic Health Records users response on various issues such as: knowledge; cost; willing to make changes in their workflow; failure of vendor in long term support; protection of privacy and clear authorization procedures; sufficient computer literacy by users; accepting training to improve skills; preference of direct entries or dictation into the records; easily accessibility and reliability of records; importance of interoperability and communication with other hospitals in sharing information and lack of adoption of uniform standards limits the use of EHR systems etc. Further, the user has to select two most significant obstacles and solutions from the given lists such as; poor application, different needs by different groups, non-standards, shift between managerial group and clinical uses and mismatch between benefits, increased work and specifying any significant obstacle to be specified out of list. The user has to select two important solutions to the given barriers. For example: increased fund for EHR development, adoption of uniform standards terminology, educational resources, multilevel confidentiality, disaster plan and any other significant solution to be specified out of list. Another important challenge, that affects the adoption of the EHRs from the list such as "Cost", "Privacy & Confidentiality", "Litigation Risks and any another challenge to be important to be specified.

c. The third section deals with the Attitude about the Benefits of EHRs. The user has to select three issues from the given list; that related to acceptability to multiple users, improved quality, efficient car, safely, security, confidentiality, decision making, communication, save physician time and money and increased productivity.

d. The fourth section deals with adoption approach of EHRs. The selection of three EHRs modules will have significant benefits from early adoption from the list. The list includes; discharge summary, lab results, medical images, surgical notes, scheduling, medication and orders, financial data, observation chart etc followed by user's comments and what influences users acceptance of EHRs from "perceived ease of use, perceived usefulness to the users and the user's clinical team, and the ability to share information beyond the local team".

A pilot test has been conduct at Centre for Health Informatics & Multiprofessional Education (CHIME) Department to ensure that the survey meet the objectives of the study. The survey was administered to ensure validity and reliability of the instrument. Minor changes were made to section two and four since it provided a misunderstanding by the pilot sample. The change was performed to ensure that item measured what the instrument purpose to measure, therefore ensuring validity. In addition, the terms computer-based patient record(CPR), computerized physician order entry(CPOE), electronic medical record (EMR) and electronic health record (EHR) are collectively referred to as EHR, to avoid misunderstanding as its been indicated by the pilot study.

In addition to the Introduction and Summary, there are three sections, the first section defined the sampling profile that participate in this study, the second section discussed the overall responses of international perception on electronic health record benefits and barriers, while the third section compared the finding between the international and national decision maker group.

7.2. Descriptive Statistical Analysis of the Study

The data were entered and analyzed using Statistical software SPSS version 16.02. For categorical variables, Summary measures were numbers and its percentages. Pearson's chi-square test was used to find whether the responses were significantly different between EHR professionals from Kuwait and other countries for questions related to perspective of EHR system and barriers affecting EHRs adaptation. Chi-square test for continuity correction was applied to find out whether the obstacles that affect the adoption of EHR systems, challenges and solutions for these were different between Kuwait and Other countries. Fisher's exact test was applied to find association between two binary factors and the expected value in any of the cells was less than 5. A p-value of less than 0.05 was considered to be significant.

7.3. Demographics of Study Population

A study was carried out to get the attitudes of decision makers in different countries about the EHR system, they were contacted and responded in the questionnaire sent to them. There were 72 Health care professionals that responded to the request. The countries from which decision makers were from include: US; Canada; Australia; Austria; Sweden; UK etc. There were 3 participants that did not mention their country of origin (Figure 9).

Decision makers who manage the EHR system have different professional backgrounds (Table 10). One third of them were clinicians managing the EHR system. Computer science graduates constituted the next highest proportion in managing the EHR system. People qualified in the management ranked third highest in managing the EHR system. Professionals from engineering and health informatics systems were the other EHR system managers.

Table10: Main professional background of Health care professionals participated in   the study

Main Professional Background	No# of response	%
Administration	5	6.9
Clinicians	26	36.1
Computer Sciences	18	25.0
Engineering	8	11.0
Management	15	20.8
Total	72	100.0

The decision making professionals were asked about their perspective of the EHR system in their health care sector (Figure 10). Three fourths of them agreed that it is useful and very important for interoperability and communication with another hospital's EHR system. Two thirds of them agreed that the EHR system is more reliable and available than paper based medical records and users undertake training to improve their skills in using EHR system. A half of the decision making professionals feel that they have sufficient knowledge of computers and sufficient skills to operate EHR system.

Denmark-1
Finland-2
Norway-1
Sweden-2
Canada -5
UK-2
Switzerland-1
Italy-1
USA -14
France-2
Korea-1
Spain-1
Kuwait-31
Malaysai-1
Australia-4

Fig 9: Countries of representation of HCPs for this study

7.4. International Stakeholder Descriptive Analysis Data

7.4.1. Section two- Part A- Response Rate per Barriers Affecting EHRs Adoption

Two thirds of the decision making professionals agree that the lack of uniform standards and poor navigation were significant barriers for the implementation of EHR system.

Fig 10: International Perspective of EHRs (n=72) — Diagree ■ Uncertain □ Agree

	Diagree	Uncertain	Agree
lack of adoption of uniform standards	20.8	13.9	65.3
interoperability and communication	12.5	9.7	77.8
EHR more reliable	27.8	25	47.2
EHR more available	33.3	5.6	61.1
poor navigation a significant barrier	19.4	12.5	68.1
Not to use computer but some to use	34.7	11.1	54.2
Users undertake training to improve their skills	18.1	13.9	68.1
Users already have sufficient skills	30.6	16.7	52.8
Users have sufficient computer literacy	29.2	15.3	55.6
better control over	30.6	18.1	51.4
better at protecting the privacy of patients	43.1	11.1	45.8
The adoption adversely affected by a vendor	16.9	19.7	63.4
The fear is a barrier	40.3	8.3	51.4
Users work towards efficient use	34.7	16.7	48.6
EHR systems to be useful but costs too high	27.8	15.3	56.9
Users have a good knowledge	37.5	13.9	48.6

7.4.2. Section two- Part B- Response Rate per Obstacles Affecting EHRs Adoption

Two thirds of the decision making professionals believe that the most significant obstacle for implementation is the mismatch between who benefits and who has increased workload from using EHR systems (Figure 11). Other perceived obstacles were the non-standard and exceptional nature of medical work and the shift in the balance between the managerial and clinical uses of EHR.

Fig 11: Most significant Obstacles (%) for EHRs (n=72)

Obstacle	%
non-standard	22
balance managerial vs clinical uses	21
Poor application design	40
Different requirements	43
Mismatch between who benefits and who has increased work	61
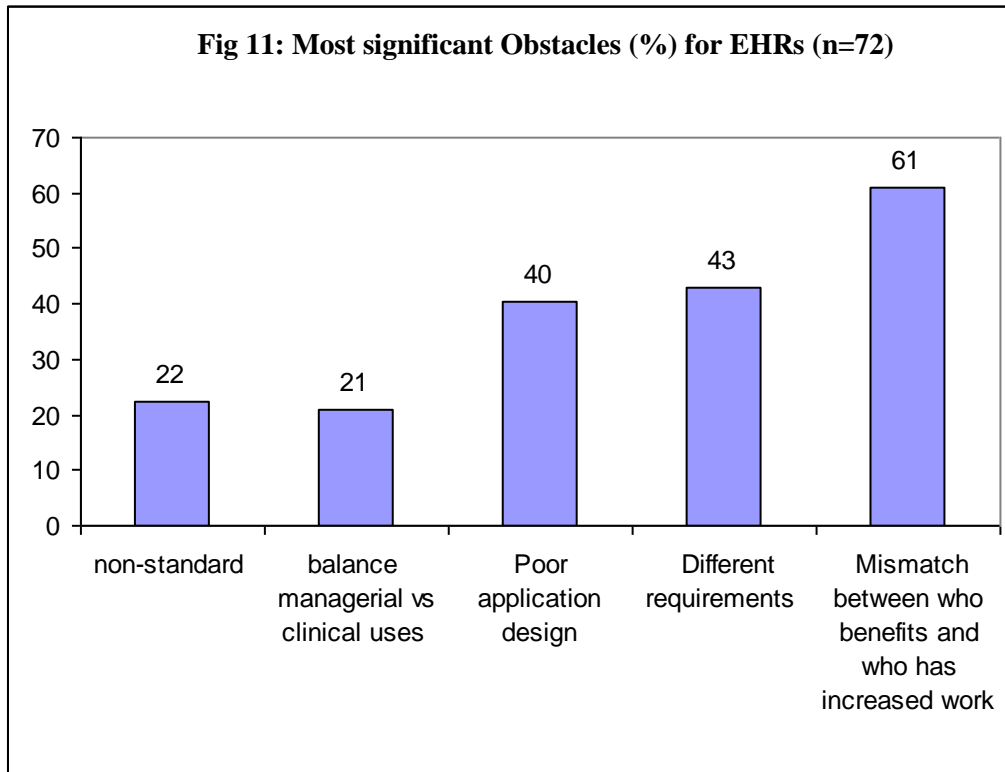
7.4.3. Section two- Part C- Response Rate per Solutions to overcome EHRs Adoption

The most important solution to overcome the barrier is to provide a well documented disaster recovery plan for the event of EHR system failure (Figure 4). Two thirds suggested provision of multilevel confidentiality for record sharing between health care organizations. One third suggested an increase in funding for the development and adaptation of a uniform set of standards and terminology and to provide in-service education.

Fig12: Most important solution to overcome barriers in EHRs (n=72)
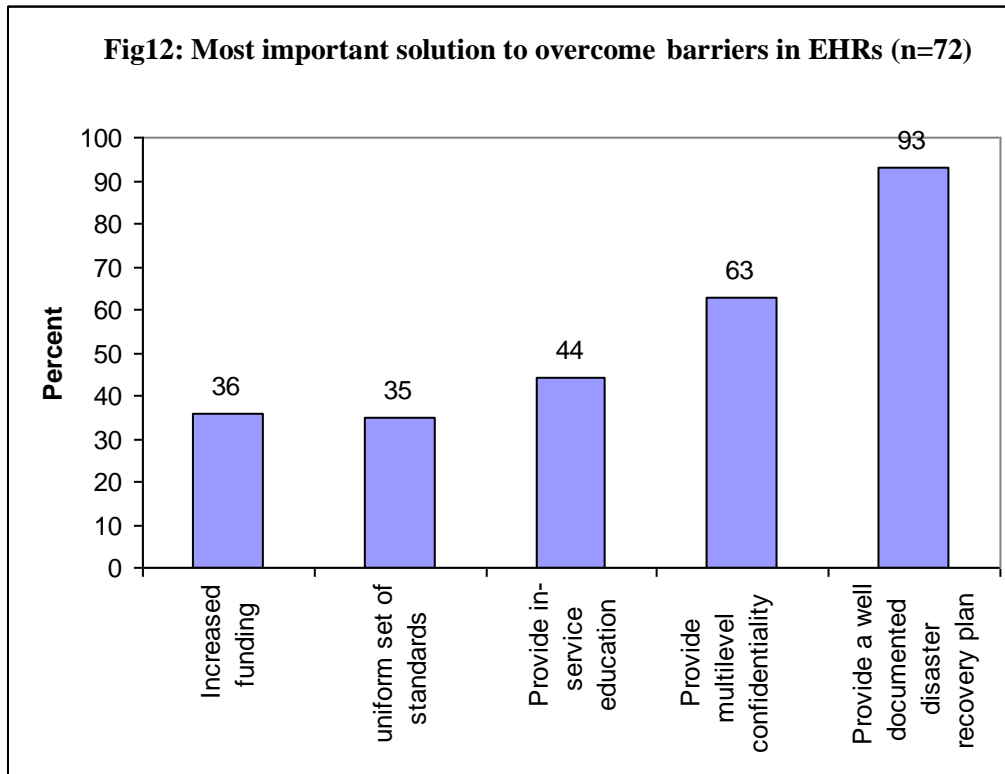
7.4.4. Section two- Part D- Response Rate per Challenges Affecting EHRs Adoption

More than half of the decision making professionals considered cost as a challenge that affect the adaptation of the EHR system (Figure 13). A very small proportion of the decision making professionals indicated privacy & confidentiality and litigation risks as challenges.

Fig 13: The most important challenges affecting of EHRs (n=72)

Litigation Risks
4%

Privacy &
Confidentiality
15%

Cost
81%
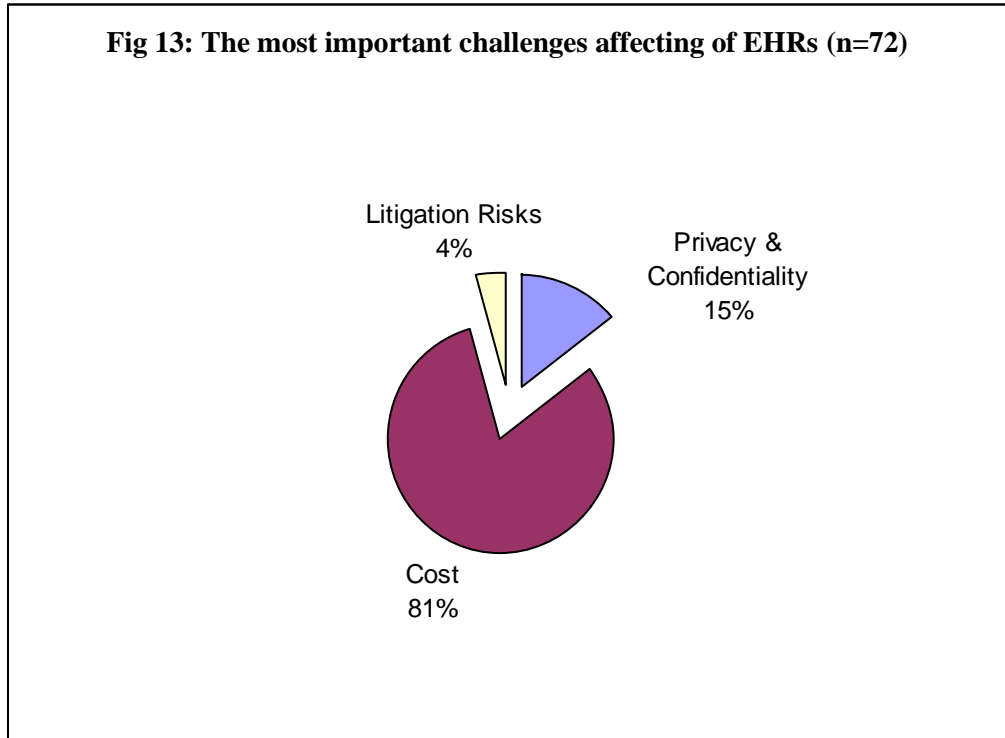
7.4.5. Section Three- Part A- Response Rate per Benefits of EHRs

Decision making professionals were asked to point out the attitude regarding benefit of the EHR system. (Figure 14) Half of the decision making professionals selected increased access and availability of patient information to multiple users. Other benefits of EHRs include: make delivery of care more efficient; enhance the quality of patient care; improve patient safety etc.

Fig14: Most important benefits of EHRs (n=72)

Benefit	Percent
Enhance security and confidentially	13.9
Increase healthcare productivity	13.9
Save physician s time	15.3
Save money in the long term	15.3
Improve clinical decision making	18.1
Improve communication	20.8
Improve the overall quality	22.2
Make management more effective	30.6
Improve patient safety	37.5
Enhance the quality of patient care	40.3
Make delivery of care more efficient	41.7
Increase access to multiple users	50

Percent

7.4.6. Section Three- Part B- Response Rate per Adoption Approach of EHRs

Decision making professionals were asked about the EHR system modules or functions that they believe would show most benefit (Figure 15). All most all of them suggested incorporating Laboratory results to be communicated to the wards, clinics and GPs. Other modules of priority include: electronic discharge summaries to be communicated to patients GP and appointment and scheduling, including availability of booking by GPs.

Fig 15: Adaptation approaches for EHRs Modules (n=72)
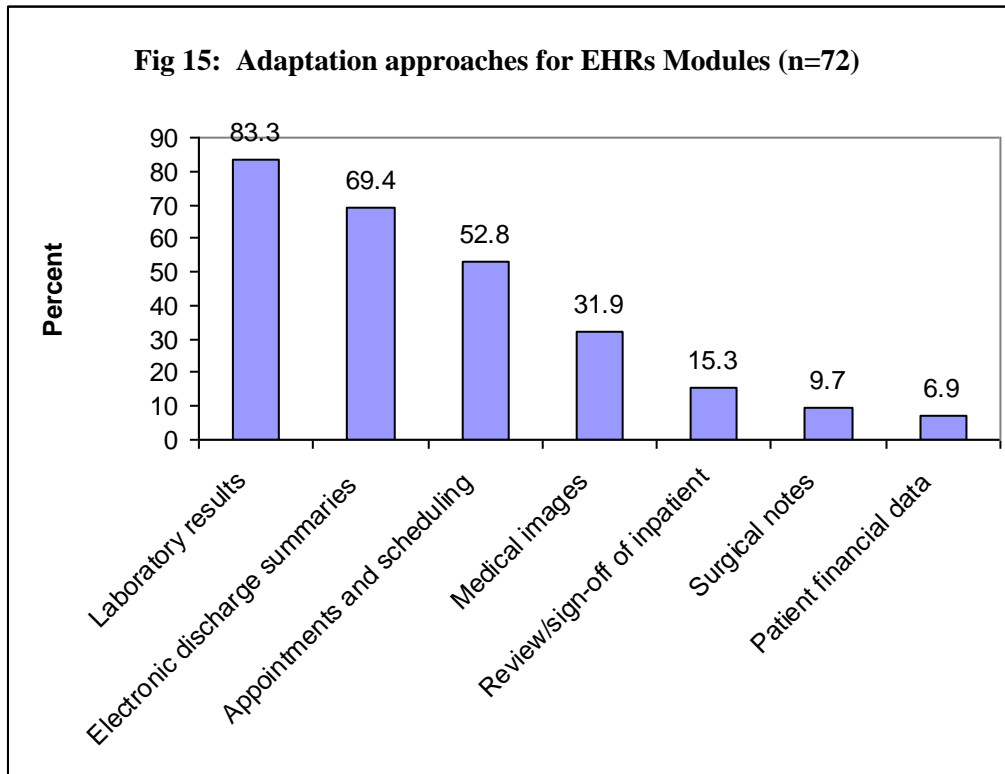
7.4.7. Section Three- Part C- Response Rate per User Acceptance Factor of EHRs

Decision making professionals were asked about the perceived users' acceptance of the EHR system. The majority of them selected acceptance because of perceived usefulness to the user and the user's clinical team (Figure 16).

Fig 16: User Acceptance of EHRs (n=72)
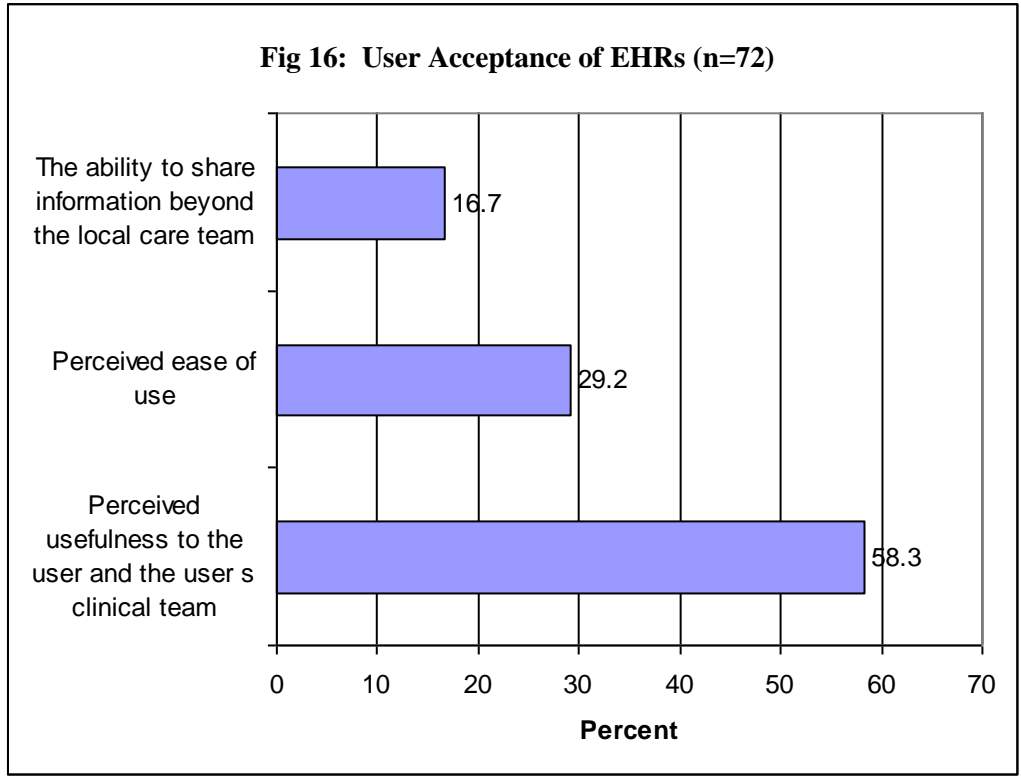
7.5. International and National Stakeholder Descriptive Analysis Data

7.5.1. Section two- Part A- Response Rate per Barriers Affecting EHRs Adoption

"Decision making Professionals (HCPs) have a good knowledge about how to use EHR system"

More decision making professionals in Kuwait (74.2%) than from other countries (29.3) believe users have a good knowledge of using an EHR (Figure 17). The belief that users have a good knowledge of using an EHR is significantly different between Kuwait and the international decision making professionals (p<0.01).

Fig 17: User have good knowledge of using EHRs (KW=31; Others=41)
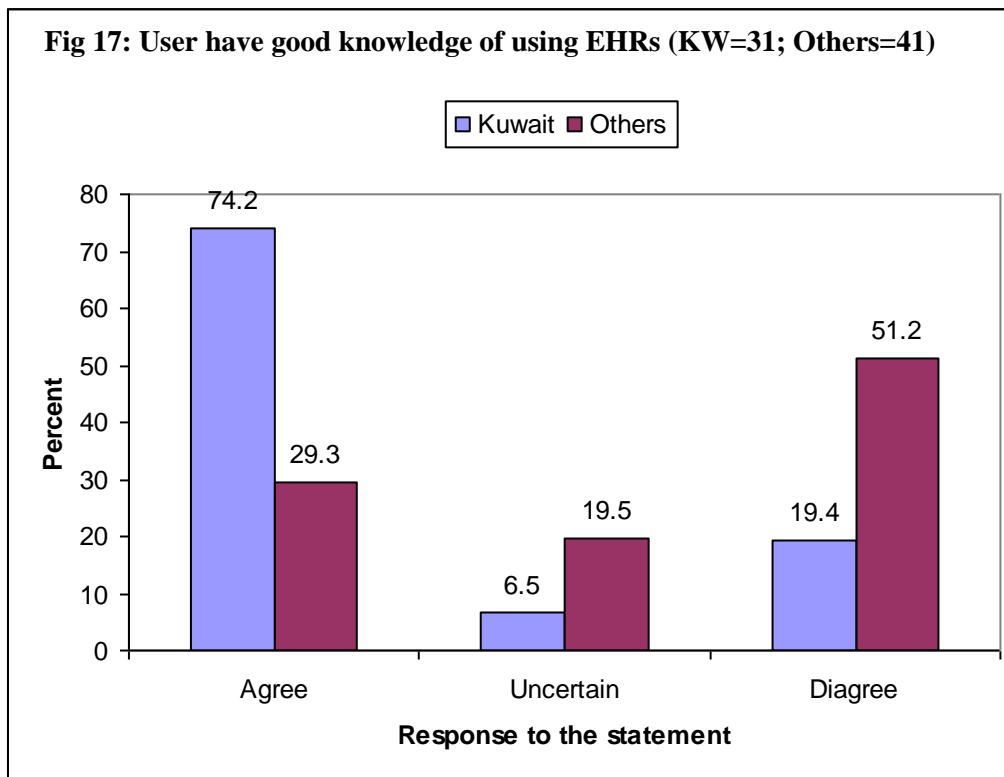
"Decision making professionals consider EHR Systems to be useful but the costs for implementation of EHRs are too high"

Half of the decision making professionals from Kuwait and other countries equally believe that the cost of implementing an EHR system is too high when compared to the benefits that it provides (Table 11).

Table 11: Decision makers' professionals' perspective of Electronic Health Record system

| | | Comparison Group | | | | | |
| | | Kuwait | | Other countries | | Subtotal | |
		No	%	No	%	Z	p-value
Users consider EHR systems to be useful in their field but think that the costs for a full EHR implementation are too high	Disagree	11	35.5	9	22.0	0.6	0.53
	Uncertain	3	9.7	8	19.5		
	Agree	17	54.8	24	58.5		
Users already have sufficient skills to start using EHR systems	Disagree	6	19.4	16	39.0	1.5	0.13
	Uncertain	6	19.4	6	14.6		
	Agree	19	61.3	19	46.3		
Health professionals would prefer not to use computers directly but would rather someone else do the computer-related work for them	Disagree	13	41.9	12	29.3	0.6	0.54
	Uncertain	3	9.7	5	12.2		
	Agree	15	48.4	24	58.5		
Users consider EHR systems to be more available than paper medical records	Disagree	11	35.5	13	31.7	0.1	0.95
	Uncertain	0	.0	4	9.8		
	Agree	20	64.5	24	58.5		

"Decision making professionals are willing to make changes in their workflow in order to make more efficient use of an EHR system"

There is a significantly high proportion of decision making professionals from Kuwait compared to other countries that agree that the users are willing to make changes in their workflow in order to make efficient use of EHR (84% vs 22%; p<0.01) (Figure 18).

Fig 18: Willingness to change for more efficient use of EHRs (n=72)
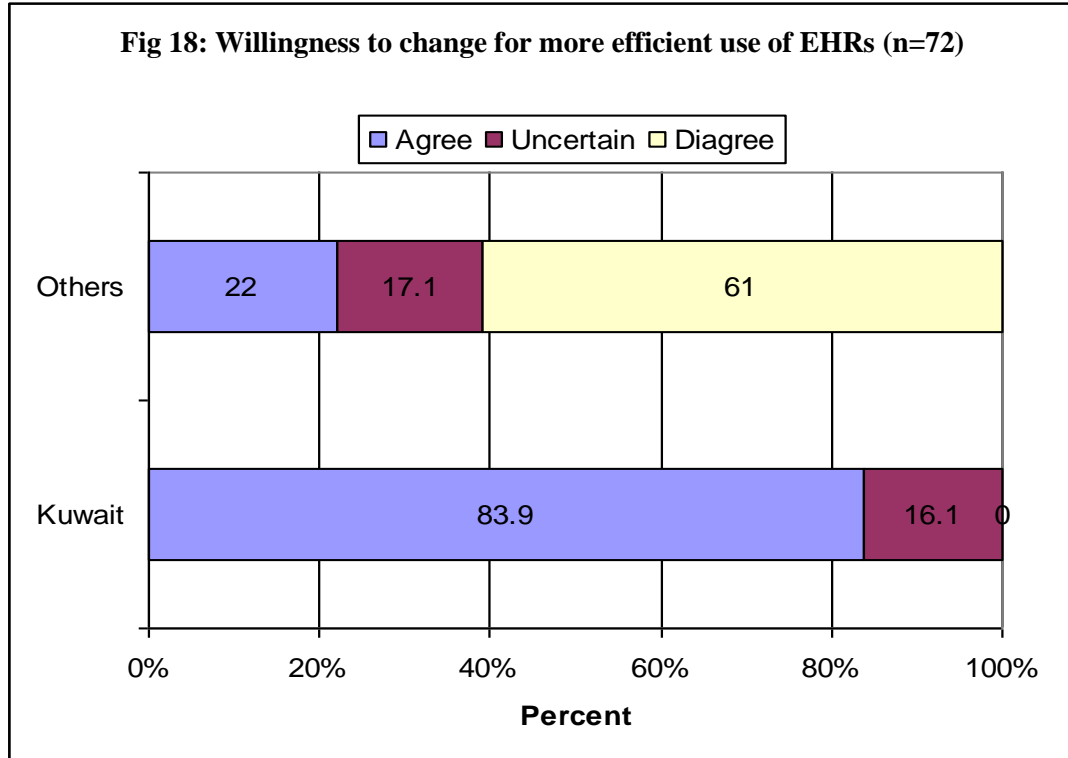
"Decision making professionals believe that the fear of using technology is a barrier to the adoption of EHR systems"

There is a disagreement of the statement: 'the fear of using technology is a barrier to the adoption of EHR systems'. The international decision makers group believes that the use of an EHR system would interrupt the workflows that the users are familiar with. So the users may resist the implementation and use of EHR system. Whereas, the Kuwait national decision makers group believes that adopting new technology would not interrupt the workflows to which the users are familiar with. Thus significantly higher proportion of the decision making professionals in Kuwait than from other countries disagree with the statement: 'the fear of using technology is a barrier to the adoption of EHR ($p=0.03$) (Figure 19).

Fig 19: The fear of using technology as a barrier for EHRs (n=72)

Group	Agree	Uncertain	Disagree
Others	63.4	7.3	29.3
Kuwait	35.5	9.7	54.8
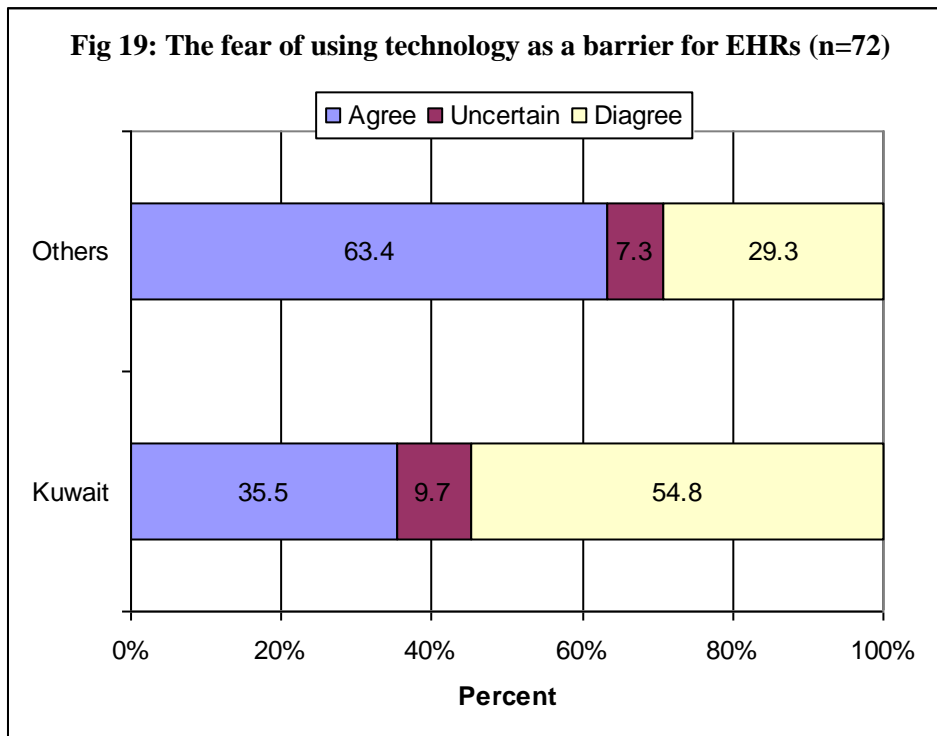
"Decision making professionals believe that the adoption of an EHR system would be adversely affected by a vendor who is not stable enough to provide long term support"

The international decision makers group believes that the adoption of an EHR system is affected by a vendor and the vendor is not stable enough to provide long term support whereas, the national Kuwait decision makers group believes that the adoption of an EHR system is not affected by the vendor as the development of software is done by the Ministry of Health. Thus, the opinion about the adoption of an EHR system would be adversely affected by a vendor who is not stable enough to provide long term support is significantly different between decision making professionals in Kuwait than from other countries ($p<0.01$) (Figure 20).

Fig 20: Unstable support from Vendor of EHRs (n=72)
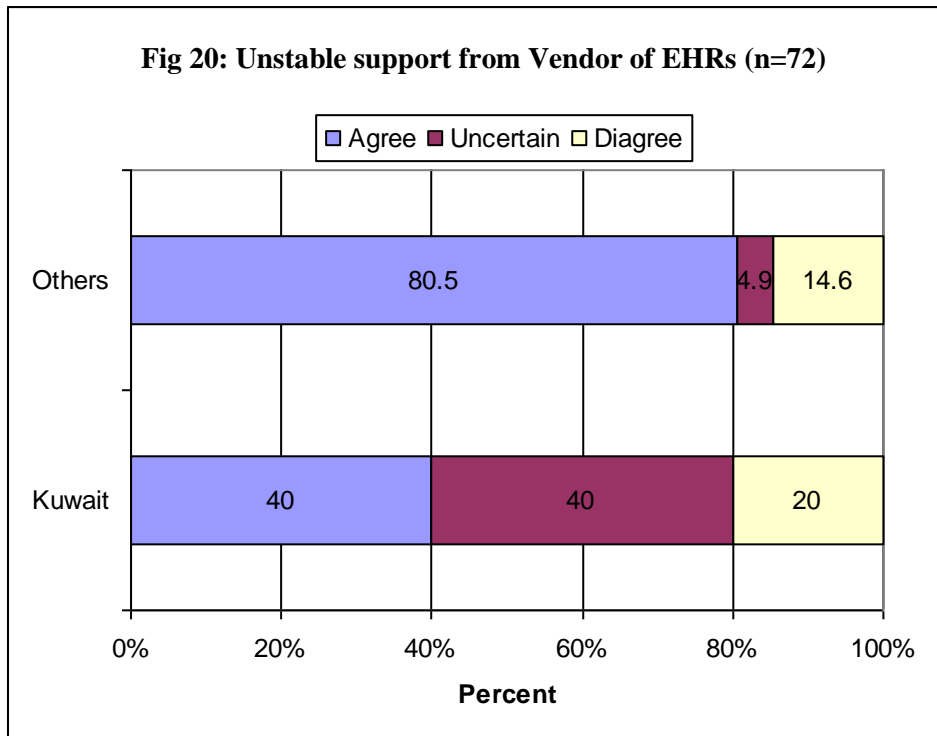
"Decision making professionals believe that an EHR system protects the privacy of patient better than paper based medical record"

The international decision makers group believes that users of an EHR system does not consider the system as being secure enough to ensure the privacy of patient information whereas, the national Kuwait decision makers group believes that the users consider the EHR system to be secure in protecting the patient information (Figure 21). A significantly higher proportion of decision making professionals from Kuwait than from other countries belief about the protection of privacy of patients is better in the EHR than in paper records (84% vs 17%; $p<0.01$).

Fig 21: EHRs better protecting the privacy of patients' than PBRs (n=72)
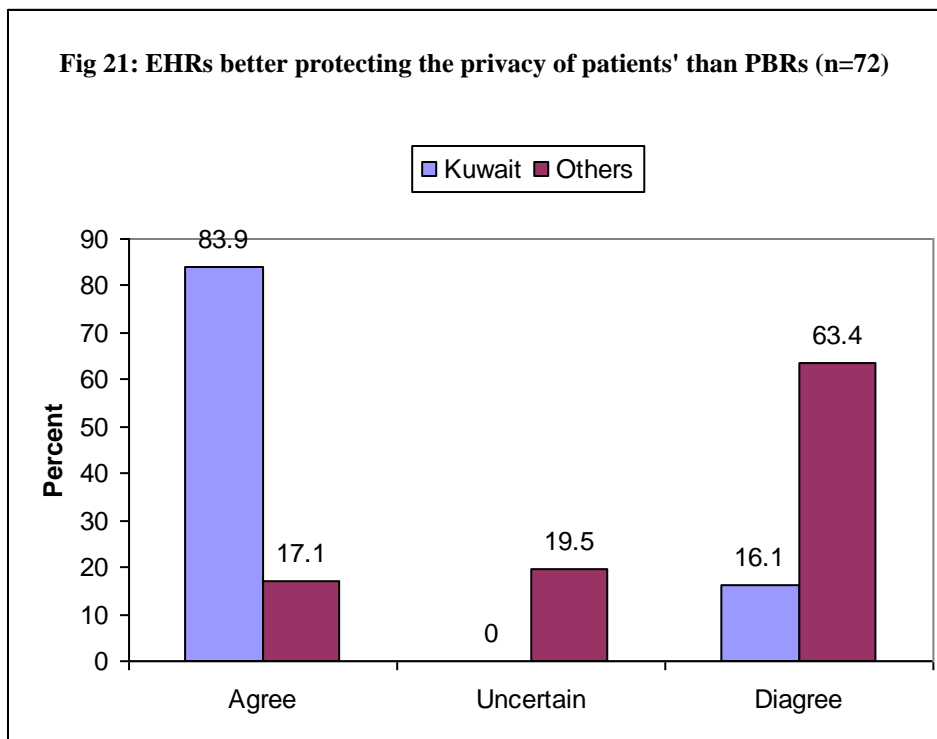
"Decision making professionals consider that an EHR system gives the patient better control over who has authorization to access their information"

Decision making professionals from Kuwait believe that users consider that an EHR system ensures the patients' confidentiality through its authorization channel. In contrast, the international decision makers group believe that the EHR system cannot ensure the confidentiality of patients' information through proper authorization channel. There is statistically significant differences (p<0.01) in their agreement (Figure 22).
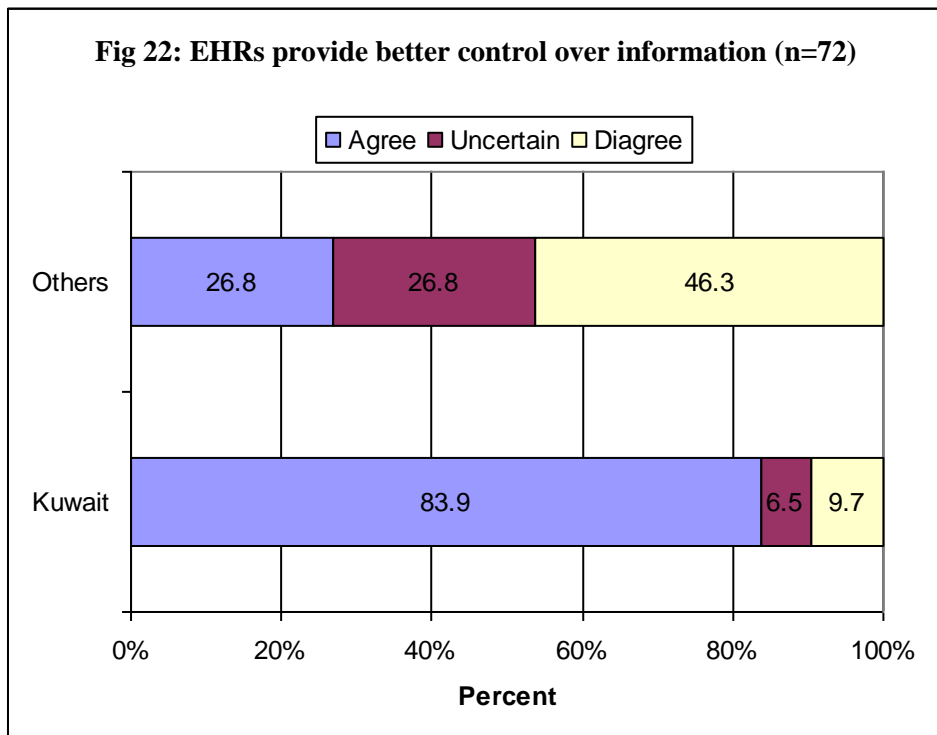
Fig 22: EHRs provide better control over information (n=72)

	Agree	Uncertain	Diagree
Others	26.8	26.8	46.3
Kuwait	83.9	6.5	9.7

Percent

"Decision making professionals have sufficient computer literacy to use health Information Technology in their workplace"

Kuwait decision making professionals believe that users have sufficient knowledge to use the health information technology in their workplace whereas this confidence does not exist from the health care professionals from other countries. The belief about sufficient knowledge of information technology among the EHR users is significantly higher among decision making professionals from Kuwait than from other countries (68% vs 46%; p=0.03) (Figure 23).

Fig 23: User have sufficient computer literacy to use EHRs (n=72)
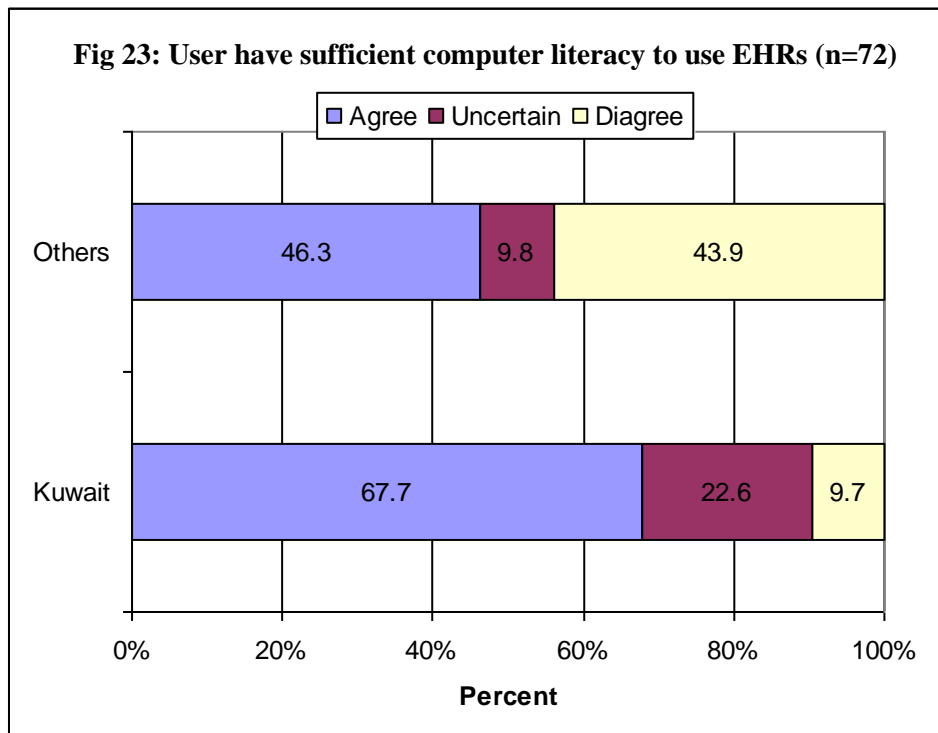
"Decision making professionals have sufficient skills to start using EHR system"

The confidence on their ability to start using EHR system is equally same between decision making professionals from Kuwait as well as from other countries (Table 11).

"Decision making professionals are willing to undertake training to improve their skills in using of EHR system"

A significantly higher proportion of the decision making professionals from Kuwait than from other countries admitted that EHR users are willing to undertake training to improve their skills in using of EHR system (77% vs 61%; p=0.03) (Figure 24) .

Fig 24: Willingness the undergo training to improve the skills in EHRs (n=72)
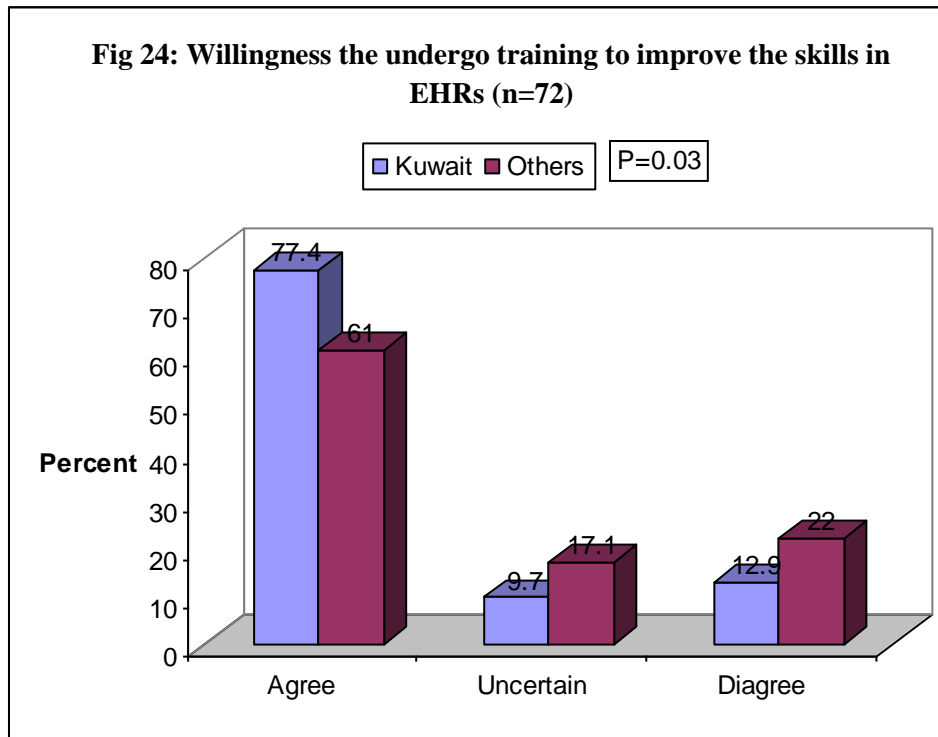
"Decision making professionals prefer not use computers directly but rather someone else do the computer-related work for them"

Nearly a half of the decision making professionals from Kuwait as well as from other countries believe that decision making professionals prefer not to use computers directly but rather get someone else do the computer-related work for them (Table 11).

"Decision making professionals consider poor navigation in EHR system is a significant barrier"

Poor navigation as a significant barrier for the use of EHR system mostly bothers decision making professionals from other countries compared to their Kuwaiti counter-parts (88% vs 42%; p=0.01) (Figure 25).

Fig 25: Poor navigation in EHRs a significant barrier (n=72)

Legend: ☐ Agree ■ Uncertain ☐ Diagree

Category	Agree	Uncertain	Diagree
2	87.8	4.9	7.3
1	41.9	22.6	35.5

Percent (x-axis: 0%, 20%, 40%, 60%, 80%, 100%)
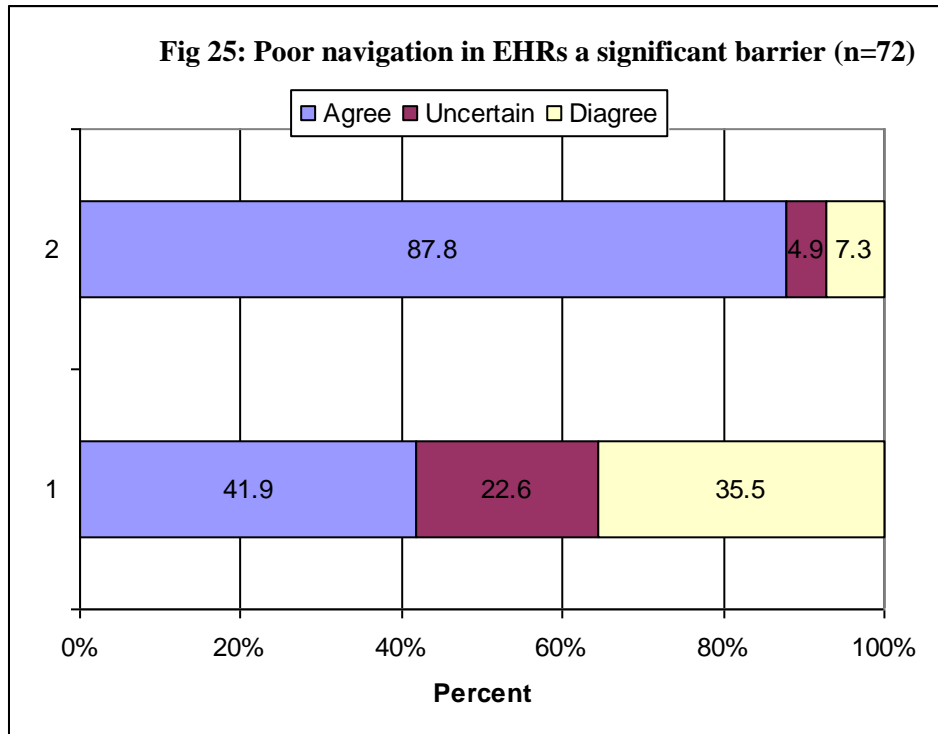
"Decision making professionals consider the EHR system to be more available than a paper medical records system"

One third of decision making professionals from Kuwait as well as from other countries consider the EHR system to be more available than paper medical record system (Table 11).

"Decision making professionals consider the EHR system to be more reliable than a paper medical record system"

Three fourths of the decision making professionals from Kuwait, compared to the one fourth of the decision making professionals from other countries consider the EHR system to be more reliable than a paper medical record system (p<0.01) (Figure 26).

Fig 26: EHRs more reliable than PBRs (n=72)

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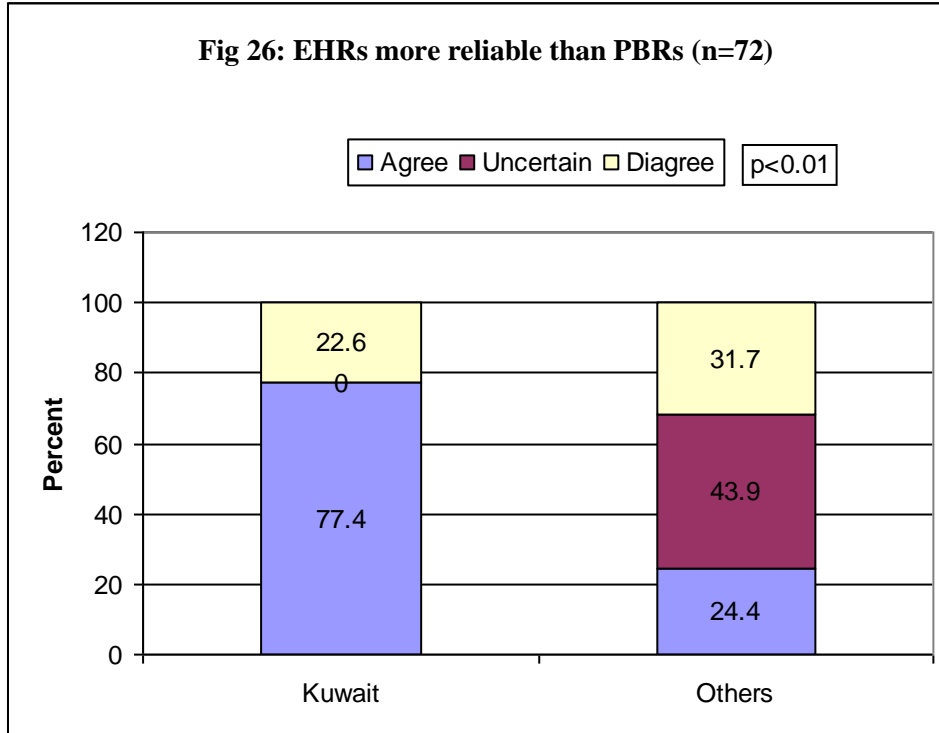
"Decision making professionals consider interoperability and communication with other hospital EHR systems to be very important"

All most all decision making professionals from Kuwait, compared with three fourths of the decision making professionals from other countries, agree with the importance of interoperability and communication with other hospital EHR systems (p<0.01) (Figure 27).

Fig 27: EHRs interoperable & communication with other Hospital (n=72)

Legend: Agree ■ Uncertain □ Diagree   p<0.01

	Kuwait	Others
Diagree		24.4
Uncertain	3/2	14.6
Agree	96.8	63.4

Y-axis: Percent (0% to 100%)
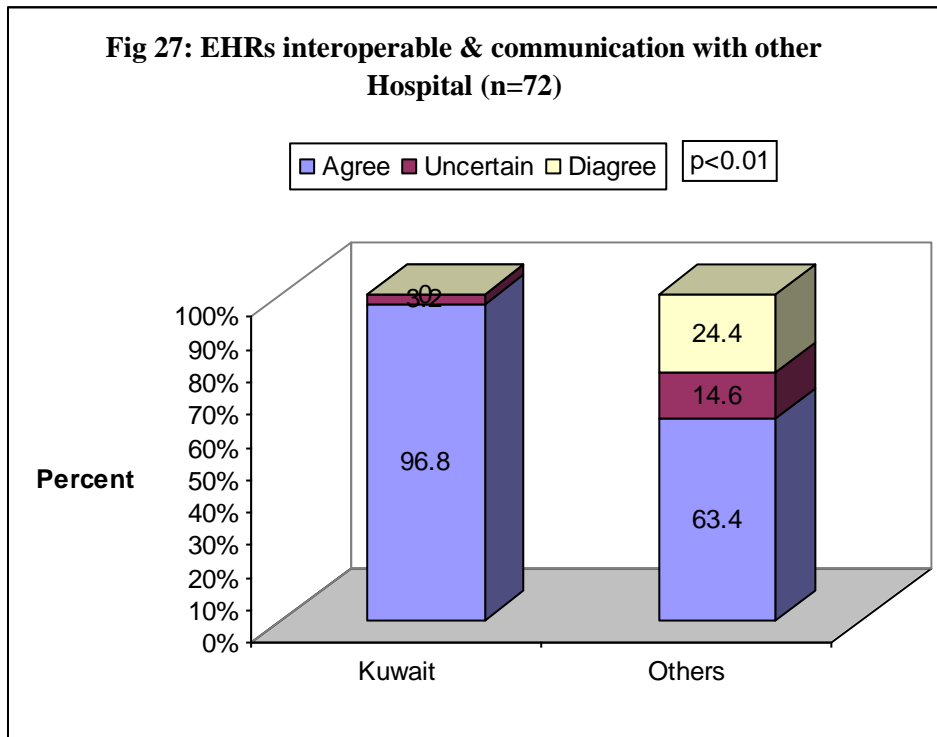
"Decision making professionals consider lack of adoption of uniform standards as a limitation of the use of the EHR system"

Two times the decision making professionals from Kuwait, compared to decision making professionals from other countries, raise concerns regarding lack of adoption of uniform standards in the use of the EHR system (87% vs 48%; p<0.01) (Figure 28).

Fig 28: Lack of uniform standards of EHRs (n=72)
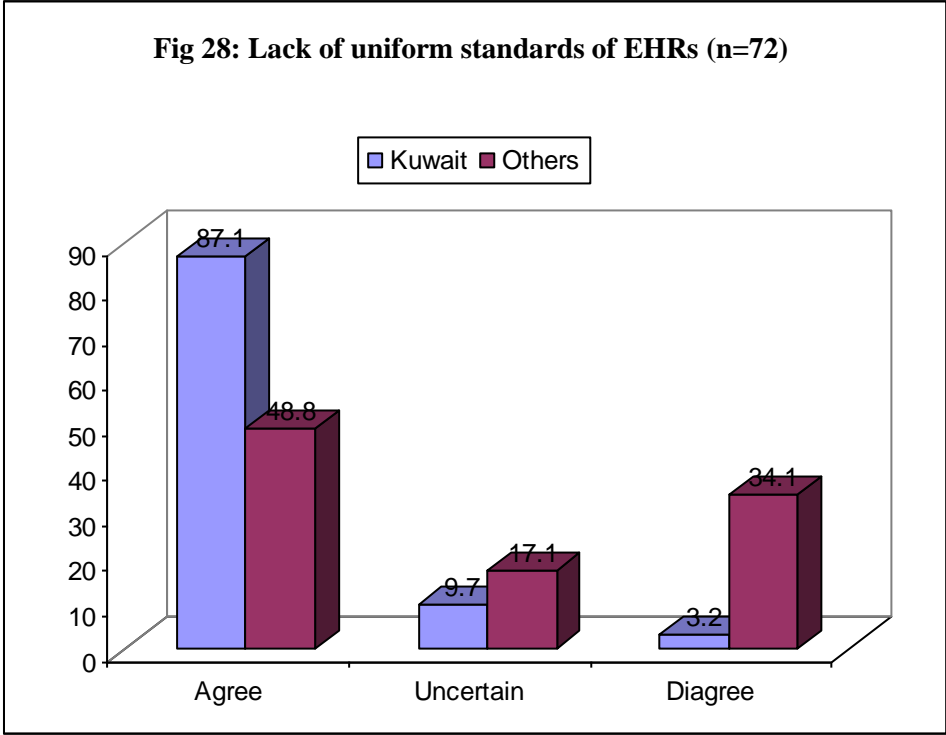
7.5.2. Section two- Part B- Response Rate per Obstacles Affecting EHRs Adoption

" Decision making professionals believe that the most significant obstacle is poor application design"

Half of the decision making professionals from Kuwait and one third from other countries believe that poor application design is an obstacle for adopting the EHR system however, the difference is not statistically significant (p=0.16) between the decision making professionals between Kuwait and other countries (Table 12).

"Decision making professionals believe that the most significant obstacle is different requirements by different professional groups"

Decision making professionals both from Kuwait and other countries equally believe that the most significant obstacle is different requirements by different professional groups (58% vs 32%; p=0.05 (Figure 29).

Fig 29: Different requirement by different professional groups
(KW=31 : Others=41)
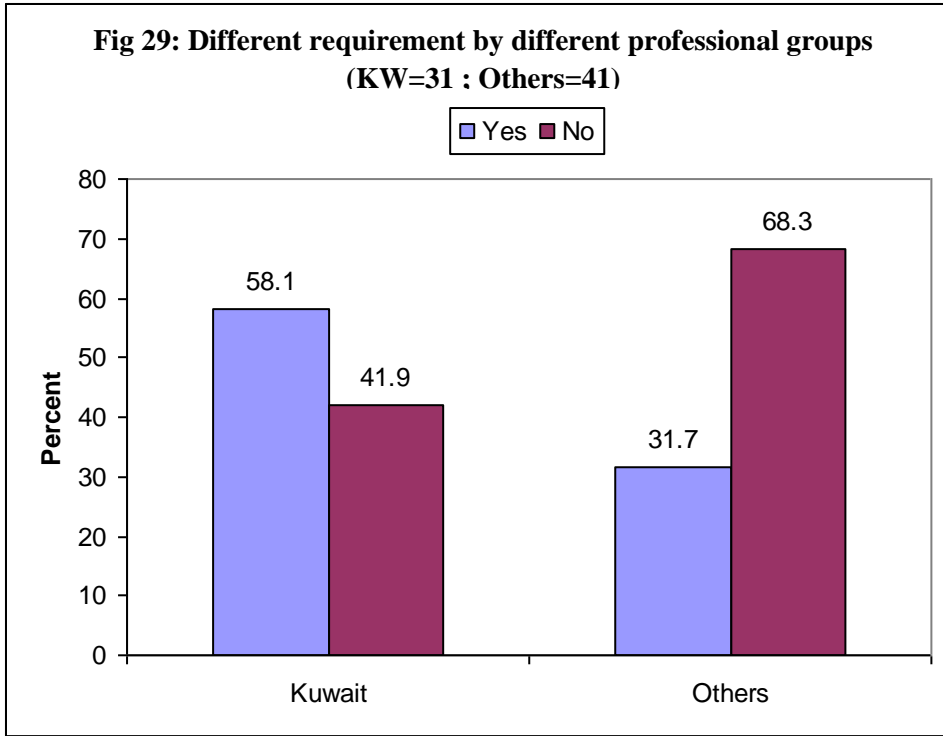
"Decision making professionals believe that the most significant obstacle is the non-standard and exceptional nature of medical work"

Only a small and non-significant proportion of decision making professionals from both groups believe non-standard and exceptional nature of medical work as an obstacle (Table 12).

Table 12: Significant obstacles that affect the adoption of EHR systems in your country

		Comparison Group					
		Kuwait		Other countries		Subtotal	
		No	%	No	%	Z	p-value
Poor application design	Yes	15	48.4	14	34.1	0.9	0.33
	No	16	51.6	27	65.9		
The non-standard and exceptional nature of medical work	Yes	8	25.8	8	19.5	0.1	0.73
	No	23	74.2	33	80.5		
The shift in the balance between the managerial and clinical uses of the HER	Yes	9	29.0	6	14.6	1.4	0.23
	No	22	71.0	35	85.4		

"Decision making professionals believe that the most significant obstacle is the shift in the balance between the managerial and clinical uses of the EHR system"

There are no statistically significant differences between the international groups and the Kuwait group regarding the shift in the balance between the managerial and clinical uses of the EHR system and both the groups believe that the balance between the managerial and clinical uses of the EHR system is not a significant obstacle (Table 12).

"Decision making professionals believe that the most significant obstacle is the mismatch between those who benefit and those who have more work after adopting the EHR systems"

The international groups believe that there is a mismatch between those who benefit and those who have more work after adopting EHR systems whereas, the Kuwait group tend to believe that there is not a mismatch between those who benefit and those who have more work after adopting EHR systems (78% vs 39%; p=<0.01 (Figure 30).

Fig 30: Mismatch between who benefits and who had increased work (KW=31 ; Others=41)
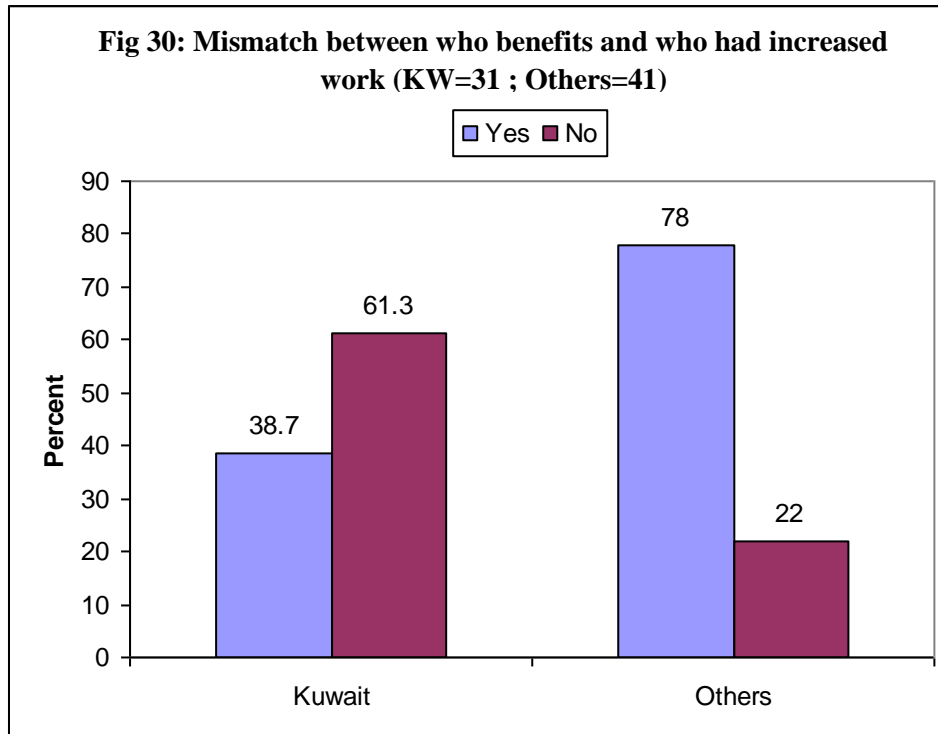
7.5.3. Section two- Part C- Response Rate per Solutions to overcome EHRs Adoption

"Decision making professionals believe that the most important solution to overcome the barrier is increased funding for the development of the EHR"

One third of the decision making professionals from Kuwait and half of the decision making professionals from other countries welcome the proposal to increasing funding for the development of EHR systems. The suggestion of increasing funding for the development of EHR systems is not significantly different between health care professionals from Kuwait and other countries (Table 13).

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"Decision making professionals believe that the most important solution to overcome the barrier is adoption of a uniform set of standards and terminology"

Less of the decision making professionals from Kuwait than from other countries believe than an adoption of a uniform set of standards and terminology is a solution. However, the suggestion of adoption of a uniform set of standards and terminology as a solution is not significantly different between health care professionals from Kuwait and other countries (Table 13).

Table 13: Solution to overcome these barriers

		Comparison Group					
		Kuwait		Other countries		Subtotal	
		No	%	No	%	Z	p-value
Increased funding for the development of EHR systems	Yes	24	77.4	22	53.7	3.4	0.07
	No	7	22.6	19	46.3		
Adoption of a uniform set of standards and terminology	Yes	16	51.6	31	75.6	3.5	0.06
	No	15	48.4	10	24.4		
Provide a well documented disaster recovery plan for the event of EHR system failure	Yes	4	12.9	1	2.4	1.6	0.21
	No	27	87.1	40	97.6		

"Decision making professionals believe that the most important solution to overcome the barrier is providing in-service education and educational resources for health care professionals"

More of the decision making professionals from Kuwait than from other countries believe adoption the provision of in-service education and educational resources for health care professionals as a solution to overcome the barriers. The suggestion of providing in-service education and educational resources for health care professionals as a solution to overcome the barrier is significantly different between decision making professionals from Kuwait and other countries (p=0.04) (Figure 31).
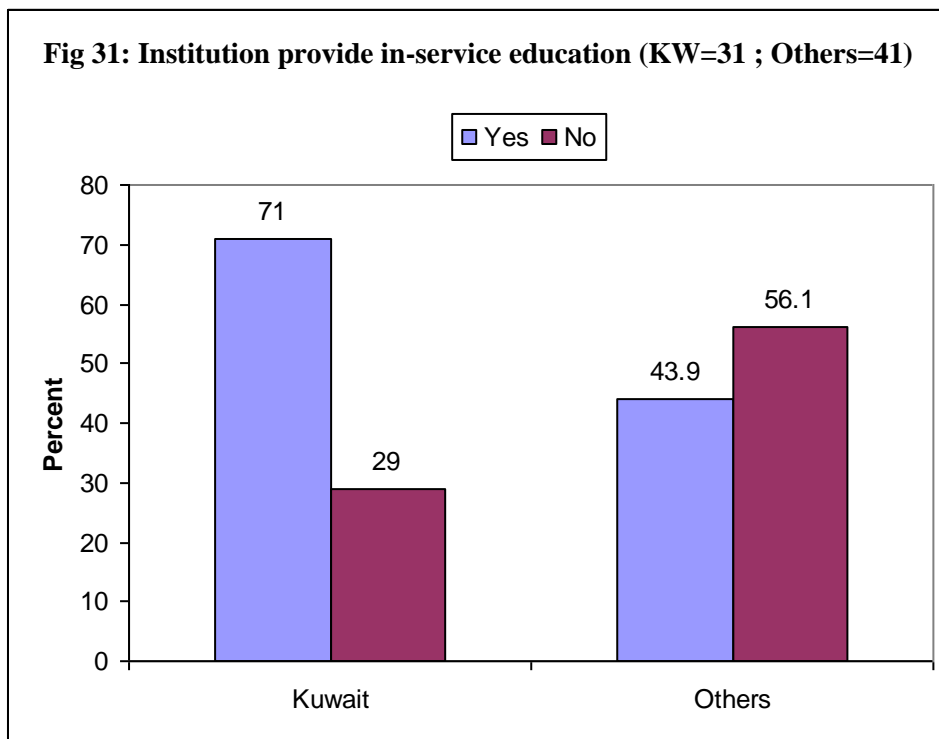
Fig 31: Institution provide in-service education (KW=31 ; Others=41)

"Decision making professionals believe that the most important solution to overcome the barrier is by providing multilevel confidentiality for record sharing between healthcare organizations".

More decision making professionals from Kuwait than from other countries believe that providing multilevel confidentiality for record sharing between healthcare organizations is a solution to overcome the barriers (Figure 32). The suggestion of providing multilevel confidentiality for record sharing between healthcare organizations as a solution to overcome the barriers is significantly different between decision making professionals from Kuwait and other countries (p=0.01).

Fig 32: Provide multilevel confidentiality for record sharing between Hospitals (P=0.01) (KW=31 ; Others=41)
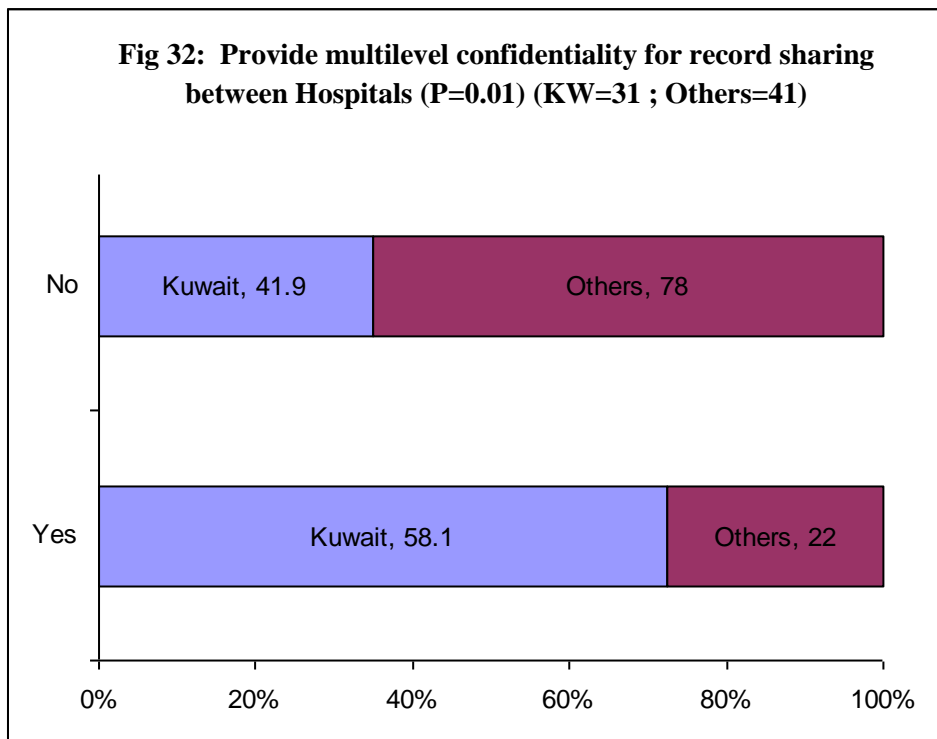
"Decision making professionals believe that the most important solution to overcome the barrier is by providing a well documented disaster recovery plan for the event of an EHR system failure"

Significantly very less decision making professionals from Kuwait and other countries perceive providing a well documented disaster recovery plan for the event of an EHR system failure as a solution (Table 13).

7.5.4. Section two- Part D- Response Rate per Challenges Affecting EHRs Adoption

Table 14: The most important challenges affecting adaptation of the EHR system

	Sample					
	Kuwait		Other countries		Subtotal	
	No	%	No	%	Z	p-value
Cost	17	54.8	22	53.7	0.0	0.92
Privacy & Confidentiality	2	6.5	5	12.2	0.7	0.42
Litigation Risks	1	3.2	1	2.4	-	0.67*

* Fishers exact test

The perceived most important challenges such as cost, privacy and confidentiality and litigation risks are not conceived differently between the two decision making professionals from Kuwait and other countries.

7.5.5. Section Three- Part A- Response Rate per Benefits of EHRs

"Decision making professionals believe that the most important anticipated benefit of adopting the EHR system is increasing access and availability of patient information to multiple users"

Half of the decision making professionals from Kuwait as well as from other countries consider that an increasing access and availability of patient information to multiple users is the most important anticipated benefit of adopting the EHR system (Table14).

"Decision making professionals believe that the most important anticipated benefit of adopting the EHR system is improving the overall quality of the patient record"

One third of the decision making professionals from Kuwait, compared to significantly less professionals from other countries (36% vs 12%; P=0.04), believe that improving the overall quality of the patient record is the most important anticipated benefit of adopting EHR system (Figure 33).
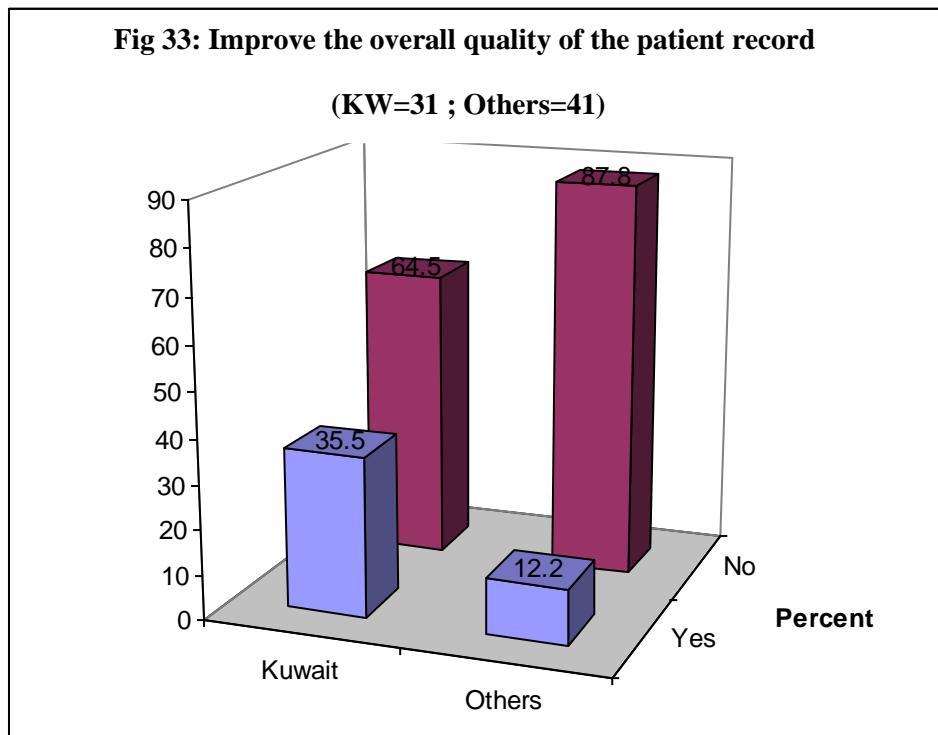
Fig 33: Improve the overall quality of the patient record

(KW=31 ; Others=41)

"Decision making professionals believe that the most important anticipated benefit of adopting the EHR system is making delivery of health care more efficient"

Making delivery of health care more efficient is in the agenda of health care professionals from all the countries (Table 15).

"Decision making professionals believe that the most important anticipated benefit of adopting the EHR system is improving patient safety"

Improving patient safety seems to be a most highly important anticipated benefit of adopting an EHR system for the decision making professionals from other countries whereas it is considered as less important among Kuwait professionals (53% vs 16%; p<0.01(Figure 34).
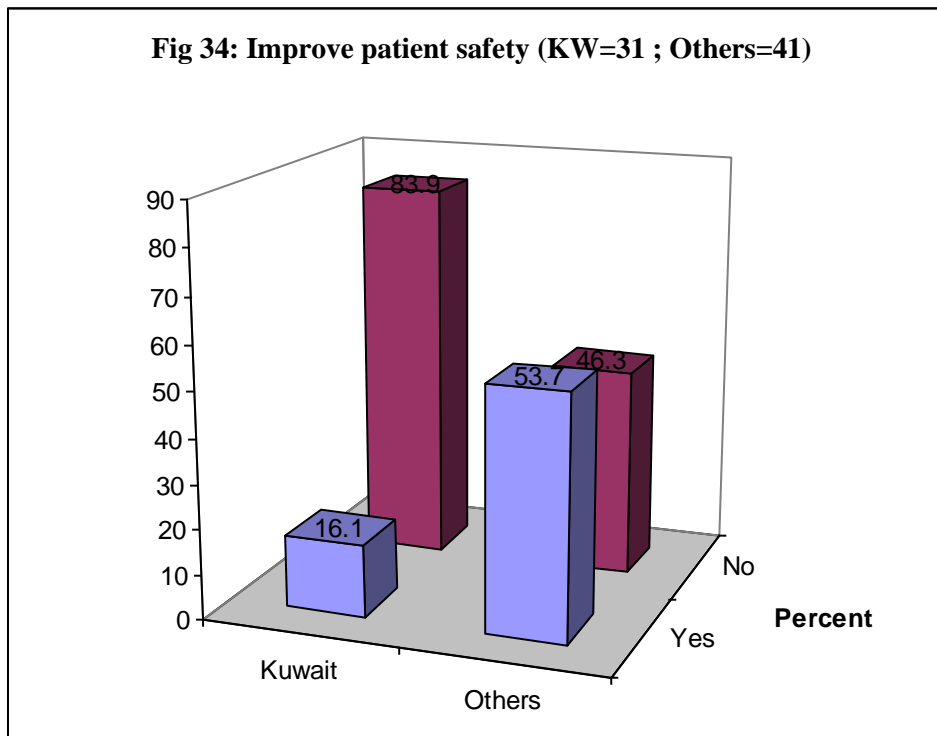
Fig 34: Improve patient safety (KW=31 ; Others=41)

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is enhancing the security and confidentially of health record information"

There is a significant difference in the attitude towards enhancing the security and confidentially of health record information between decision making professionals from Kuwait as well as from other countries (29% vs 3%; p<0.05 (Figure 35).

Fig 35: Enhance the safety & confidentiality (KW=31 ; Others=41)
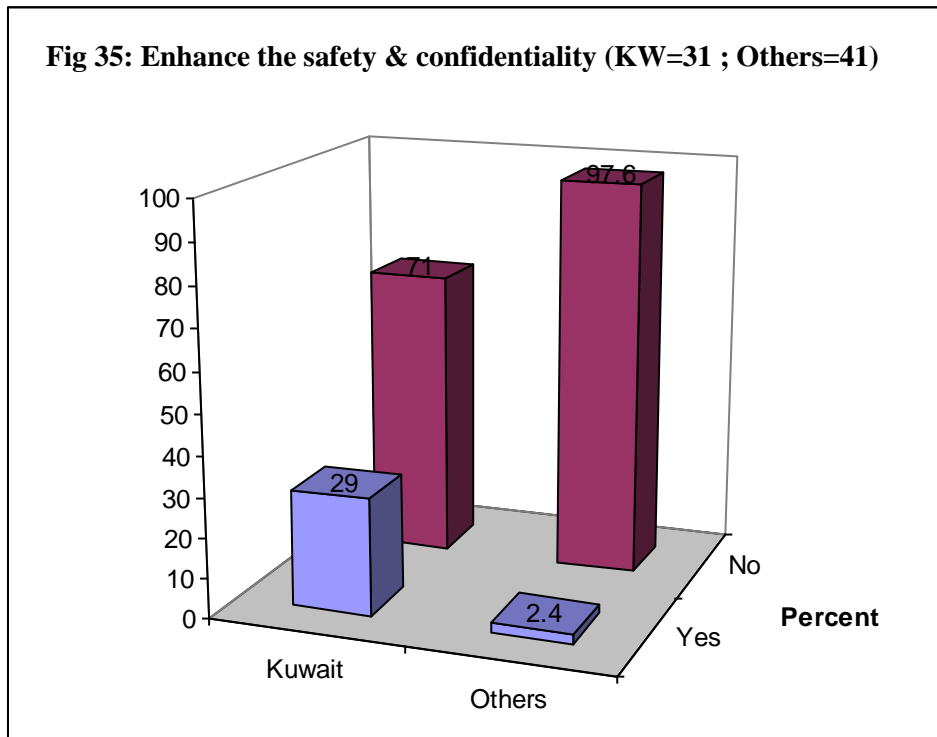
Table 15: Attitude Regarding the Benefits of   Electronic Health Record system

		Comparison Group					
		Kuwait		Other countries		Subtotal	
		No	%	No	%	Z	p-value
Increase access and availability of patient information to multiple users	Yes	16	51.6	20	48.8	0.0	1.0
	No	15	48.4	21	51.2		
Make delivery of health care more efficient	Yes	16	51.6	14	34.1	1.56	0.21
	No	15	48.4	27	65.9		
Make management of chronic conditions more effective	Yes	9	29.0	13	31.7	0.0	1.0
	No	22	71.0	28	68.3		
Improve clinical decision making	Yes	3	9.7	10	24.4	1.7	0.19
	No	28	90.3	31	75.6		
Save money in the long term	Yes	3	9.7	8	19.5	-	0.33*
	No	28	90.3	33	80.5		
Improve communication between health care professionals	Yes	6	19.4	9	22.0	0.0	1.0
	No	25	80.6	32	78.0		
Increase healthcare productivity	Yes	6	19.4	4	9.8	0.7	0.41
	No	25	80.6	37	90.2		

* Fishers exact test

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is making management of chronic conditions more effective"

One third of the decision making professionals, from both countries, equally believe in making management of chronic conditions more effective (Table 15).

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is enhancing the quality of service provided to the patient"

Less of the Kuwaiti decision making professionals compared to more of the international decision making professionals believe that the EHR enhances the quality of service provided to the patient. Thus there are statistically significant differences (23% vs 54%; p=0.02) between the international groups and the Kuwait group in the attitude towards enhancing the quality of patient care (Figure 36).
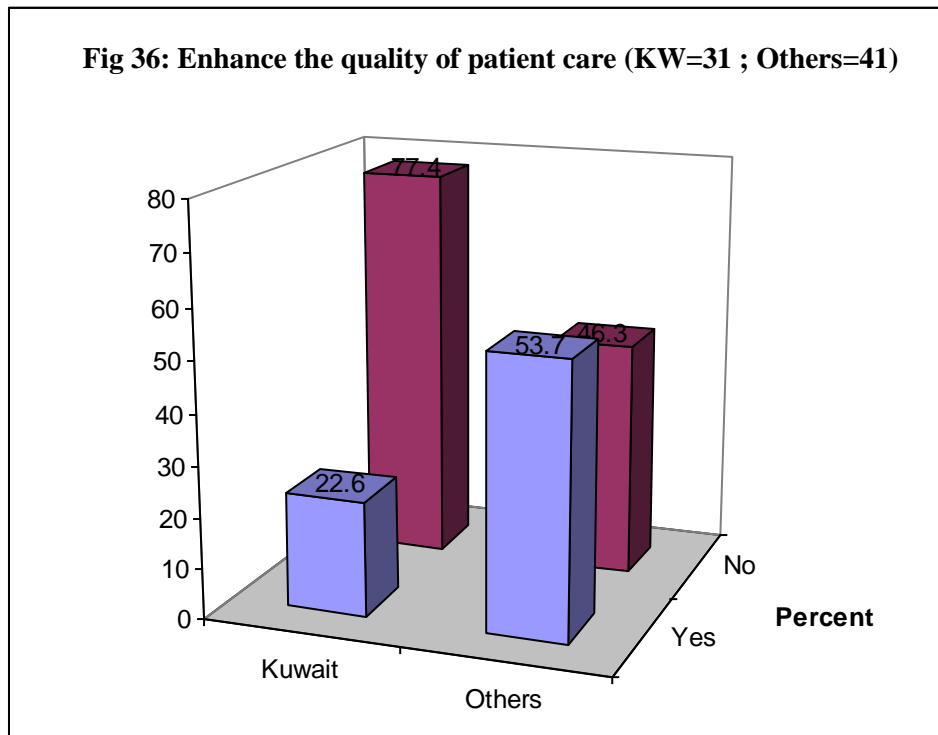
Fig 36: Enhance the quality of patient care (KW=31 ; Others=41)

" Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is improving clinical decision making "

Significantly less proportion of the Kuwait decision making professionals compared to international decision making professionals believe that the EHR system will improve clinical decision making however, this is not statistically different from health care professionals from other countries (Table 15).

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is saving money in the long term"

Decision making professionals believe that an EHR system will save money long-term, in contrary to the belief of Kuwait professionals (p=0.33) (Table 15).

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is saving physicians' time"

Much less of a proportion of the decision making professionals, from both Kuwait and other countries, believe that introduction of an EHR system will save physicians' time however, the proportion of belief is significantly different between the two groups of professionals (29% vs 5%; p<0.01) (Figure 37).
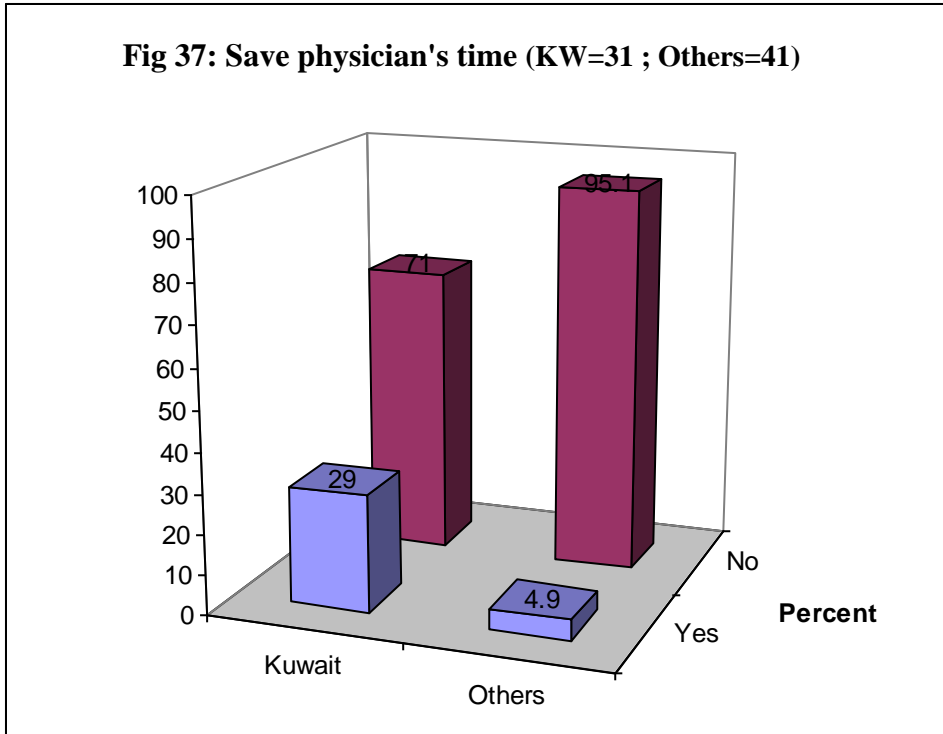
Fig 37: Save physician's time (KW=31 ; Others=41)

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is improving communication between health care professionals"

One fifth of the decision making professionals believe that introduction of an EHR system will improve communication between decision making professionals however, the difference in belief is not significantly different between the two groups (Table 15).

"Decision making professionals believe that the most important anticipated benefit of adopting an EHR system is increasing healthcare productivity"

The belief about an increase in healthcare productivity after introduction of an EHR system is not significantly different between decision making professionals from Kuwait compared to other countries (Table 15).

7.5.6. Section Three- Part B- Response Rate per Adoption Approach of EHRs

"Decision making professional believe that most important modules that would show significant benefits from early adoption is lectronic discharge summaries (communicated to the patient's GP)"

Four fifths of the decision making professionals from Kuwait and one third of the decision making professionals from other countries would like to have electronic discharge summary as communication to GPs to be introduced; this seems to be a most important priority of introducing early in the EHR system for the benefit of the patient (Figure 38).

"Decision making professional believe that most important modules that would show significant benefits from early adoption is laboratory results (communicated to the wards, clinics and GPs)"

More than 80% of the decision making professionals from both Kuwait and other countries would like to have adoption of laboratory results (communicated to the wards, clinics and GPs) (Figure 38).

Fig 38: Preference for early adaptation of EHRs (KW=31 ; Others=41)
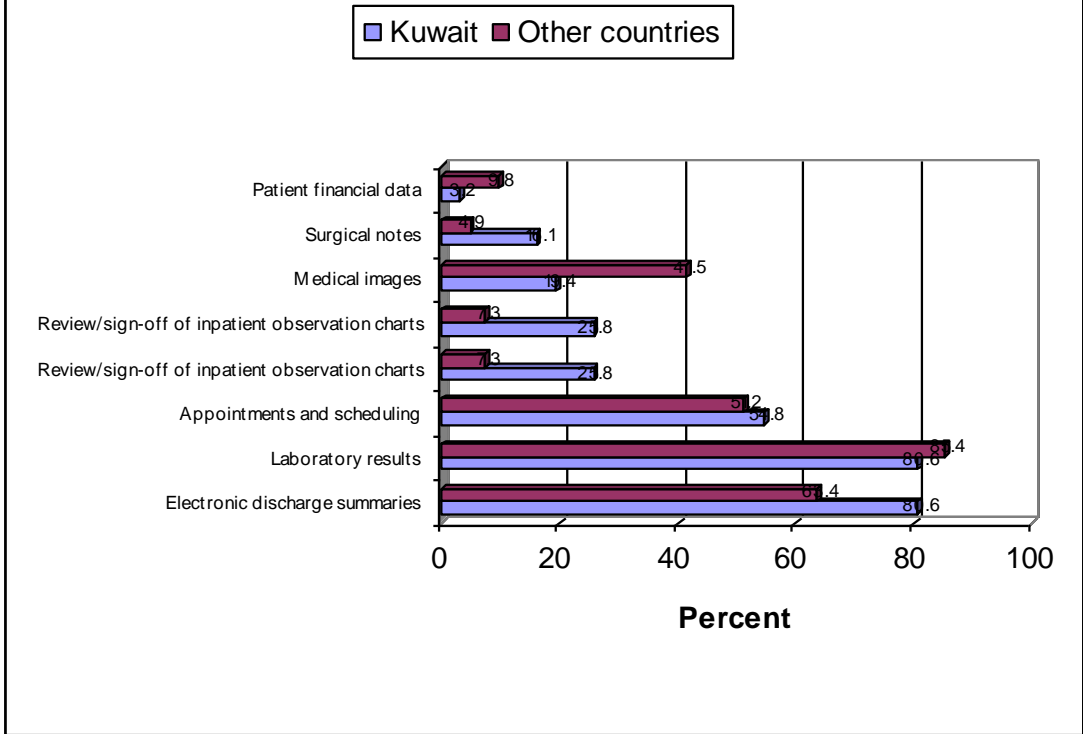
"Decision making professionals believe that the most important modules to show significant benefits from early adoption are appointments and scheduling (including availability for booking by GPs)"

Half of the decision making professionals would like early adoption of appointments and scheduling (including availability for booking by GPs) (Figure 38).

"Decision making professionals believe that the most important modules to show significant benefits from early adoption are review/sign-off of inpatient observation charts"

One fourth of the Kuwaiti decision making professionals and even less of a proportion of decision making professionals from other countries would like to have early adopting of review/sign-off of inpatient observation charts module (Figure 38).

"Decision making professionals believe that the most important modules to show significant benefits from early adoption is medical images (communicated to the wards, clinics and GPs)"

A high proportion of professionals from other countries, compared to Kuwaiti professionals, are in favour of the introduction of medical images (communicated to the wards, clinics and GPs (Figure 38).

"Decision making professionals believe that the most important modules to show significant benefits from 'early adoption are surgical notes (accessible across the hospital)' and " patient financial data (for reimbursement, insurance, episode costing *etc.*)"

Early adaptation of surgical notes and inpatient financial data were the least important in the priority of introducing in the EHR system for the benefit of the patient (Figure 38).

7.5.7. Section Three- Part C- Response Rate per User Acceptance Factor of EHRs

"Decision making professionals believe that the most important factor that influences user acceptance of the EHR system is perceived ease of use"

The decision making professionals were asked about the factors that influence user acceptance of the EHR system. A significantly higher proportion of Kuwaiti professionals, compared to professionals from other countries, mentioned that perceived ease of use is the most important factor that influences user acceptance of EHR system. (45% vs 17%; $p<0.01$) (Figure 39).

"Decision making professionals believe that the most important factor that influences user acceptance of the EHR system is perceived usefulness to the user and the user's clinical team"

A significantly higher proportion of decision making professionals from other countries, compared to professionals from Kuwait, mentioned perceived usefulness to the user and the user's clinical team as the most important factor that influences user acceptance of EHR system (42% vs 71%; $p<0.01$) (Figure 39).

Fig 39: The important factors that influence user acceptance of EHRs (KW=31 ; Others=41)
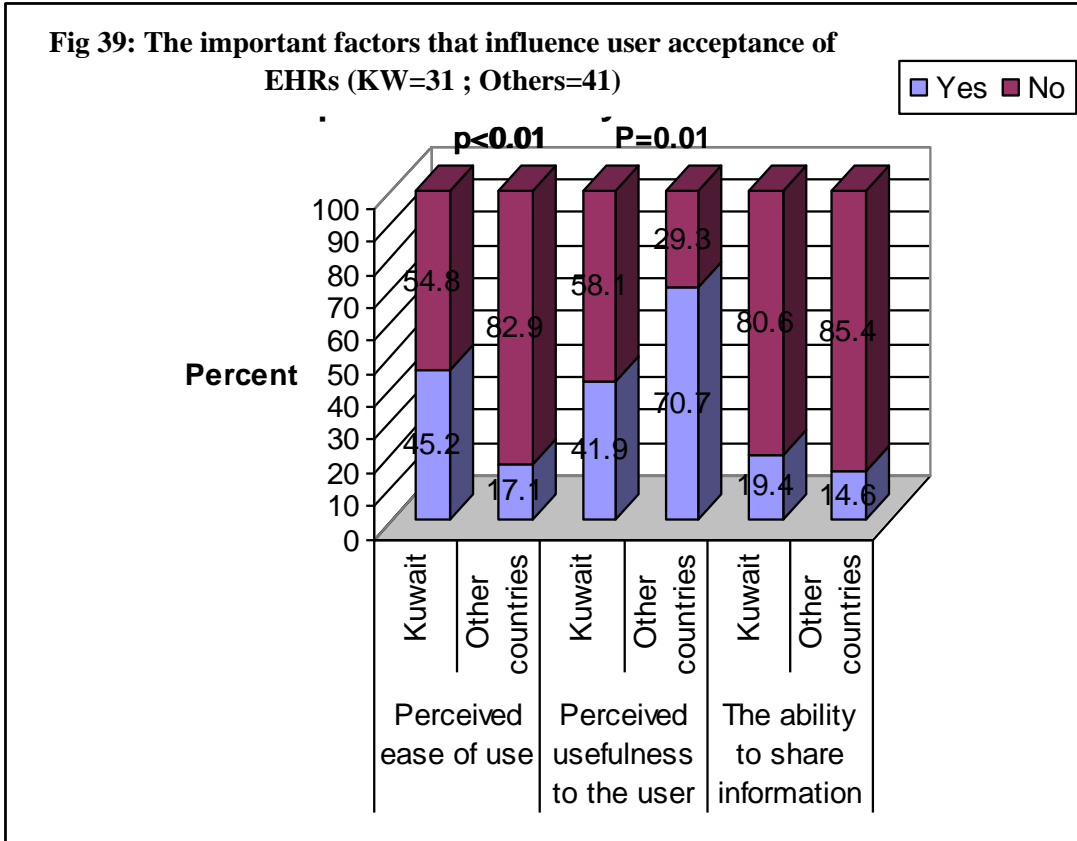
"Decision making professionals believe that the most important factor influencing user acceptance of the EHR system is the ability to share information beyond the local care team"

There is no significant difference (19.4% vs 14.6%) in the perception regarding 'the ability to share information beyond the local care team' between decision making professionals from Kuwait and other countries (Figure 39).

7.6. Summary

In this chapter, results of the survey questionnaire data have been discussed. The chapter provides empirical evidence on the extent of the main barriers and benefits that would effect the adoption approach of EHRs. There were 72 decision makers who participated, from 16 countries throughout world: USA; Canada; UK; Spain; Malaysia and Korea and including Kuwait. Decision makers who manage the EHR system have different educational backgrounds, such as managing director of the health care sector, information technology consultants, clinician, computer science engineers, health informatics system experts, etc. As a general observation, it is important to mention that these results are not 100% conclusive since they only represent a small sample of the target population and they describe what they consider to be the general position of EHRs users in their countries, from their perspective. Also, since participation was voluntary, there was no control over distribution of the population sample size with regards to their professional background.

A constructive area of this study was that the decision makers consider that the users believe EHR systems are better at protecting the privacy of patients than paper-based medical records,they expect this to be more available than paper based records and consider being useful for interoperability and communication with other hospital EHR systems.

Also, they consider that the users believe EHR systems to be more reliable than paper medical records. They also admitted that the users have a good knowledge of using an EHR system because have got sufficient computer literacy to use health information technology in their workplace and further, that they are willing to make changes in their workflow in order to make more efficient use of EHR systems. They consider that the users are enthusiastic to undertake training to improve their skills in using EHR systems and some already have sufficient skills to start using EHR systems. It is also observed that more of the national decision making professionals from Kuwait, than the international decision makers, perceived that the user consider EHR systems better in protecting the privacy of the patient, more reliable than paper based records, have sufficient knowledge of the IT within the workplace and thereby a good knowledge of using an EHR system.

Further, they consider that the users are willing to undergo training to improve their skills and in turn makes changes in the EHR system to adopt for local use.

An unconstructive area of this study was the decision makers believe that the users consider EHR systems to be useful in their field but consider that the costs for a full implementation are too high, which is one of the greatest challenges. The fear of using technology seems to be a barrier to the adoption of EHR systems from users point of view. The adoption of an EHR system would be adversely affected by a vendor who is not stable enough to provide long-term support. Another barrier is the poor navigation in EHR systems. The decision makers consider that the users believe the lack of adoption of uniform standards ,poor navigation, lack of adaptation of uniform standard codes ,and lack of long term support from vendor limits the use of EHR systems.

The decision makers believe that the users consider two main obstacles effecting adaptation of EHR systems: mismatch between those who benefit and those who have increased work from using EHR systems. More of the international decision makers compared to national Kuwaiti decision makers visualize the mismatch between the benefits and the increase in workload after introducing EHR system.

The decision makers believe that the users consider the two most important solutions to overcome the EHRs barriers were: provide well documented disaster recovery plan for the event of EHR system failure and provide multilevel confidentiality for record sharing between healthcare organizations.

More of the national Kuwaiti decision makers, than from the international decision makers countries, feel that the solution to overcome barriers to adaptation of EHR systems from users' perspective is by providing in-service education and to provide multi-level confidentiality for record sharing between health care organizations.

The decision makers believe that the users consider the three most important benefits to improve the users' attitude toward the EHRs are: increased access and availability of patient information to multiple users**;** making delivery of health care more efficient and enhancing the quality of patient care**.** International decision makers, compared to national Kuwait decision makers, considered that improving patient safety would improve the users attitude toward the EHRs benefits, where as the national Kuwaiti decision makers consider that saving physicians' time would improve the users' attitude toward the EHRs.

The decision makers believe that the three most important modules of EHRs to show significant benefits from early adoption from the user perspective were: laboratory results to be communicated to the wards, clinics and GPs; electronic discharge summaries communicated to the patient's GP and appointments and scheduling (including availability for booking by GPs). On other hand, the national Kuwait professionals believe that ease of use and usefulness is the key to adopting EHR systems from users' perspective. While international decision makers believe that the ability to share information is the key to adopting EHR systems.

Finally, the first case study was not conducted only for understanding the current benefits and barriers affecting the adoption approach of the electronic health record system. It was conducted to indicate if there is a need to do more investigation of the current EHR/EMR that is implemented at Kuwait Primary Health Care and to suggest any solutions to improve it. So, the first case studies' results were used as a preliminary tool to develop questions and key topic areas for a second case study survey.

Chapter Eight: Kuwait Healthcare Professionals Perspectives' on Electronic Health Record System

8.1. Introduction

The overall objective of a health information system is to improve the health of a population and to improve the quality of health care provision. A health information system (HIS) must respond to the characteristics, needs, and values of its users (Rice & Katz, 2001). Therefore, a health information system must be designed to respond to the way health care workers who use the system like to work and interact (Zuboff, 1988). For example:

No change: Utilising a HIS can result in no change in the work processes if tasks continue to be performed in the same way as before. For example, in the case of the EHR/EMR application system in Kuwait's primary health care sector, a laboratory test can still be ordered and printed from the system and the resulting information is thus obtained, viewed, and shared manually, so removing the motivation to use the potentials of the electronic format.

Automating existing activities: There are some tasks that can be carried out by a computer instead of by a health worker. In these cases, tasks are said to be automated. For example, in the past, information on a patient was retrieved by the health care worker from a patient's paper file. This search can be automated by asking the computer to perform the search function instead of the health worker. Therefore, all the health worker needs to do is type in the patient's name and the computer searches and retrieves the information. The task is the same, the required information is the same, and how the information is used is the same. The system has simply automated the manual task of physically searching for the information.

Totally transferring activities: This model means a complete function of a health care department/organisation is transferred to an automated system and the task is performed in a totally different way. A new HIS may make unnecessary the manual compiling and submitting of reports on individuals' cases to management. Managers can obtain the reports directly from the database, so freeing up health workers' time. Moreover, these reports can be more detailed and timely. Thus, a manual reporting function has been completely transformed by the new system.

One method of evaluating a HIS is through the perceptions of the users of the system in relation to the value to their work and how they use the HIS to support their decision-making processes. Although some tools exist for assessing information quality, system use, and user satisfaction, very few tools have been developed for measuring a system's intangible values and benefits (e.g. contingent valuation). One way to identify the effectiveness of an information system is to assess internal organisational improvements.

Research into the impact of information systems has resulted in findings that are mixed or inconclusive. Many researchers have tried to determine criteria to assess the successful implementation of a HIS, and others have tried to identify the factors that have caused a HIS to fail. Increasingly, it is acknowledged that the implementation of many information systems has resulted in unanticipated costs, broken promises, and disillusionment (Anderson & Jay, 1987; Lyytinen & Hirshheim, 1987). Some researchers have also demonstrated that information systems can affect the structure and functioning of the organisation as a whole, the quality of employees' work life, and the cost and quality of the services provided by the organisation (Dowling, 1980; Gardner, 1990; Lyytinen, 1988). However, it has been found that professionals who develop, implement, and evaluate HISs will often address only the technical aspects of these systems. This approach is limited because the success of implementation and utilisation depends on the integration of the information system into the complex organisational setting within which it functions. Information systems cause structural changes that alter organisational information flows and work designs (Nelson, 1990), which in turn, can affect the success of an organisation's ultimate objectives.

The designer of any HIS must be clear about what benefits it is intended to produce (Nelson, 1990). The designer must define variables that can be used to assess its impact, including system use, decision-making performance, decision-making time, user satisfaction, user confidence in decisions, and user attitudes towards the information system (Doll & Torkzadeh, 1988; Kjerulff et al, 1981; Schultz & Slevin, 1975; Kaplan & Duchon, 1989). When an information system is evaluated we need to consider a number of aspects relating to the *technology* of the system itself as well as issues relating to the individuals who use the system, and the organisation for which those individuals work. Technological aspects to examine include system quality, information quality, and ease of use. Individual user attributes include behaviour, qualifications, gender, age, and user satisfaction; all of which can, in turn, impact on the way the organisation functions as a whole. Thus, evaluating the impact of an information system on the individual and ultimately on an organisation can be very complex.

By identifying factors affecting the successful implementation of an organisation's information system, and by synthesising measures used to evaluate information systems, Heeks et al (1999) determined that a successful HIS needs to match its environment in relation to technical, social, and organisational factors, including the views and perceptions of the major stakeholders involved in the study. Therefore, it is important that the design concept of a HIS takes into account the differences between vision and reality, which can mean the difference between success and failure (Heeks et al, 1999). These differences or gaps are not always due to differences between the stakeholders. They could also be due to what information individuals may think they want from the system as compared to what information they actually need, which can result in dissatisfaction with the system and, ultimately, system failure. It is therefore important to examine what the users of a system want and expect from the system, and the extent to which the final system applications meet these expectations. Understanding this perceived value can ultimately affect the successful implementation of an information system.

Alavi and Joachimsthaler (1992) showed that user factors do impact on IT implementation success and that user situational variables are more important than individual differences. In fact, their study showed that by manipulating user situational variables, the implementation success rate could be improved by as much as 30%. This study demonstrates that it is worth using user situational variables to measure system success. User adaptation to information systems is also a key measure. User attitude towards the implementation of a new system is also a critical evaluation measure. Users' attitudes towards the implementation of a system can result in users needing more support to use the system, work slowing down, interruptions to established work flow patterns, or users being given more responsibilities.

It is also important to examine the attitudes of stakeholders *after* an information system has been implemented. A number of years ago, some researchers tried to identify what aspects of an information system were influenced negatively by its use. Schultz and Slevin (1975) tested an implementation attitude measurement instrument to determine attributes that would be important to the implementation of an information system in an organisation. They proposed that user concerns are critical to successful implementation of an information system, particularly concerns about the impact on individual performance. One of the factors proposed was interpersonal disturbances, which related to individuals requiring more assistance from others once an information system was implemented. If a system requires that a user seeks assistance from other people, it may impact negatively on the way the information system is used and thus on the value of the information system as a whole. Kaplan and Duchon (1989) also believed that users' perceptions of increased (what they termed) 'personal hassles', as a result of the implementation of an information system, negatively impacted on users' attitudes. It was concluded that if job responsibilities increased, or if rate of work slowed, then users would not react favourably to the information system. User participation in the development of an information system has for a long time been considered a critical factor in achieving system success. Research has failed thus far to demonstrate clearly the benefits of this issue (Hartwick & Barki, 1994).

Zuboff (1988), Braverman (1974), and Weick (1990) discussed how information technology is used to automate work processes and thus improve productivity and management control. When automation is introduced, workers are pleased to find that they are able to develop their capabilities by using information technology for improving information processing and increasing problem solving skills, allowing workers to become more innovative in their tasks. Increased productivity and innovativeness lead to improved customer satisfaction. These positive benefits will lead to increased value and use of the information system. Conversely, if the information technology is perceived by workers to increase management control over work processes, it may adversely impact on the work of individual end users and result in low value perceptions by these users.

Researchers have already outlined the attributes of an information system that appeal to stakeholders, such as system quality, information quality, ease of use, and the ability to transform work processes. Many researchers agree that a successful information system, i.e., a valued information system, requires a number of attributes to exist (Anderson et al, 1994). Yet there are very few studies that have investigated large information systems in order to determine which attributes are present or missing that account for the success or failure of the system. Large, complex information systems are becoming more prevalent in health care, either as institution-wide or nation-wide systems and health professionals are beginning to judge information systems on their value for improving patient care (Rice & Katz, 2001).

It is therefore suggested that user satisfaction can be used as an alternative measure of perceived system value, since value perception is a more direct measure of information system success when related to a specific information system (van der Meijden et al, 2003).

This case study investigates a number of attributes in order to determine which of these attributes influence users' perception of value. A system's value is enhanced if it provides relevant information that can be used by individuals in their decision making processes. Increased value is associated with increased satisfaction with both the system and the job, with greater adoption to technology, and a better attitude towards implementation. Greater perceived value is also related to the information system having a positive impact on the work of the end users.

In this case study, a comprehensive survey questionnaire was organized by the researcher based on the findings of the first case study and EHR related literature. The second case study was reviewed and approved by the first and second supervisors of the researcher. The overall aim of this case study is to assess the Electronic Health Record system developed by the Information Technology Department at Ministry of Health for PHC, and to determine the attitude of stakeholders, who are the end users of the system and whose activities are strongly affected by the system. The selection of stakeholders to study, the specific subjects to study, and the risks and benefits of the study were evenly distributed based on the subjects' efforts, needs, and rights. Subjects were selected for reasons directly related to problem being studied and not for their straightforward availability. They were selected based on their being the heaviest users of the electronic health record system at each primary healthcare center. Stakeholder groups included: physicians, nurses, and pharmacists. A stratified random sampling method was used to select the sample. The population of healthcare professionals at Kuwait MOH in 2006 was 14,926 (Ministry of Health, 2006a). To determine the number of participants to be included in the sample, the following formula was used:

$$n = Npq(N-1)D + pq, \quad D \; B^2/4$$

B is the bound for the error, set at 5% which is considered to be an acceptable margin of error for many studies. The value of p and q is set at 0.5 for the purpose of sample size determinations, since this value produces the most conservative value for the required sample size. N is the total number of the population under study, which is 14,400 healthcare professionals

$$D = 0.05^2/4 = 0.000625$$

$$n = (14,926)(0.5)(0.5)/(14,926)(0.000625) + 0.25 = 389.51$$

The researcher has a meeting with head director of each healthcare center involved in the study to: explain the purpose of the study; to approve and conduct the study at their center; and to assign a moderators at each primary health center. After a personal meeting between the head director at each healthcare center , moderators were assigned at each healthcare center, and a researcher , whose mainly responsibility was to distribute and collect the survey questionnaires. The moderators in each health care center were female in their mid 30yrs, and surrounded with familiar stakeholders with whom they worked in the primary health care center. Each participant signed a written informed consent form.

The survey questionnaire consisted of six sections, and in each there were a varying number of questions related to the title of the category.

The questionnaire sections are:

a. The first section, related to contributor's demographic information.

b. The second section, related to whether EHRs were implemented in the facility or not; if implemented, information was requested about whether it was fully implemented, partially or hybrid etc., the date implemented and the duration of user's experience in using EHRs.

c. The third section, related to the availability of different features in the EHRs: to be stated as: "I do not use", "I use some of them", "I use most or all of the time", "Not applicable to my facility". The feature list covered demographic, problem list, physicians orders, clinical notes, identification of allergies, immunizations, medications, communications and reporting etc.

d. The fourth section, related to benefits of EHRs; for example: quality clinical decisions, communication with providers, patients, prescription refills, preventing medication errors, scheduling, etc to be stated as "Strongly Agree", "Disagree", "Neutral or Uncertain", "Agree", "Strongly Agree".

e. The fifth section, related to barriers of EHRs; such as resistance to new technology, problems with confidentiality, privacy and security, a lack of uniform standards, conflict with personal attention to patient, clinical data etc., to be stated as one of "Major barrier", "Minor barrier", "Not a barrier".

f. The sixth section, related to the user's satisfaction with using EHRs by stating "Very Satisfied", "Satisfied", "Neutral", "Dissatisfied", and "Very Satisfied". The topics related to: ease and reliability of system, frequent failure of the system, sharing of information, interface with other departments, lab, radiology, pharmacy, hospital information, etc.

A pilot test was conducted at two Primary Health Care Centers to ensure that the survey meet the objectives of the study. The survey was administered to ensure the validity and reliability of the instrument. Minor changes were made to section two, and four since these created a misunderstanding within the pilot sample. The change was performed to ensure that each item measured what the instrument was intended to measure, therefore ensuring validity. In addition, the terms computer-based patient record(CPR), computerized physician order entry(CPOE), electronic medical record (EMR), and electronic health record(EHR) were collectively referred to as EHR, to avoid a misunderstanding that had been indicated during the pilot study.

In addition to the Introduction and Summary, there are six sections, the first section defines the sampling profile that participate in this study, the second section discusses the overall responses of international perception on electronic health record benefits and barriers, while the third section compares the finding between the international and national decision maker group.

8.2. Descriptive Statistical Analysis of the Study

 The data were entered and analyzed using Statistical software SPSS version 16.02. Summary measures such as mean and SD were computed if the variable was continuous and followed a normal distribution, and Median and Inter Quartile range (IQR) were computed if the variable was continuous/ ordered and did not follow normal distribution. An appropriate Chi-square test was used to find any association between various factors and the professional category or satisfaction level of using EHRs at each facility. Multiple logistic regression was used to find the best combination of factors associated with satisfaction of using EHRs at each facility. An attempt was made to find an association among responses related to benefit, barrier and satisfaction of EHRs use.

The sum of the scores based on response for each question was obtained under each major heading: benefit, barrier and satisfaction towards use of EHRs. The responses for the questions under barrier to the use of EHRs carry 1 for a major barrier, 2 for a minor barrier and 3 for no barrier. The responses for the questions under benefits of EHR use carry 1 for agree, 2 for neutral and 3 for disagree. The satisfaction related questions carry 1 for very satisfied, 2 for satisfied, 3 for neutral , 4 for dissatisfied and 5 for very dissatisfied.

In the barriers for use of EHRs, lower score indicates major barrier and higher score indicates no barrier. In the benefits of use of EHRs, lower score indicates higher agreement to the statement and higher score indicates disagreement to the statement. In the satisfaction of EHRs use, lower score indicates very satisfied and higher score indicates very dissatisfied. A correlation coefficient was calculated between benefit score and barrier score, benefit score and satisfaction score, and barrier score and satisfaction score. ANOVA was performed to find out whether benefit score, barrier score or satisfaction score were significantly different among professional categories. Once the ANOVA test was termed out to be significant, the Scheffe test was used to find out which group was significantly different from other group. A p-value less than 0.05 was considered to be statistically significant. There were three health care regions that participated in this study: Hallawlly, Capital, and Farwanyai health care region. 26 primary health care centers participated in this study.

8.3. Demographics of Study Population

The overall participants in this study were 327 professionals who were using EHRs in their facility. Gender balance was almost equal (Male 47%, Female 53%) (Figure 40). There were 34 (10.4%) professionals in the age group less than 29 years, 94 (28.7%) in the age group 30-39 yrs, 128 (39.1%) in the age group 40-49 yrs and 71 (21.7%) in the age above 50 yrs (Figure 41). Three quarters of the participants were Doctors and the rest were Nurses and Pharmacist equally (Figure 42). The Median number (IQR) of years in the practice was 12 years (8, 20). It was found that there were gender differences in the study subjects with respect to their professional categories (Figure 43). There were significantly less males in the nursing profession than in other professions ($p < 0.001$) whereas the age distribution was equal among all the professional categories ($p = 0.203$) (Figure 44).

Fig 40: Gender distribution of study subjects (n=327)

Male, 153, 47%

Female, 174, 53%
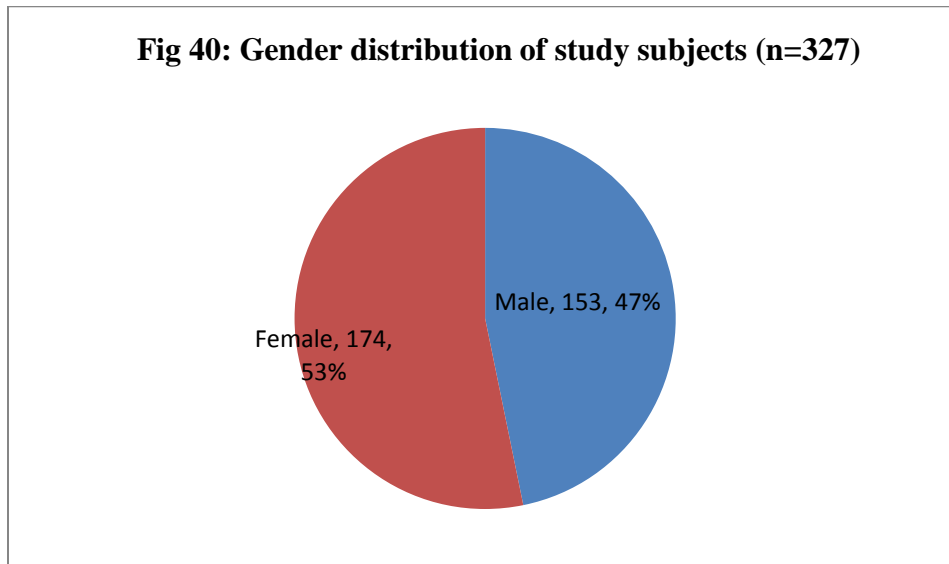
Fig 41: Age distribution of study subjects (n=327)

- Under 29 yrs
- 30-39 yrs
- 40-49 yrs
- 50 yrs +

34, 10%

94, 29%

128, 39%

71, 22%
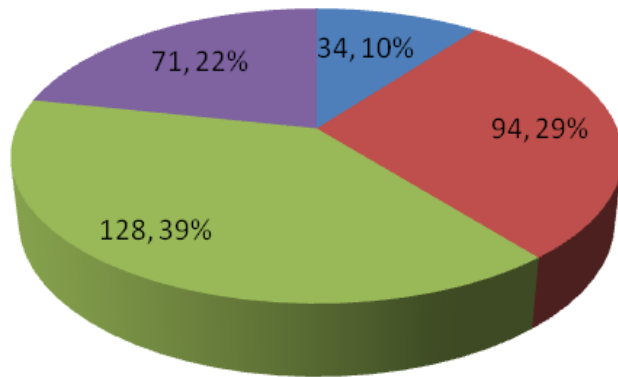
Fig 42: Professional category of study subjects (n=327)

- Doctor
- Nurse
- Pharmacist

Pharmacist, 45, 14%

Nurse, 41, 12%

Doctor, 241, 74%
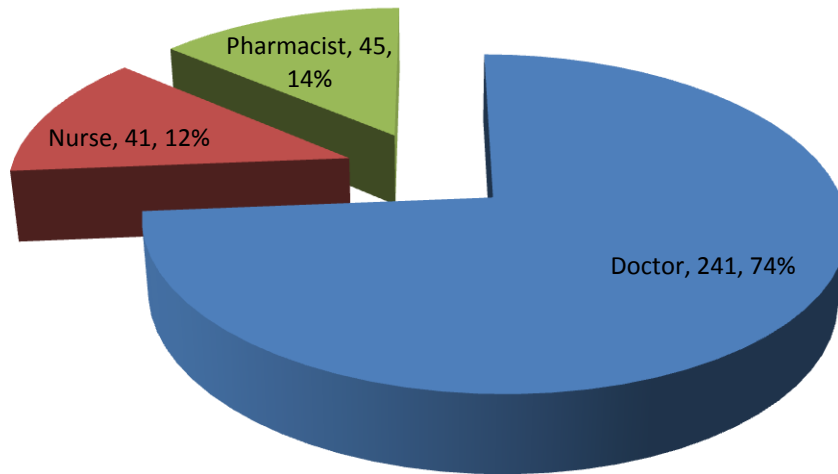
Fig 43 : Professional category of study subjects by gender (n=327)

■ Male   ■ Female

	Doctor	Nurse	Pharmacist
Male	128	5	20
Female	113	36	25
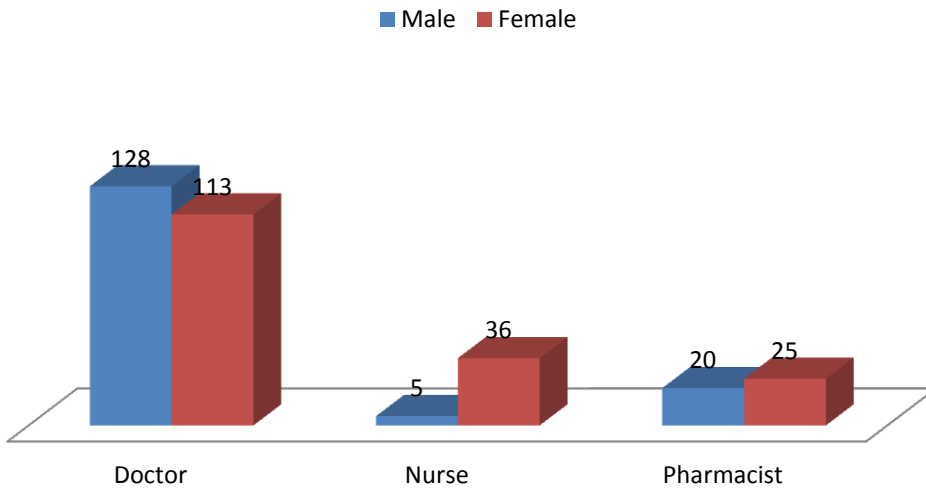
Fig 44 : Professional category of study subjects by age group (n=327)

■ Doctor   ■ Nurse   ■ Pharmacist

	<30 yrs	30-39 yrs	40-49 yrs	50 + yrs
Doctor	19	72	94	56
Nurse	7	8	18	8
Pharmacist	8	14	16	7

277
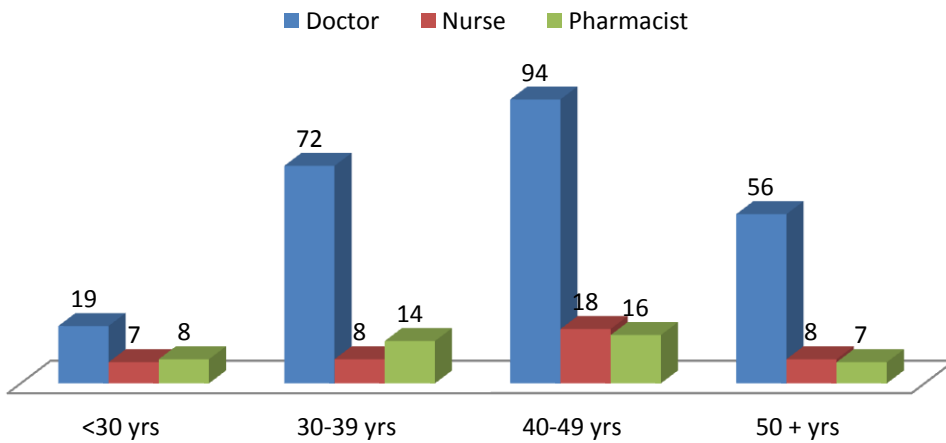
8.4. EHRs Existence and Experience with the System Availability in the Facility

It was observed that all of the respondents were using a Hybrid Electronic Health record system. Three quarters of them were using a Hybrid system for more than 5 years (Median: 72 months; IQR: 60, 72 months) (Figure 45) . It was also observed that the Electronic Health Record system was not connected to all the departments of their hospital. Most of them (88%) admitted that they were good at using EHRs and a very few were managing it very slowly (Table 16). Two thirds of the users did not receive a training programme in the use of EHRs (Figure 46).

Table 16: Type of EHRs existence and its availability in the facility

		No	%
Is an Electronic Health Record System implemented in your Healthcare Facility?	Hybrid system	327	100.0
Is the electronic health record system in the hospital connected to all the departments of the hospital?	Yes	0	.0
	No	230	70.3
	Do not Know	97	29.7
Are you good in using the Electronic Health Record System?	Yes	289	88.4
	No	12	3.7
	Managing slowly	26	8.0

Fig 45 : % of professionals using EHRs in different duration(in months) (n=327)

Duration	12	20	24	36	48	60	72	84	96
%	0.60	0.30	2.80	6.10	14.40	24.80	45.60	5.20	0.30
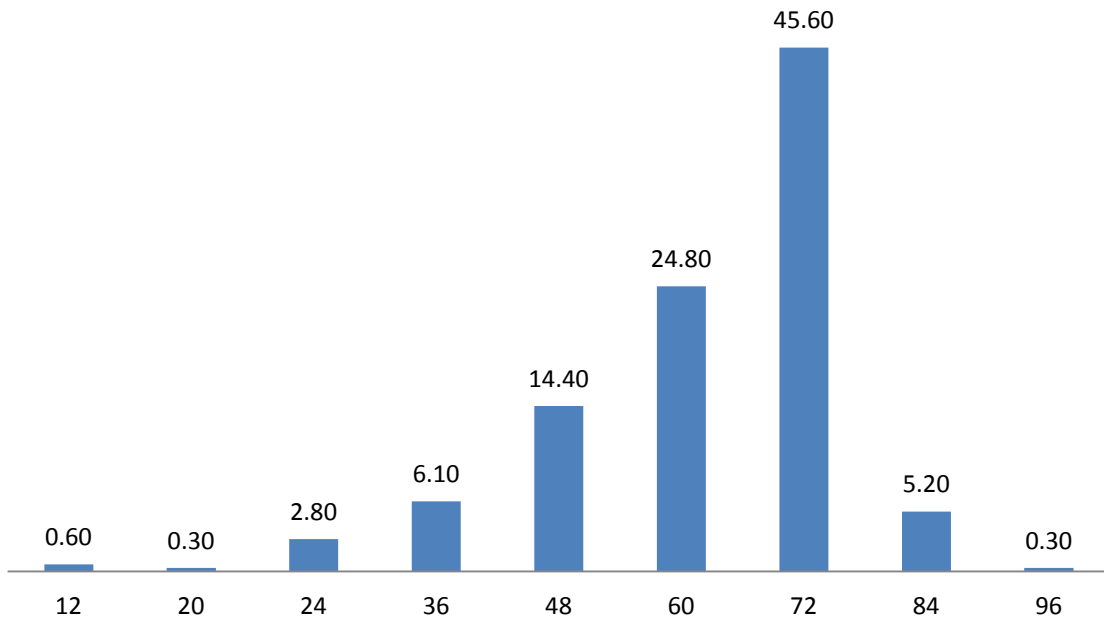
Fig 46: Have you received training course on the use of EHRs ? (n=327)

Yes, 106, 32%

No, 221, 68%
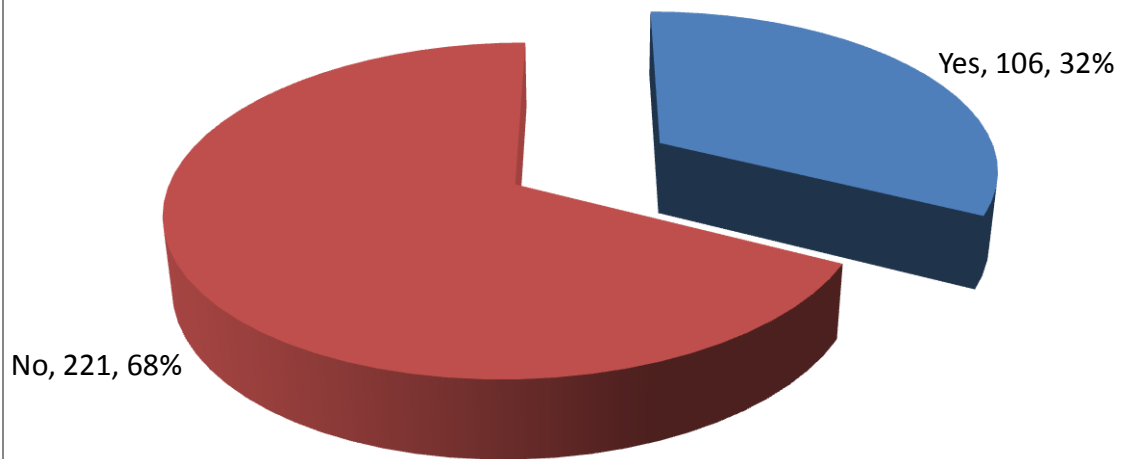
8.5. Features Available in the EHRs and its Use in their Facility

An attempt was made to explore the features available in the EHRs at each participant's facility and its use by the professionals (Figure 47). All the EHRs had the provision to record a patient's demographic details and it was used all the time by every professional. It has a provision to list the patient's problems in the system. One third of the systems' users do not use it, and the remaining two thirds do use it (Figure 48). Two thirds of the EHRs had the provision to order laboratory tests. These lab tests were sent paper-based but not electronically, and so viewing of the result was also paper based. Two thirds of the EHRs had the provision to order radiology tests. However radiology tests were also sent paper-based but not electronically, and viewing of these results was also paper based. Storing the image in the computer had not yet come to practice in these EHRs, and so nobody was able to view the radiology result as an electronic image and there was no comment regarding whether an electronic image use was easy, modifiable, if the user was able to enlarge it or to review similarly to a physical x-ray. No other tests were ordered using EHRs. Two thirds of the EHRs had the provision to enter clinical notes and this was fully utilized. These systems have the features to capture medical history, physical exam and progress notes. These additional features were used in all the systems. None of the EHRs have provision for voice recognition or creating telephone messages. However, there is a provision to create notes using a combination of information available by mouse click, and this was used as a routine for patient management.

Fig47: Features of EHRs in the users' institution (n=327)

Feature	Yes	No
Patient Demographic	100	
Patient problem lists	62.7	37.3
Order for laboratory tests	62.7	37.3
Viewing Lab result		100
Order for radiology tests	62.7	37.3
Orders for other tests		100
Clinical notes	62.7	37.3
Identify allergies	87.8	12.2
Review progress notes	62.7	37.3
Review prior vital signs	62.7	37.3
	87.8	12.2
Document patient care (overall)	62.7	37.3
Create and maintain medication list of each…	100	
Receiving drug-allergy alerts when writing…	62.7	37.3
Receive drug formulary information and alert…	87.8	12.2
Connect electronically or by e-fax to pharmacy	87.8	12.2
Manage prescription writing (overall)	62.7	37.3
Reminders for guideline-based interventions…		100
Public Health reporting		100
Monitor immunizations		100
		100
		100
Manage referrals (overall)		100
Send e-faxes to outside physicians		100
		100
Communications and remote access (overall)		100

Fig48: Use of EHRs Features in Users' Institution (n=327)

Legend: ■ I use most of them ■ I use some

Feature	I use most of them	I use some	(green)
Patient Demographic	100		
Patient problem lists	4.9	57.2	37.9
Order lab result	62.7		37.3
Clinical notes	67.7		37.3
Identify allergies	62.4	25.4	12.2
Review progress notes	62.7		37.3
Review prior vital signs	58.1	4.6	37.3
Monitor current and past meds and medical refills	87.8		12.2
Document patient care (overall)	62.7		37.3
Create and maintain medication list of each patient	96	4	
Receiving drug-allergy alerts when writing prescriptions	62.7	25.1	12.2
Receive drug formulary information and alert when writing prescriptions	87.8		12.2
Connect electronically or by e-fax to pharmacy	87.8		12.2
Manage prescription writing (overall)	62.7	37.3	

Most of the EHRs had the feature to identify allergies, and this was used by all. Most of the EHRs had the provision to review progress notes, review prior vital signs, monitor current and past needs and medical refills, and these features were utilized by all. All of the systems had the facility to create and maintain a medication list for each patient and these were utilized. The EHRs did not have provision to alert the user about a drug-drug interaction when writing a new drug prescription. However, two thirds of the systems has the provision to alert for a drug-allergy risk when writing prescriptions and this was utilized by all. Almost all of the systems had the provision to receive drug formulary information and alert when writing prescriptions and this used by all. EHRs have been connected to the pharmacy and the link was used efficiently. EHRs were used for drug prescriptions in two thirds of cases. The EHRs did not have the option to remind the user of guideline based interventions and / or screening tests. Overall management of drug prescription was done through EHRs.

The EHRs did not have features to capture information for public health reporting: notifiable diseases reporting, monitoring immunization schedules, receiving alerts on health maintenance deficiencies, tracking health maintenance items (i.e. pap, mammogram, colonoscopy, etc.,), tracking preventive care, identifying providers covered on a patients' insurance, managing referrals, sending e-fax to outside Physicians, accessing records remotely (i.e. chart access from home or remote transcriptionist access) or overall communications and remote access.

8.5.1. Comparison of Features Available in the EHRs and its Use in their Facility among the Professional Categories

It was found that patient problem lists, ordering laboratory tests, ordering radiology tests and clinical notes were used mainly by doctors (Figure 49). A very few nurses used the ordering of laboratory tests and radiology tests electronically. The EHRs features included review progress notes, review prior vital signs, monitor current and past meds and medication refills, document patient care, receive drug allergy alerts when writing prescription, manage prescription writing were used by doctor and pharmacist regularly (Figure50).

Fig49: Use of EHRs Features by Healthcare Professionals' (n=327)

Legend: ■ I do not use ■ I use some ■ I use most of them

Category	Role	I do not use	I use some	I use most of them
Patient demographic	Doctor			100
	Nurse			100
	Pharmacist			100
Patient Problem	Doctor	16.2	77.2	6.6
	Nurse	97.6	2.4	
	Pharmacist	100		
Order for laboratory	Doctor	15.4		84.6
	Nurse	97.6		2.4
	Pharmacist	100		
Order for radiology	Doctor	15.4		84.6
	Nurse	97.6		2.4
	Pharmacist	100		
Clinical notes	Doctor	15.4		84.6
	Nurse	97.6		2.4
	Pharmacist	100		
Identify allergy	Doctor		15.8	84.2
	Nurse	97.6		2.4
	Pharmacist		100	
Review progress	Doctor	15.4		84.6
	Nurse	97.6		2.4
	Pharmacist	100		
Review Prior vital signs	Doctor	15.4	6.2	78.4
	Nurse	97.6		2.4
	Pharmacist	100		

Fig 50: Use of EHRs Features by Healthcare Professionals' (n=327)

8.6. Benefits of EHRs

The participants were asked about the benefits of EHRs. It was found that 60% of the professional stated that EHRs were very useful to make clinical decision (Figure 51). Of the remaining, the majority were neutral or uncertain about EHR use for clinical decisions and very few (9%) disagreed with this use. The use of EHRs for communication among the providers or with patients was not agreed or uncertain by nearly half of the EHR users. Two thirds of the providers agreed that EHRs are used for timely access to medical records. More than two thirds of the providers agreed that EHRs are greatly used for the repeat prescription. Of the remaining, half of them were uncertain about these uses. One third of the providers believed that prescription through EHRs reduces or avoids medication errors. Nearly 60% of the providers believed that EHRs were used for delivering preventive care and 29% were uncertain of delivering preventive care through EHRs.

Half of providers greatly benefited by using EHRs for patient appointment scheduling and the remaining were uncertain or disagreed with its use for patient scheduling. Three fourths of the providers believed that it improves the overall quality of care to patients.

Fig51:Benefit of Electronic Health Record system (n=327)
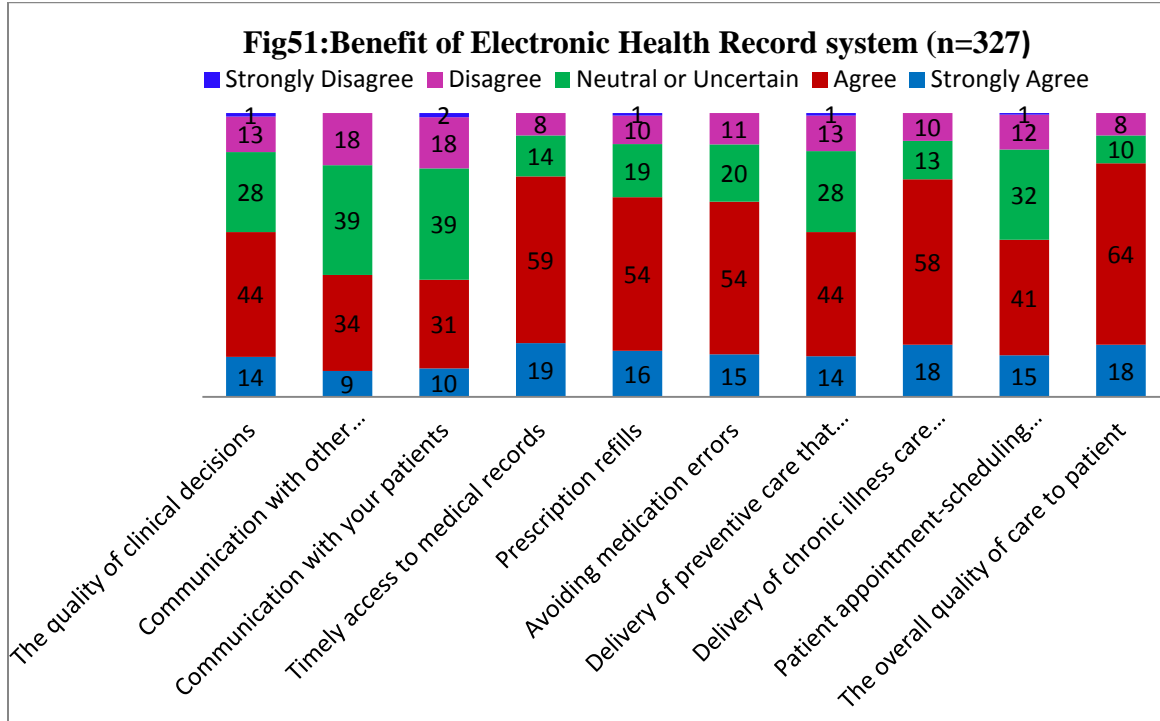
8.6.1. Comparison of the Benefits of EHRs among Professionals

The beliefs of the benefit of EHRs depends on the professional category of the providers (Table 17). A significantly higher proportion of doctors agreed that EHRs are used for the quality of clinical decisions than nurse or pharmacy-providers (p<0.001) (Figure 52) whereas the nurse and pharmacy providers were uncertain about its use especially for the quality of clinical decisions. The belief about 'EHRs used for communication with other provider' is significantly higher among doctors than nurses and pharmacists (p<0.001) (Figure 53). The agreement on EHR system use for communication with patients was not significantly different between doctors, nurses and pharmacist (P=0.009) (Figure 54). The benefit regarding EHR use for timely access to medical records was significantly higher among doctors than nurses and pharmacists (p=0.004) (Figure 55). A significantly higher proportion of doctors and pharmacists than nurses agreed EHRs are best used for repeat prescriptions (p<0.001) (Figure 56). Significantly more doctors and pharmacists believe that EHR are useful for avoiding medication errors than nurse (p=0.009) (Figure57). The benefit of EHR use for the delivery of preventive care and chronic diseases that meets guideline is not significantly different among doctor, nurse and pharmacist providers. More doctors than nurses and pharmacists agreed on the benefits of the use of EHRs for patient appointment and rescheduling (p<0.001) (Figure 58). The satisfaction from EHR use for overall quality of care to patient was same among doctors, nurses and pharmacists.

Table 17: Comparison of benefit of EHRs by Professional category

| | | Your title recode | | | | | | p-value |
| | | Doctor | | Nurse | | Pharmacist | | |
		No	%	No	%	No	%	
The quality of clinical decisions	Agree	168	69.7	8	19.5	14	31.1	<0.001
	Neutral	41	17.0	28	68.3	23	51.1	
	Disagree	32	13.3	5	12.2	8	17.8	
Communication with other providers	Agree	121	50.2	7	17.1	12	26.7	<0.001
	Neutral	79	32.8	25	61.0	22	48.9	
	Disagree	41	17.0	9	22.0	11	24.4	
Communication with your patients	Agree	113	46.9	9	22.0	13	28.9	.009
	Neutral	82	34.0	23	56.1	23	51.1	
	Disagree	46	19.1	9	22.0	9	20.0	
Timely access to medical records	Agree	189	78.4	32	78.0	33	73.3	0.004
	Neutral	30	12.4	5	12.2	12	26.7	
	Disagree	22	9.1	4	9.8	0	.0	
Prescription refills	Agree	186	77.2	7	17.1	37	82.2	<0.001
	Neutral	29	12.0	28	68.3	4	8.9	
	Disagree	26	10.8	6	14.6	4	8.9	
Avoiding medication errors	Agree	176	73.0	20	48.8	28	62.2	0.009
	Neutral	38	15.8	15	36.6	13	28.9	
	Disagree	27	11.2	6	14.6	4	8.9	
Delivery of preventive care that meet guidelines	Agree	145	60.2	24	58.5	21	46.7	0.431
	Neutral	65	27.0	13	31.7	15	33.3	
	Disagree	31	12.9	4	9.8	9	20.0	
Delivery of chronic illness care that meets guidelines	Agree	190	78.8	31	75.6	29	64.4	0.194
	Neutral	27	11.2	6	14.6	11	24.4	
	Disagree	24	10.0	4	9.8	5	11.1	
Patient appointment-scheduling system	Agree	149	61.8	14	34.1	18	40.0	<0.001
	Neutral	58	24.1	23	56.1	23	51.1	
	Disagree	34	14.1	4	9.8	4	8.9	

The overall quality of care to patient	Agree	200	83.0	32	78.0	37	82.2	0.716
	Neutral	21	8.7	5	12.2	6	13.3	
	Disagree	20	8.3	4	9.8	2	4.4	

Fig52:Benefit of EHRs for the quality of clinical decisions by professional category (Doctor=241; Nurse=41; Pharmacist=45)
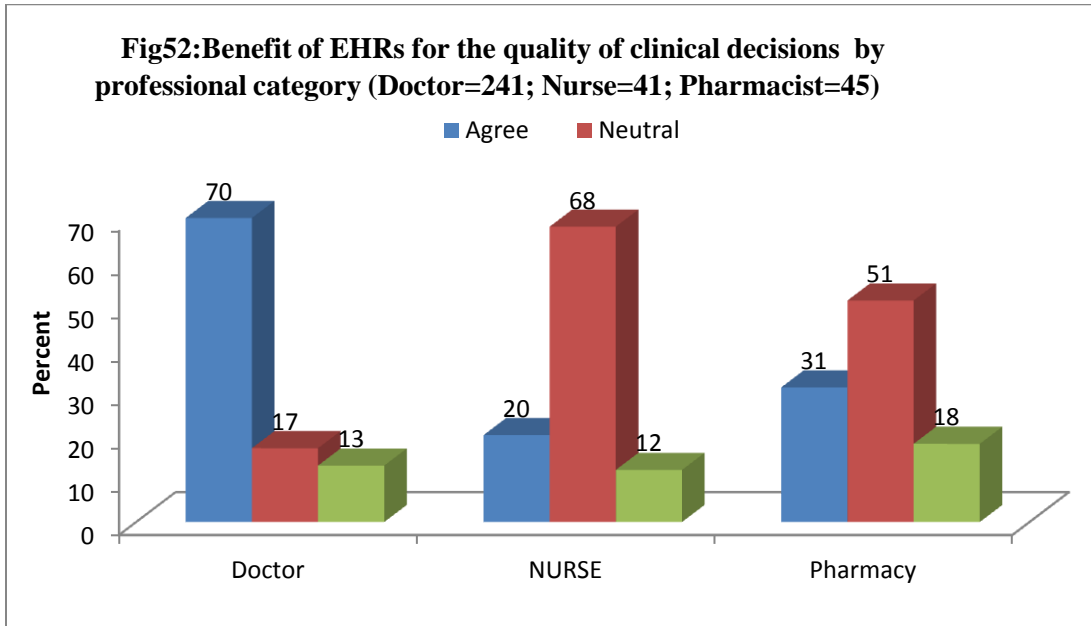
Fig53: Benefit of EHRsfor communication with other providers by professional category (Doctor=241; Nurse=41; Pharmacist=45)
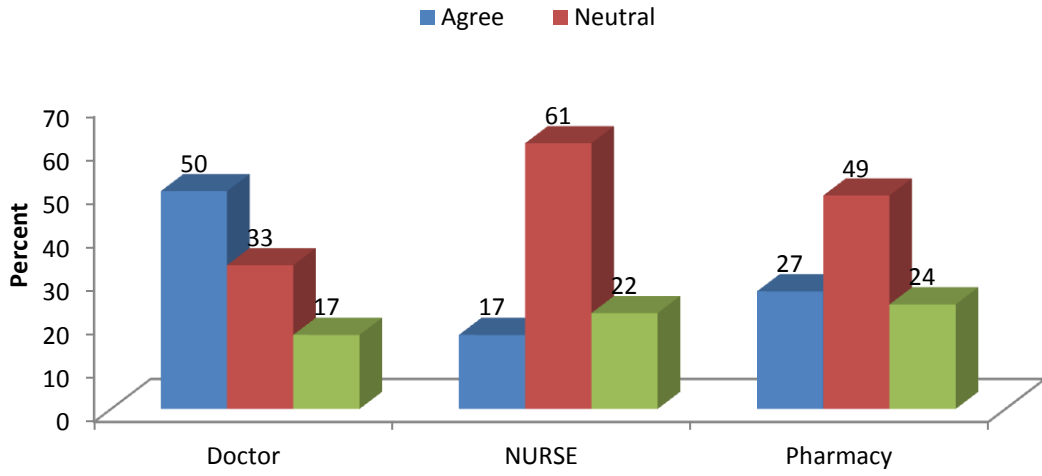
Fig54: Benefit of EHRs for communication with your patients by professional category (Doctor=241; Nurse=41; Pharmacist=45)
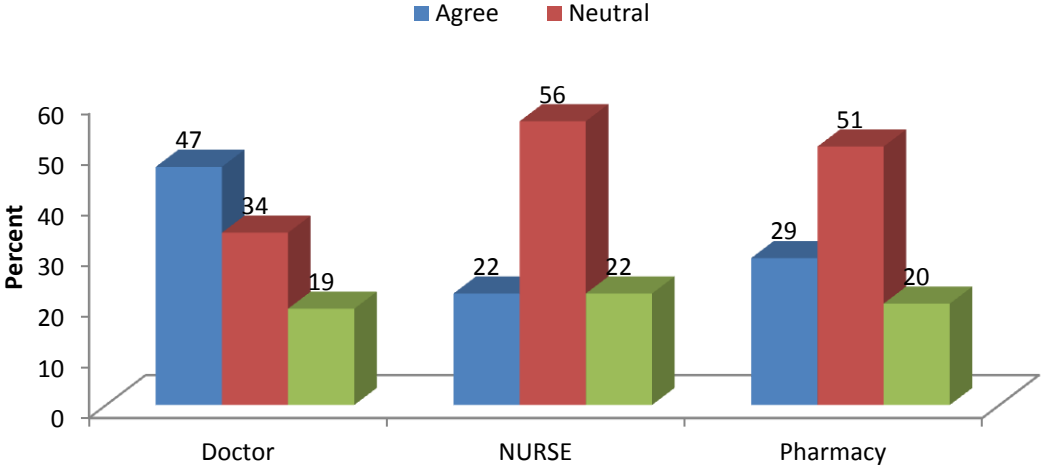
Fig55:Benefit of EHRs for timely access to medical records by Professional category (Doctor=241; Nurse=41; Pharmacist=45)
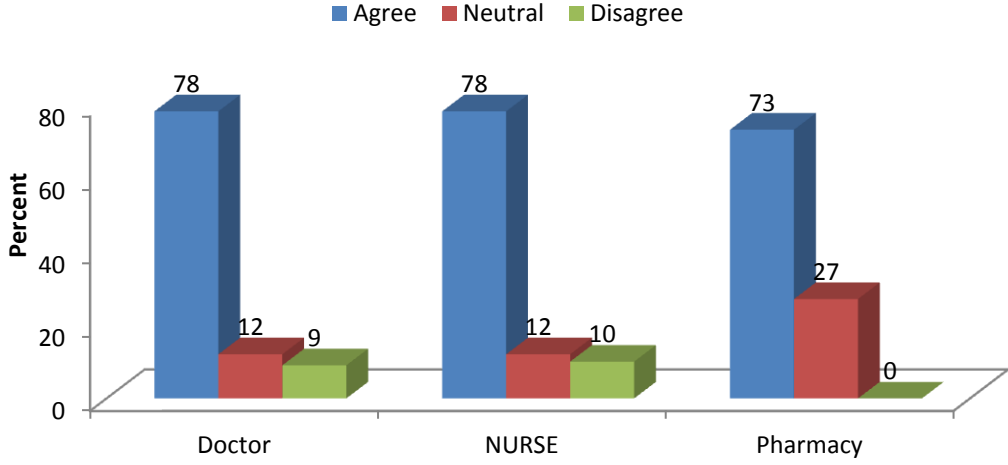
Fig56:Benefit of EHRs for prescription refills by professional category (Doctor=241; Nurse=41; Pharmacist=45)
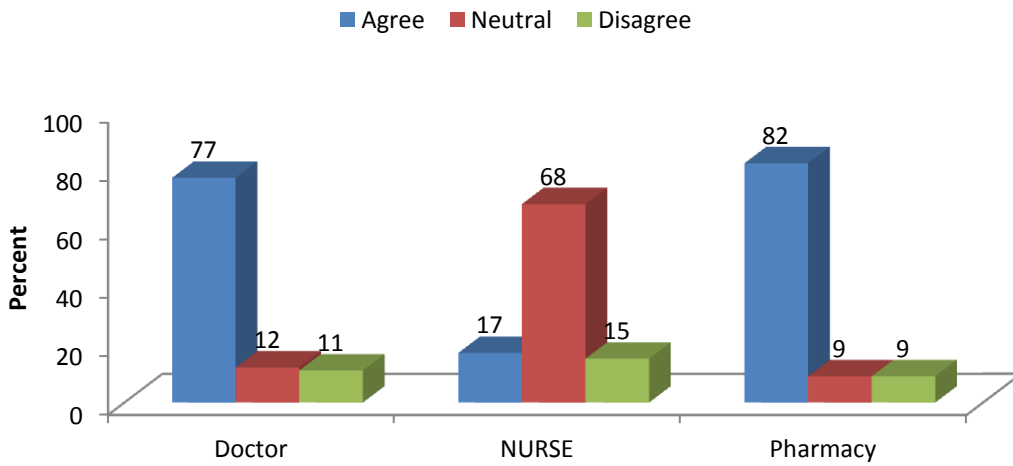
Fig57:Benefit of EHRs for avoid medication error by professional category (Doctor=241; Nurse=41; Pharmacist=45)
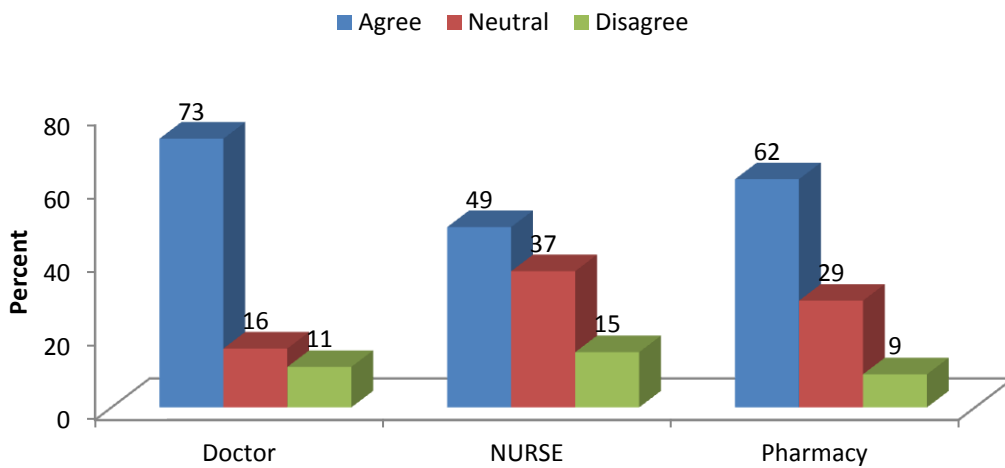
Fig58: Benefit of EHRs for patient appointment - scheduling system (Doctor=241; Nurse=41; Pharmacist=45)
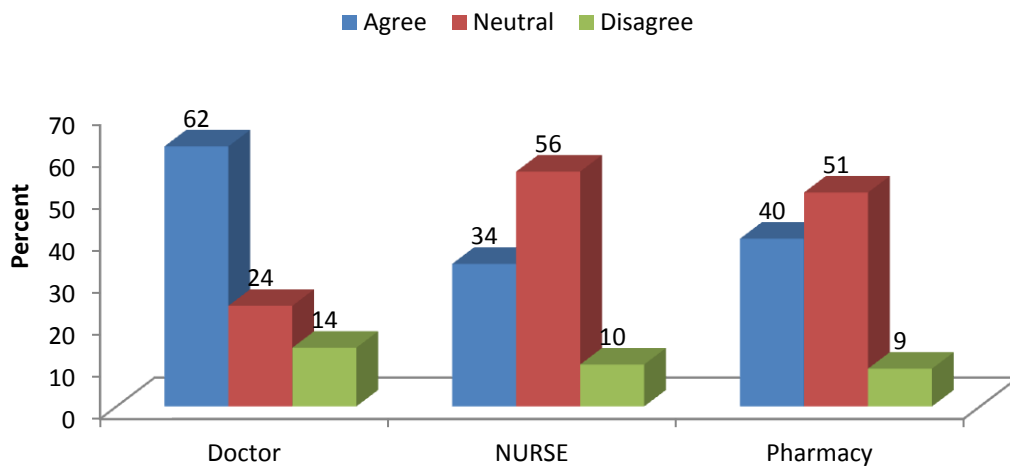
8.7. Barriers of EHRs

The providers were asked to respond to various statements related to EHR use with responses of "no barrier", "minor barrier" or "major barrier". Three fourths of the providers stated that a lack of EHR awareness is a major barrier (Figure 59). Two thirds of the providers think that resistance to new technology is a minor barrier and of the remaining one third, half of them believe it is not a barrier and another half as a major barrier. It was observed that 80% of the providers were concerned that a loss of productivity during the use of EHRs is a barrier. It was also felt by 80% of the providers that a lack of experience in the use of computers is a barrier. More than half of the providers felt that confidentiality and privacy are not a barrier in the use of EHRs. It was not very clear from the providers if security issues regarding the use of and access to EHRs is a barrier. Two thirds of the providers think the cost of EHRs is not a barrier. Only two thirds of the providers felt EHRs poor quality and limited ease of use are barriers. More than two thirds of the providers think a lack of adoption of uniform standards within EHRs is a barrier. Most of the providers felt that system maintenance and down time is the major (62%) and minor (32%) barrier. Three fourths of the providers think that the system becoming obsolete in near future is a barrier to providing continuous care of the patient. Half of the providers thought that the time consumed by EHRs for entering data is a barrier. It was also felt that inadequate hardware (PC) in all the units of the hospital is a barrier. Three fourths of the providers think a clinician would not pay much personal attention to the patient because he will be busy in entering data into the system. Three fourths of the providers believed minimization of EHR data input as a barrier. It is believed to be a barrier by 87% of the providers because the EHR system does not allow individual user specific customization. It was also observed from many providers as a barrier that EHRs restricted input will result in a loss of clinical data.

Fig59:Barrier for use of EHRs (n=327)

Legend: Not a barrier, Minor barrier, Major barrier

Category	Not a barrier	Minor barrier	Major barrier
Lack of Electronic Health Record awareness	4.6	23.9	71.6
Resistance to new technology	16.5	66.1	17.4
Concern about loss productivity during the use	16.5	43.7	39.8
Lack of experience with use of computers	17.4	40.4	42.2
Confidentiality and privacy concerns	51.4	39.1	9.5
Security concerns regarding the use and access	26.6	32.7	40.7
Cost of Electronic Health Record System	58.1	30.6	11.3
Instability of software providers	22.9	43.4	33.6
Electronic Health Record software quality and ease of use	32.4	46.5	21.1
Lack of adoption of uniform standards	22.3	42.8	34.9
System maintenance and downtime	5.5	32.4	62.1
Concerns that the system will become obsolete	23.2	45	31.8
Concern that the system is time consuming	23.5	29.7	46.8
Inadequate hardware (PCs) in all the units	20.2	38.2	41.6
loss of personal attention with patient while entering	25.7	30	44.3
memory power loss due to handling investigations	22.6	48.9	28.4
Concerns the EHR minimizes user data input	21.4	51.7	26.9
EHR not allowing user-specific customization	13.8	49.2	37
Concern of loss of clinical data	8.3	35.8	56

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8.7.1. Comparison of Barriers of EHRs among Professional Categories

A significantly higher proportion of doctors than nurses and pharmacists were concerned about a loss of productivity during the use of EHRs as a major barrier (p=0.008) (Figure 60). Security concerns regarding the use and access to EHRs seems to be a major barrier for many of the nurses and pharmacists rather than doctors (p<0.001) (Figure 61). Significantly more doctors than nurses and pharmacists felt time spent using EHRs not to be a barrier (p=0.016) (Figure 62). Significantly more nurses and pharmacists than doctors seemed to think that inadequate hardware (PC) in all the units of hospital seems to be the major barrier (p=0.003) (Figure 63).

The following barriers were not different among doctors, nurses and pharmacists (Table 18): lack of EHRs awareness; resistance to new technology; lack of experience with use of computers; cost of EHRs; instability of software providers; EHRs quality and ease of use; lack of adoption of uniform standards; confidentiality and privacy; instability of software providers; EHR system quality and ease of use; system maintenance and downtime; the system becoming obsolete in supporting continuity of care for patients; loss of personal attention to patients due to entering data into the computer; loss of memory power due to availability of names of investigations; medication lists etc in the computer; not allowing user specific customization and minimization of user data input.

Table 18: Comparison of barriers of EHRs by professional category

		Your title recode						p-Value
		Doctor		Nurse		Pharmacist		
		No	%	No	%	No	%	
Lack of Electronic Health Record awareness	Minor-Major barrier	228	94.6	39	95.1	45	100.0	0.618
	No barrier	13	5.4	2	4.9	0	.0	
Resistance to new technology	Minor-Major barrier	197	81.7	39	95.1	37	82.2	0.421
	No barrier	44	18.3	2	4.9	8	17.8	
Concern about loss productivity during the use of EHR System	Minor-Major barrier	195	80.9	40	97.6	38	84.4	0.003
	No barrier	46	19.1	1	2.4	7	15.6	
Lack of experience with use of computers	Minor-Major barrier	193	80.1	37	90.2	40	88.9	0.023
	No barrier	48	19.9	4	9.8	5	11.1	
Confidentiality and privacy concerns	Minor-Major barrier	119	49.4	17	41.5	23	51.1	0.071
	No barrier	122	50.6	24	58.5	22	48.9	
Security concerns regarding the use and access to EHR system	Minor-Major barrier	162	67.2	37	90.2	41	91.1	0.253
	No barrier	79	32.8	4	9.8	4	8.9	
Cost of Electronic Health Record System	Minor-Major barrier	107	44.4	13	31.7	17	37.8	0.015
	No barrier	134	55.6	28	68.3	28	62.2	
Instability of software providers	Minor-Major barrier	193	80.1	27	65.9	32	71.1	0.074
	No barrier	48	19.9	14	34.1	13	28.9	
Electronic Health Record software quality and ease of use	Minor-Major barrier	169	70.1	22	53.7	30	66.7	0.988
	No barrier	72	29.9	19	46.3	15	33.3	
Lack of adoption of uniform standards	Minor-Major barrier	192	79.7	28	68.3	34	75.6	0.093
	No barrier	49	20.3	13	31.7	11	24.4	
System maintenance and downtime	Minor-Major barrier	227	94.2	39	95.1	43	95.6	0.453
	No barrier	14	5.8	2	4.9	2	4.4	
Concerns that the system will become obsolete in providing the care for the patient	Minor-Major barrier	178	73.9	33	80.5	40	88.9	0.060
	No barrier	63	26.1	8	19.5	5	11.1	
Concern that the system is time consuming	Minor-Major barrier	175	72.6	36	87.8	39	86.7	<0.001
	No barrier	66	27.4	5	12.2	6	13.3	
Inadequate hardware (PCs) in all the	Minor-Major barrier	184	76.3	34	82.9	43	95.6	<0.001

units of the hospital	No barrier	57	23.7	7	17.1	2	4.4	
Concerns about loss of personal attention with patient as entering patient information in to the computer	Minor-Major barrier	179	74.3	33	80.5	31	68.9	<0.001
	No barrier	62	25.7	8	19.5	14	31.1	
Concerns about loss of memory power due to availability of names of investigations, medications list etc. in the computer	Minor-Major barrier	181	75.1	34	82.9	38	84.4	<0.001
	No barrier	60	24.9	7	17.1	7	15.6	
Concerns the EHR minimizes user data input	Minor-Major barrier	192	79.7	34	82.9	31	68.9	0.001
	No barrier	49	20.3	7	17.1	14	31.1	
Concern the EHR does not allow individual user-specific customization	Minor-Major barrier	206	85.5	35	85.4	41	91.1	<0.001
	No barrier	35	14.5	6	14.6	4	8.9	
Concern of loss of **clinical** data	Minor-Major barrier	217	90.0	40	97.6	43	95.6	<0.001
	No barrier	24	10.0	1	2.4	2	4.4	

Fig60:Concern about loss of productivity during the use of EHRs by professional category (Doctor=241; Nurse=41; Pharmacist=45)
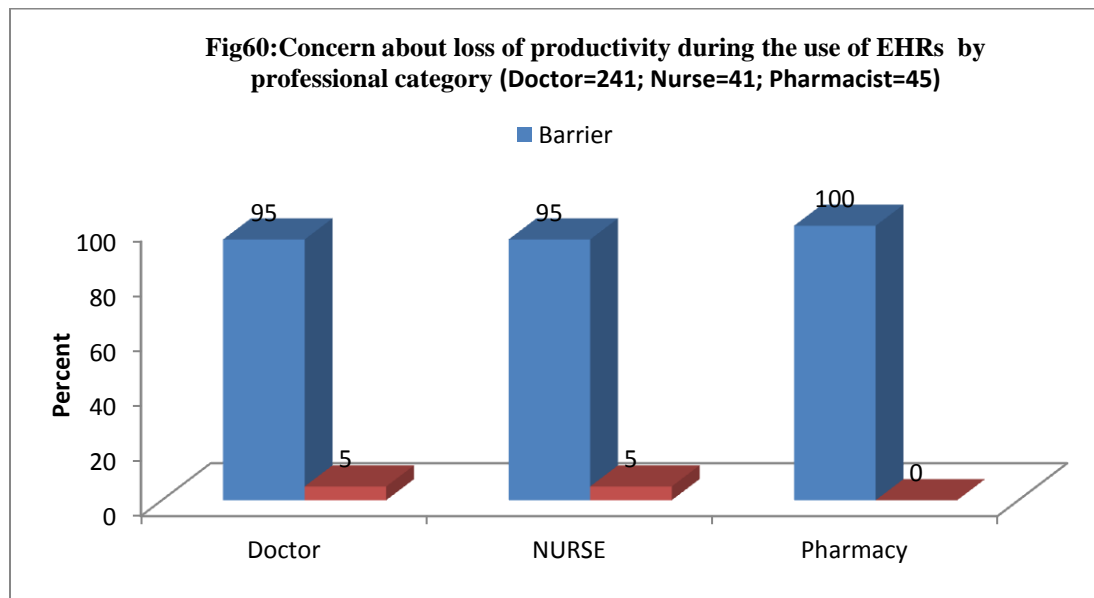
Fig61:Security concerns regarding the use and access to EHRs by professional category (Doctor=241; Nurse=41; Pharmacist=45)

■ Barrier

Doctor: 67, 33
NURSE: 90, 10
Pharmacy: 91, 9

(Percent)
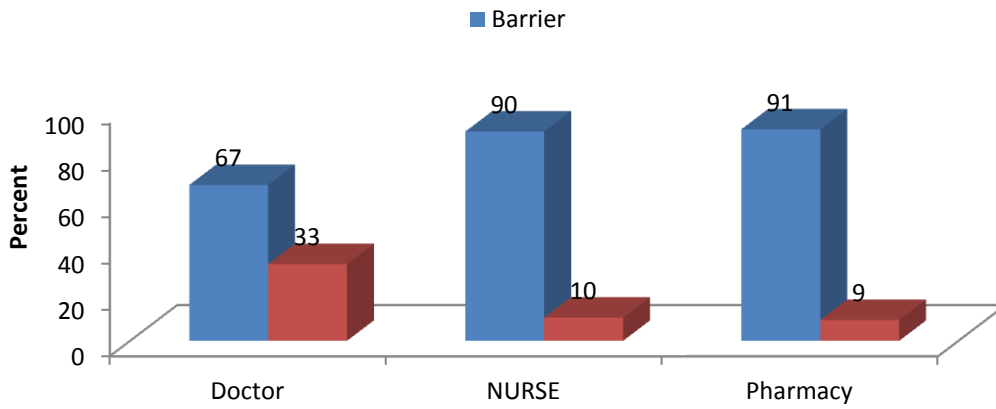
Fig62:Concern that the system is time consuming by professional category (Doctor=241; Nurse=41; Pharmacist=45)

■ Barrier

Doctor: 73, 27
NURSE: 88, 12
Pharmacy: 87, 13

(Percent)

Fig63:Inadequate hardware (PC) in all the units of the hospital by professional category (Doctor=241; Nurse=41; Pharmacist=45)
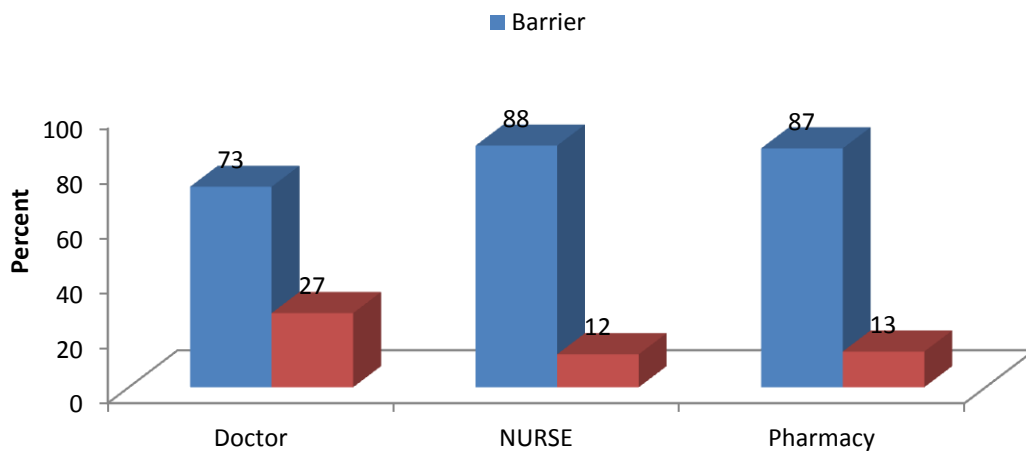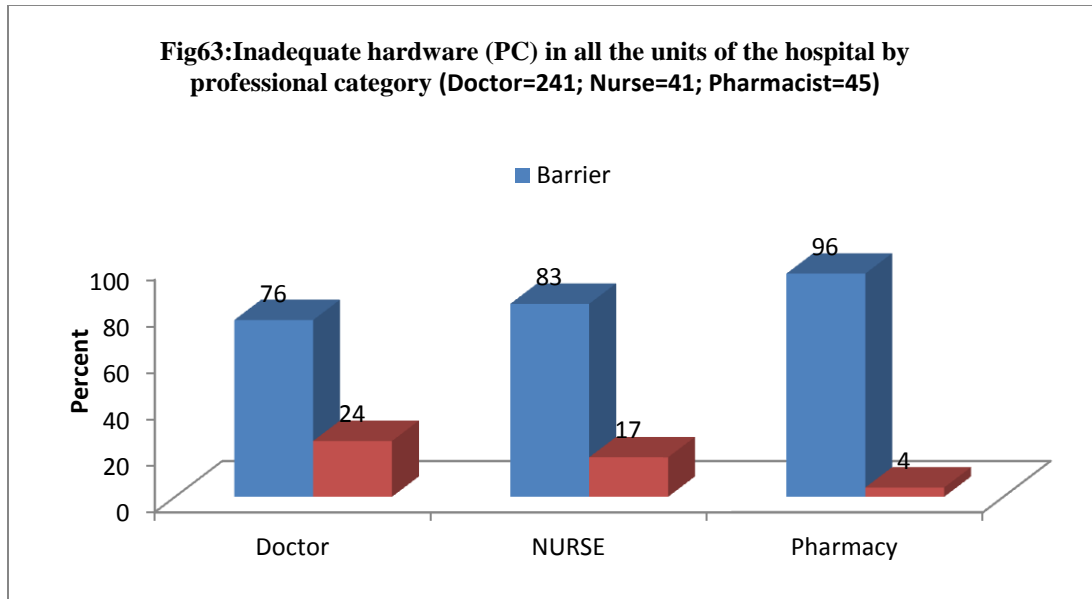
8.8. Satisfaction Level related to Different Aspect of EHRs

The participants were asked how satisfied they were in the use of EHRs. It was observed that 80% of users were satisfied with the ease of use of the system (Figure 64). Nearly 60% of the providers were dissatisfied with the reliability of the system and system speed, and 23% of others were non-committal. Most of the participants were dissatisfied with the frequency of system failure. Almost all except a few were dissatisfied about a lack of provision in the software for sharing the medical information with other departments. Regarding overall functioning of the EHRs at their place of work, 60% were dissatisfied and 20% were neutral on this statement. For the question about the easy use of software interface between EHRs and other system, 54% were dissatisfied and 42% were neutral. Nearly 20% of the providers were satisfied with the patient related database/ information management in the system. The function of different systems was asked about, it was observed that 40% of the providers were dissatisfied with the laboratory system and radiology system and 60% were neutral.

Nearly 40% of the providers were satisfied with the EHRs functioning for pharmacy. Almost all were either neutral or dissatisfied about the functioning of the EHRs for maintaining hospital based information. For obtaining previous records of the patients instantly, 50% were dissatisfied with recovery of the previous record of the patient, 20% were neutral and 30% were satisfied. A half of the providers were not satisfied that their writing work was reduced and or that they felt comfortable with the system: 13% were neutral and 38% were dissatisfied. It was observed that two thirds of the providers were dissatisfied with the EHRs in general and 24% were satisfied.

Fig64:Satisfaction of EHRs (n=327)

Legend: Dissatisfied, Nuetral, Satisfied

Category	Satisfied	Nuetral	Dissatisfied
easy to use the system	80	13	7
Reliability of the system - system speed	18	24	58
Frequency of system failure	1	11	88
Sharing of the medical information	6	23	71
Overall satisfaction	18	20	62
software interfaces between yours and others	4	42	54
Practice management system	20	35	46
Laboratory system		59	40
Radiology system		60	40
Commercial Pharmacies	41	32	27
Hospital Information System	1	51	49
Obtain previous records instantly	29	21	51
Writting reports	48	14	38
overall use	24	11	65

8.8.1. Factors Associated with Satisfaction of Using EHRs in the Facility

An attempt was made to find out about factors such as personal experience, features available in the EHRs in their facility, benefit of its use and barriers associated with the satisfaction of using EHRs in their facility (table 19).

The satisfaction is significantly different between the professional categories: doctors were more satisfied using EHRs in their facility than other professional categories (p=0.041). Those professionals who were good at using EHRs were more satisfied than those professionals who were not good or managing slowly (p<0.001). The professionals working in a facility with EHRs having features such as patient problem lists, orders for lab tests, orders for radiology tests, clinical notes, review progress notes, review prior vital signs, document patient care, reviewing drug-allergy alerts when writing prescriptions and manage prescription writing were more satisfied than the professionals working in a facility without these features(p<0.001).

The professional who agreed with the use of EHRs for delivery of preventive care with guidelines were more satisfied with using EHRs in the facility than the professionals who disagreed or were neutral about it (p=0.036). The professional who considered 'cost of EHRs', as a barrier were more likely to be satisfied with using EHRs in the facility than other professionals (p=0.015). The professionals who did not view the following as a barrier: 'loss of productivity during the use of EHRs'; 'lack of experience with use of computer '; 'EHRs as time consuming'; 'inadequate hardware in all the units of the hospital'; loss of personal attention with patient as entering patient information in to the computer'; ' have concern about minimum data input in EHRs'; 'unavailability of user-specific customization as a limitation'; 'loss of clinical data' were more likely to be satisfied with using EHRs in the facility than other professionals.

Those professional who were satisfied with 'the ease of EHRs use', 'reliability of the system-system speed', 'sharing of the medical information with others department', practice management system', 'use of EHRs for Pharmacies', 'use of EHRs for obtaining previous records instantly', 'feeling that writing work reduced and comfortable with EHRs system' were more likely to be satisfied with the use of the EHRs in their facility. It was observed from the multivariate analysis that those professionals who considered a limitation of user specific system as no barrier (Figure 65), were satisfied that the EHR was easy to use (Figure 66), considered it

useful for clinical practice and managing patient information (Figure 67) and were satisfied with EHRs running for a commercial pharmacy (Figure 68) were more likely to be satisfied with use of EHRs system in their facility (Table 20).

Table 19: Factors associated with satisfaction of using EHRs in their facility

		Overall, how satisfied are you with the system at your facility				p-value
		Neutral-dissatisfied		Satisfied		
		No	%	No	%	
Your title recode	Doctor	189	70.8	52	86.7	0.041
	Nurse	37	13.9	4	6.7	
	Pharmacist	41	15.4	4	6.7	
Are you good in using the Electronic Health Record System?	Yes	235	88.0	54	90.0	<0.001
	No	7	2.6	5	8.3	
	Managing slowly	25	9.4	1	1.7	
Patient problem lists	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Order for laboratory tests	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Clinical notes	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Review progress notes	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Review prior vital signs	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Document patient care (overall)	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Receiving drug-allergy alerts when writing prescriptions	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Manage prescription writing (overall)	Yes	154	57.7	51	85.0	<0.001
	No	113	42.3	9	15.0	
Delivery of preventive care	Neutral-disagree	119	44.6	18	30.0	0.036

that meet guidelines	agree	148	55.4	42	70.0	
Concern about loss productivity during the use of EHR System	Minor-Major barrier	231	86.5	42	70.0	0.001
	No barrier	36	13.5	18	30.0	
Lack of experience with use of computers	Minor-Major barrier	227	85.0	43	71.7	0.023
	No barrier	40	15.0	17	28.3	
Cost of Electronic Health Record System	Minor-Major barrier	103	38.6	34	56.7	0.015
	No barrier	164	61.4	26	43.3	
Concern that the system is time consuming	Minor-Major barrier	217	81.3	33	55.0	<0.001
	No barrier	50	18.7	27	45.0	
Inadequate hardware (PCs) in all the units of the hospital	Minor-Major barrier	226	84.6	35	58.3	<0.001
	No barrier	41	15.4	25	41.7	
Concerns about loss of personal attention with patient as entering patient information in to the computer	Minor-Major barrier	213	79.8	30	50.0	<0.001
	No barrier	54	20.2	30	50.0	
Concerns about loss of memory power due to availability of names of investigations, medications list etc. in the computer	Minor-Major barrier	219	82.0	34	56.7	<0.001
	No barrier	48	18.0	26	43.3	
Concerns the EHR minimizes user data input	Minor-Major barrier	220	82.4	37	61.7	<0.001
	No barrier	47	17.6	23	38.3	
Concern the EHR does not allow individual user-specific customization	Minor-Major barrier	241	90.3	41	68.3	<0.001
	No barrier	26	9.7	19	31.7	
Concern of loss of clinical data	Minor-Major barrier	254	95.1	46	76.7	<0.001
	No barrier	13	4.9	14	23.3	
Ease to use the system	Neutral-dissatisfied	63	23.6	1	1.7	<0.001
	Satisfied	204	76.4	59	98.3	
Reliability of the system - system speed	Neutral-dissatisfied	236	88.4	32	53.3	<0.001
	Satisfied	31	11.6	28	46.7	
Sharing of the medical	Neutral-dissatisfied	255	95.5	52	86.7	0.022

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information with others dept	Satisfied	12	4.5	8	13.3	
Practice management system	Neutral-dissatisfied	242	90.6	20	33.3	<0.001
	Satisfied	25	9.4	40	66.7	
Commercial Pharmacies	Neutral-dissatisfied	166	62.2	26	43.3	0.001
	Satisfied	101	37.8	34	56.7	
Can obtain previous records of patient instantly	Neutral-dissatisfied	207	77.5	25	41.7	<0.001
	Satisfied	60	22.5	35	58.3	
My writing work is reduced & comfertable with the system	Neutral-dissatisfied	160	59.9	9	15.0	<0.001
	Satisfied	107	40.1	51	85.0	

Table 20: Multivariate analysis to find factors related to satisfaction related to using EHRs at their facility

		95% C.I.for EXP(B)	
	OR	Lower	Upper
No barrier regarding Limitation of user specific system	2.16	1.32	6.34
Satisfied as easy to use EHRS	2.72	1.13	6.48
useful for Practice management	9.37	1.14	77.04
EHRS for commercial Pharmacy	11.478	1.310	100.535

Fig65:Professionals considered no barrier for limitation to user-specific customization (n=327)
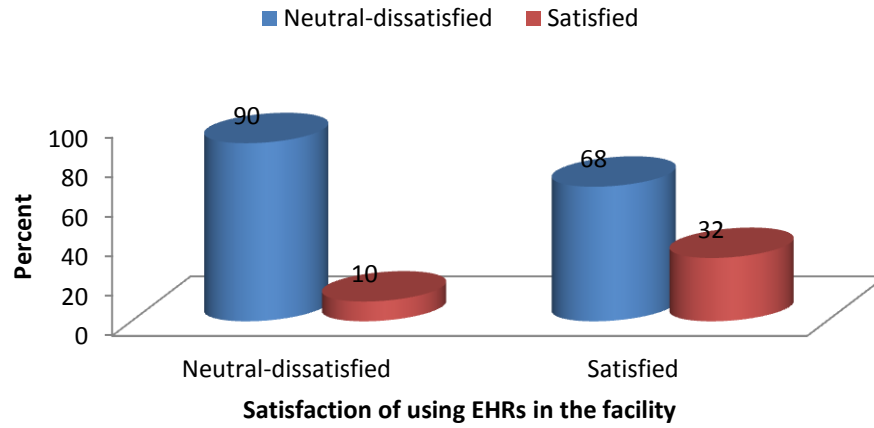
Fig66:Professionals considered Ease to use EHRs (n=327)
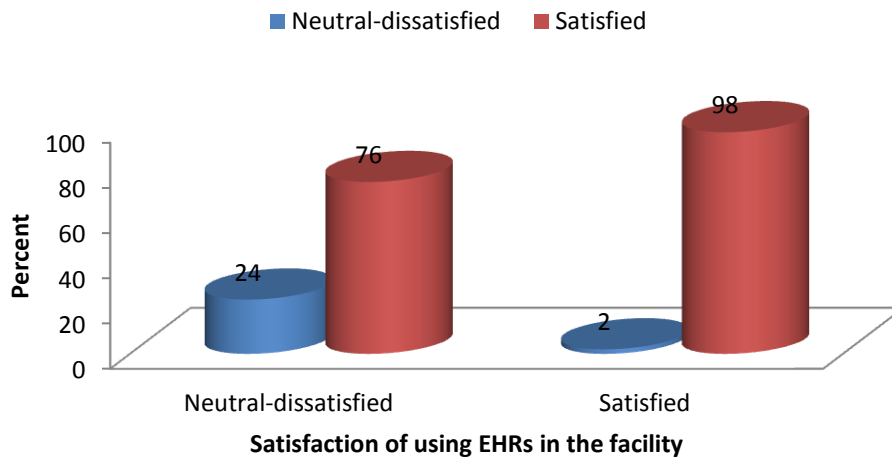
Fig67:Professionals considered EHRs useful for Patient management (n=327)

■ Neutral-dissatisfied ■ Satisfied

Satisfaction of using EHRs in the facility
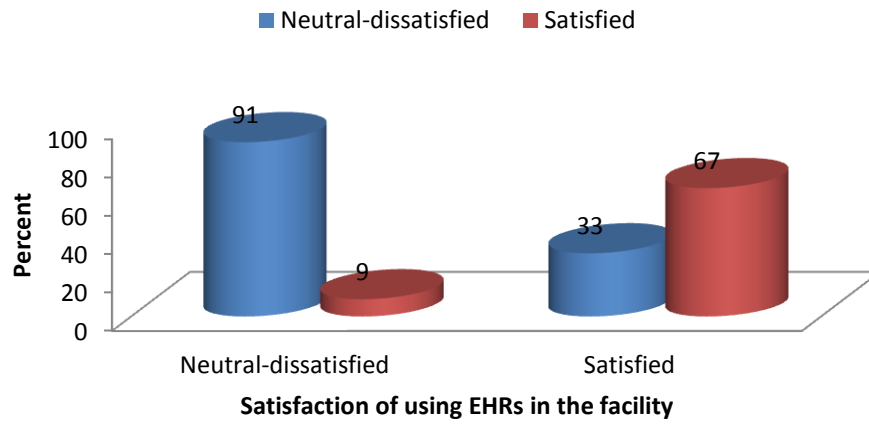
Fig68:Professionals considered EHRs useful for commercial Pharmacy (n=327)

■ Neutral-dissatisfied ■ Satisfied

Satisfaction of using EHRs in the facility
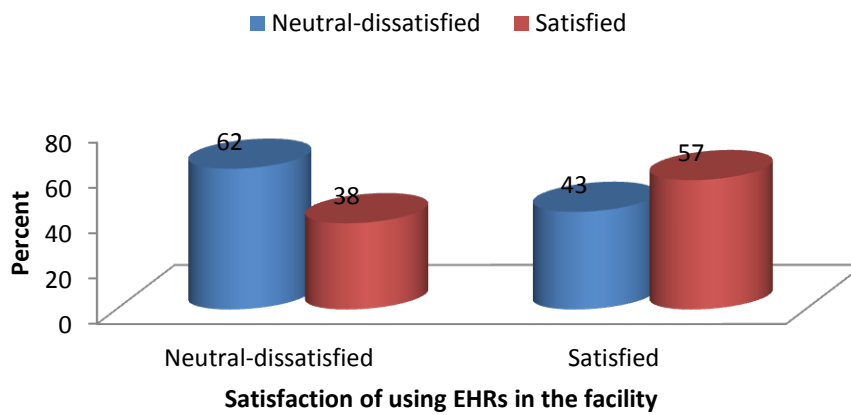
8.9. Relationship among Responses related to Benefit, Barrier and Satisfaction of EHRs Use

An attempt was made to find an association among responses related to benefits, barriers and satisfaction of EHRs use. The sum of the scores based on responses for each question was obtained under each major heading: benefit, barrier and satisfaction towards use of EHRs. The responses for the questions under barrier to the use of EHRs carry 1 for "major barrier", 2 for "minor barrier" and 3 for "no barrier". The responses for the questions under benefits of EHRs use carry 1 for "agree", 2 for "neutral" and 3 for "disagree". The satisfaction related questions carry 1 for "very satisfied", 2 for "satisfied", 3 for "neutral" , 4 for "dissatisfied" and 5 for "very dissatisfied".

In the barriers for use of EHRs, a lower score indicates major barrier and a higher score indicates no barrier. In the benefits of use of EHRs, a lower score indicates higher agreement to the statement and a higher score indicates disagreement to the statement. In the satisfaction of EHRs use, a lower score indicates very satisfied and a higher score indicates very dissatisfied.

An attempt was made to compare the benefit score, barrier score and satisfaction score among the professional categories.

Table 21: Comparison of benefit score, barrier score and satisfaction score among the professional categories

	Doctor		Nurse		Pharmacist		p-value
	mean	SD	mean	SD	mean	SD	
Benefit score (n=241)	14.5	5.0	16.9	5.0	15.9	4.6	0.008
Barrier score (n=41)	36.0	6.2	33.7	5.5	33.6	4.8	0.007
Satisfaction score (n=45)	47.7	6.1	47.5	4.1	47.2	5.7	0.867

ANOVA was performed to find out whether benefit scores, barrier scores or satisfaction scores were significantly different among professional categories. Once the ANOVA test was found to be significant, the Scheffe test was used to find out which group was significantly different from the other group.

It was found out that benefit scores were significantly different among the professional category (Figure 69) (p=0.008). The multiple comparison tests shows that doctors have agreed to more of the benefits than nurses. Similarly, it was found that the barrier score was significantly different among the professional categories (Figure 70) (p=0.007). Doctors were more likely to have no major barrier to many of the issues than nurses were (Table 21). The satisfaction levels were almost same in all the professional groups.

Fig 69: Comparison of benefit scores among professional categories
(Doctors =241; Nurses=41; Pharmacist=45)

Error Bars: 95% CI

Fig 70 : Comparison of mean barrier score among professional categories
(Doctors =241; Nurses=41; Pharmacist=45)

Error Bars: 95% CI
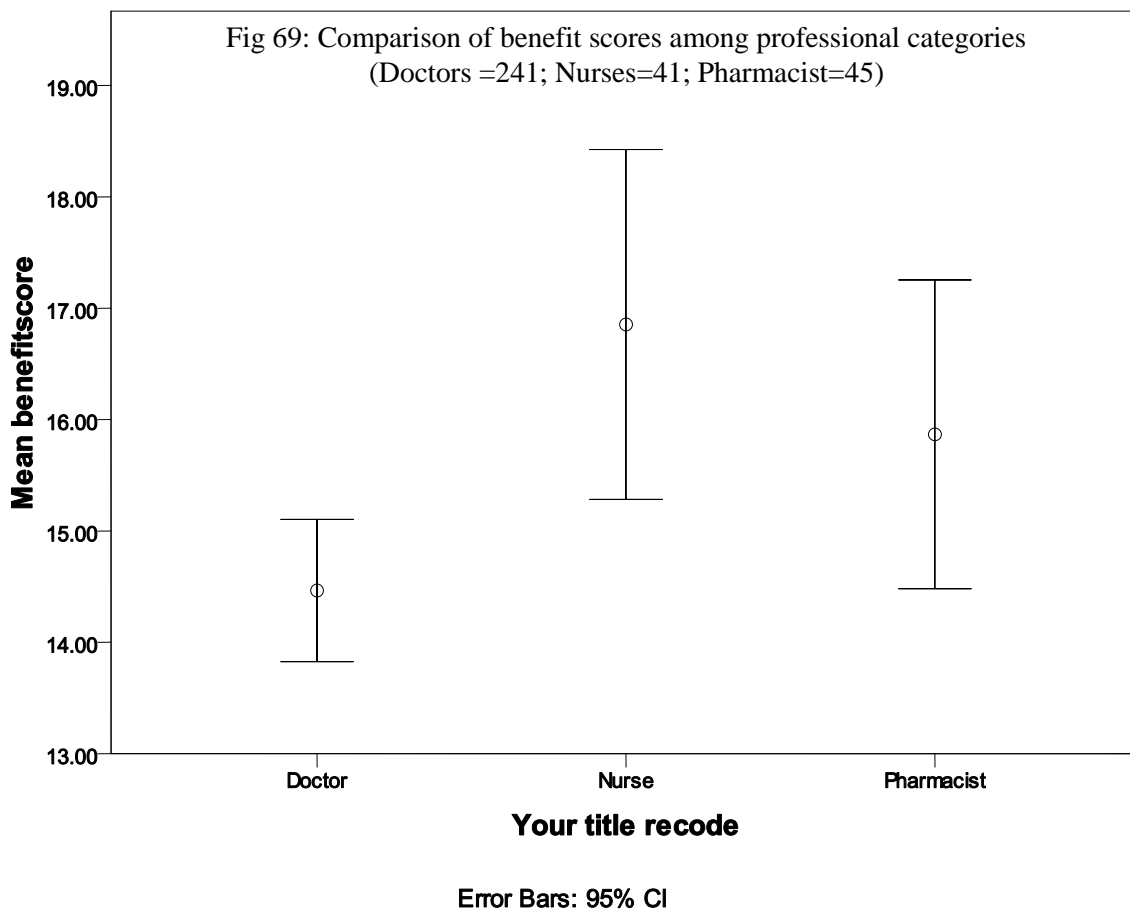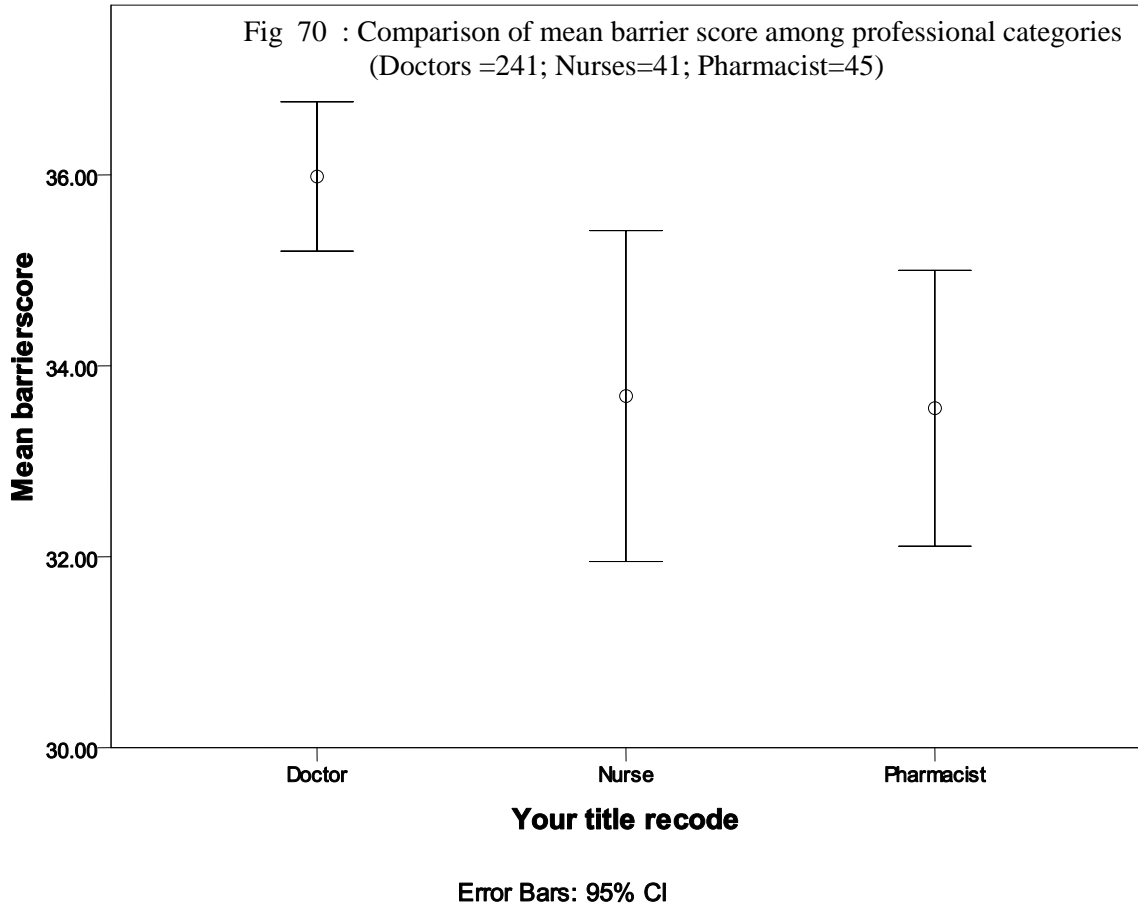
In the correlation study, it was inferred from the scatter diagram between barrier score and satisfaction score that the providers who have less barriers for use were more satisfied with the use of EHRs (Figure 71, r= -0.265; p<0.05). This relationship holds in all professional categories. Similarly, it was inferred from the scatter diagram between barrier score and benefit score that the providers who have more major barriers were more likely to disagree with many of the statements related to benefits of EHRs use (Figure 72, r= -0.149; p<0.05). This relationship is not consistent for nursing professional category. There was no clear relationship observed between benefit score and satisfaction score of EHRs use (Figure73) (table 22).

Table 22: Correlation between benefit, barrier and satisfaction by the   professional category

Correlation between	Overall	Doctor	Nurse	Pharmacist
Barrier and satisfaction	r= -0.265 p<0.001	r= -0.261 p<0.001	r= -0.586 p<0.001	r= -0.152 p=0.318
Benefit and barrier	r= -0.149 p=0.007	r= -0.135 p=0.036	r= 0.197 p=0.218	r= -0.404 p=0.006
Benefit and satisfaction	r= 0.119 p=0.032	r= 0.192 p=0.003	r= -0.536 p<0.001	r= 0.164 p=0.280

Fig 71: Correlation between barriers score and satisfaction score

Fig 72: Correlation between barrier score and benefit score

Fig 73: Correlation between benefit score and satisfaction score
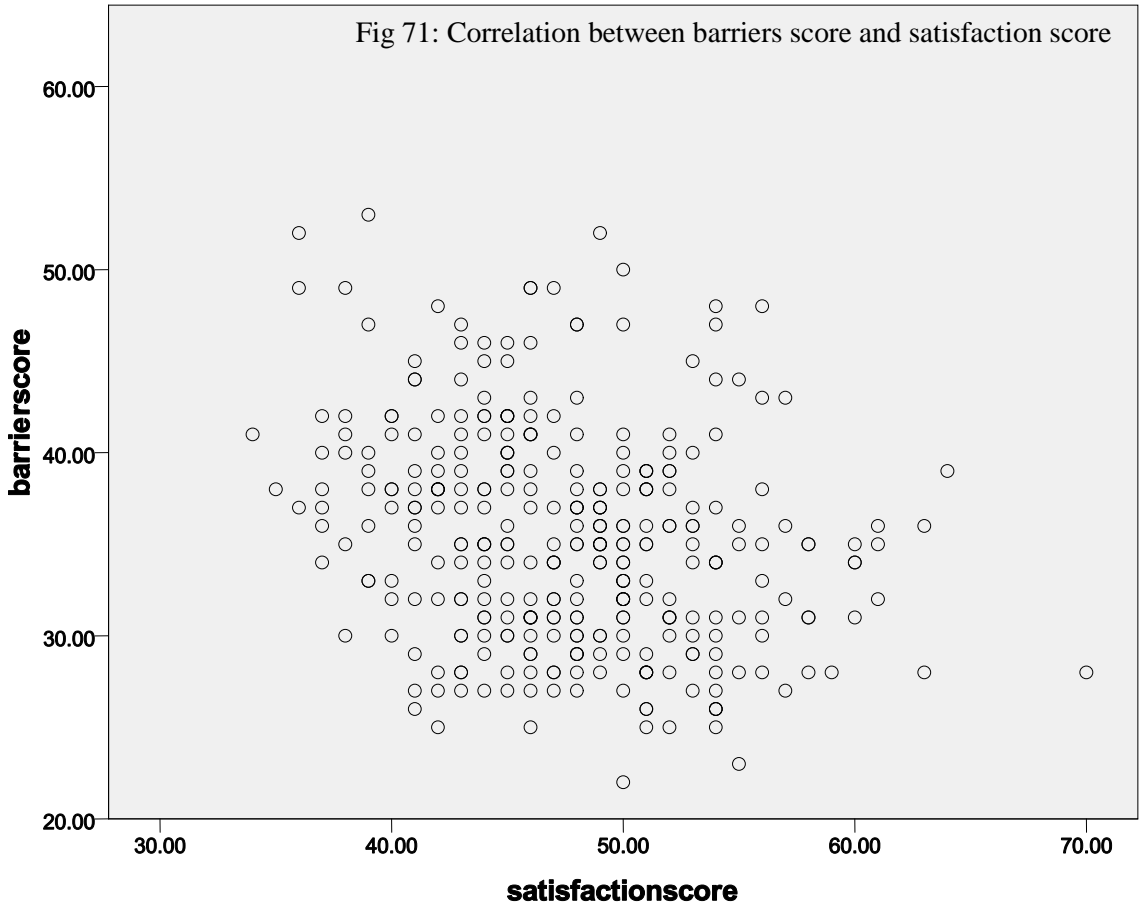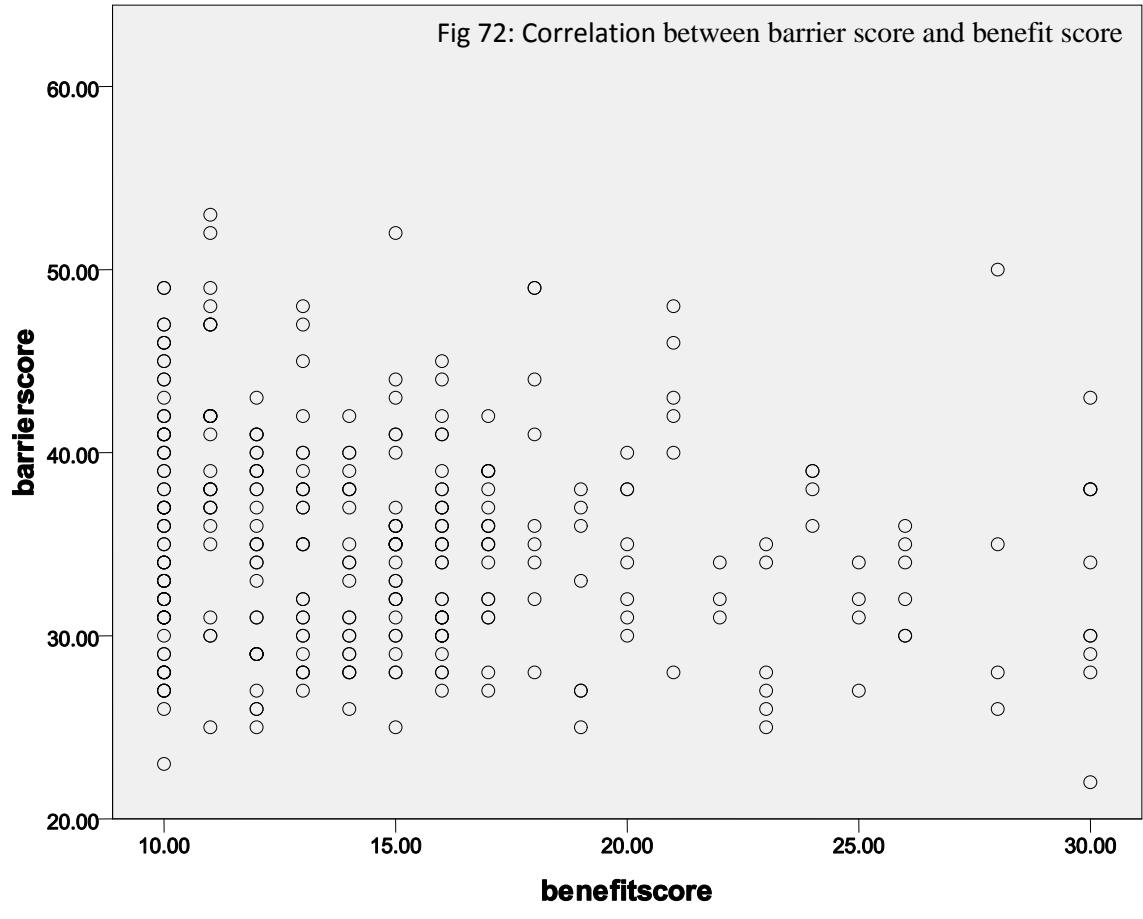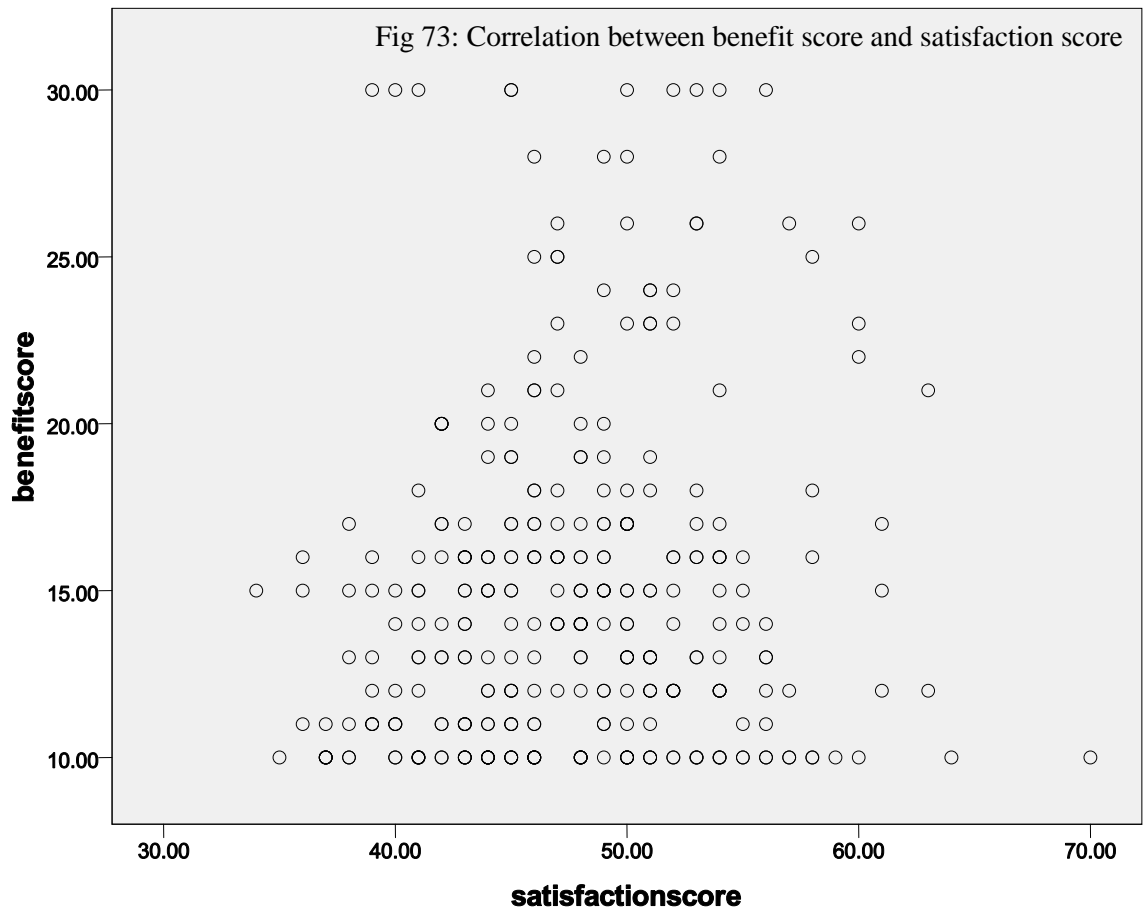
Some of the questions related to barriers were associated with satisfaction of EHR use (Table 23). Most of the providers responded that a lack of EHRs awareness is a major barrier irrespective of their satisfaction level in the use of EHRs. Concern about loss of productivity during the EHRs use seems to be major barrier among those with neutral response to the satisfaction level of EHRs use (p<0.003). People who are neutral or dissatisfied with the use of EHRs have felt EHRs to be time consuming (p<0.001), EHRs minimizes data input (p=0.050) as a major barrier. The providers who are satisfied with the ease of use of EHRs have agreed that EHRs are useful for clinical decisions (p=0.002).

Table23: An association between barrier and benefit with satisfaction of EHRs use

		The quality of clinical decisions						p-value
		Agree		Neutral		Disagree		
		No	%	No	%	No	%	
Lack of Electronic Health Record awareness	Minor-Major barrier	180	94.7	90	97.8	42	93.3	0.393
	No barrier	10	5.3	2	2.2	3	6.7	
Concern about loss productivity during the use of EHR System	Minor-Major barrier	148	77.9	85	92.4	40	88.9	0.005
	No barrier	42	22.1	7	7.6	5	11.1	
Concern that the system is time consuming	Minor-Major barrier	137	72.1	72	78.3	41	91.1	0.023
	No barrier	53	27.9	20	21.7	4	8.9	
Concerns the EHR minimizes user data input	Minor-Major barrier	150	78.9	76	82.6	31	68.9	0.181
	No barrier	40	21.1	16	17.4	14	31.1	

Lack of EHRs awareness seems to be a major barrier irrespective of whether providers are satisfied with ease of use of EHRs (Table 24). Providers who have less concern about loss of productivity during the use of EHRs (p=0.005) and with the system being time consuming (p=0.003) were more likely to agree that EHRs are useful for clinical decisions. EHRs minimizes data input was considered as a major barrier irrespective of the satisfaction level of the EHRs use.

Table24: An association between barriers and satisfaction of EHRs use

		Ease to use the system						P-value
		Satisfied		Neutral		Dissatisfied		
		No	%	No	%	No	%	
Lack of Electronic Health Record awareness	Minor-Major barrier	251	95.4	40	95.2	21	95.5	0.998
	No barrier	12	4.6	2	4.8	1	4.5	
Concern about loss productivity during the use of EHR System	Minor-Major barrier	214	81.4	41	97.6	18	81.8	0.003
	No barrier	49	18.6	1	2.4	4	18.2	
Concern that the system is time consuming	Minor-Major barrier	189	71.9	41	97.6	20	90.9	<0.001
	No barrier	74	28.1	1	2.4	2	9.1	
Concerns the EHR minimizes user data input	Minor-Major barrier	200	76.0	36	85.7	21	95.5	0.050
	No barrier	63	24.0	6	14.3	1	4.5	
The quality of clinical decisions	Agree	164	62.4	16	38.1	10	45.5	0.002
	Neutral	67	25.5	20	47.6	5	22.7	
	Disagree	32	12.2	6	14.3	7	31.8	

8.10. Summary

In this chapter, we discussed the results of survey questionnaire data. The chapter provides empirical evidence on the extent of the availability, features, benefits, barriers, and end-user satisfaction with the current system at PHC. Of the 390 distributed surveys, 325 completed the survey, which yielded a response rate of 81%. A copy of the survey appears in the supplementary appendix. The study has indicated that all health care centers have hybrid EHRs, the systems have been implemented in each facility for more than five years. The end-users, especially physicians, are mostly in charge of EHRs in their facility. The main nursing users are senior nurses, since the junior nurses do not have access to a computer, because of inadequate hardware and insufficient access to a training program. Meanwhile only pharmacists who are dispensing in the health care centres have access to the system. Most of participants stated that they have a good knowledge in using EHRs. Furthermore, 32% of end-users have received training in how to use the system.

Concerning the EHR system features, the case study points out that the systems have basic features such as patient demographics, patient problem lists, and manage prescription lists. Most of available features are used by physicians themselves. It demonstrated that EHR systems cannot be consider as fully functional since they only have 67% of the desired features. The outcome of the study indicated that 75% of end-user respondents agreed that EHRs would improve timely access to medical records, delivery of chronic illness care, and the overall quality of care to patients. However, more than 50% of end-user respondents stated that EHRs would not improve communication with patients.

Furthermore, the study results show that the end-users do not consider cost or confidentiality and privacy as a main barriers, while they consider lack of EHRs awareness, system maintenance, system downtime, concerns about the loss of clinical data, and EHR not allowing user specific customization as the main barriers that would effect the system adoption process.

Finally, It is also encouraging that a large majority of end-users reported overall satisfaction with EHRs in term of its ease of use, use for commercial pharmacy and writing reports. However, most of end-users' reported their dissatisfaction in term of system frequency of system failure**,** non-sharing of the medical information**,** software interface between their own and other providers/units**,** laboratory and radiology systems.

Regarding the relationship among responses related to benefits, barriers and satisfaction with EHR use, the study found that there is no barrier regarding limitations of use-specific systems, and users were satisfied that the system was easy to use. However, association among barriers, benefits and satisfaction with use of EHRs the study identifies that providers who think some of the issues are not barriers were more likely to be satisfied with the ease of use of EHRs, and providers who think some of the issues are major barriers were more likely to disagree with statements related to benefits of use of EHRs.

Chapter Nine: Kuwait E-health Strategic Roadmap

9.1. Introduction

The strategic development of an information system (IS) is essential if an organisation is to be successful. Top-level planning must set out a vision of the way forward and must recognise that information technology is an integral element of such business planning (Kings, 1987). This suggests that information should be used as a resource in its own right. Peel (1995: p. 27) says that an information strategy is a strategy that relates to an IS and information technology, 'It is a formal plan for introducing, maintaining, and supporting information systems and information technology in an organization'. According to Robson (1994), the purpose of an IS and an information technology (IT) strategy is to identify the most appropriate targets for automation and then to plan and timetable the implementation of that automation. This implies that there will be a clear expected output for the strategic IS/IT plan. This plan will have been formulated with the involvement of a number of high level manager/directors, and will contain information on the objectives and organisation of the IS development. One of the elements required to ensure the effective formulation of such a strategy, is finding the appropriate expertise; as Earl (1987: p. 302) pointed out:

'In business it is not unusual to find general mangers with inadequate experience and qualifications addressing the technology strategy and IS executives, who cannot know all about business needs, trying to drive the applications strategy. It a common to find steering committees quite confused about which of these levels of strategy is their concern'.

Acquiring, retaining, and updating the level of knowledge necessary to develop an effective IT strategy within a health organisation involves a high level of commitment and time, which is sometimes hard to come by in an organisation without extra capacity. The strategic issues in relation to the strategic development of an IS fall in two main areas.

1. The objectives of a new technology: Some examples could include cost and staff reduction, more effective and timely decision-making, better communication, and translating savings into improved organisational effectiveness (Long, 1987)

2. Technical and human resources: These issues include resolving who will design and take the lead in implementing the new system, the implementation approach to be used, the influence a user should have, the roles of various key actors in the process, and how conflict between these actors will be resolved (Willcocks & Mason, 1987).

9.2. The Literature

It is important to recognise that the strategic development of an IS not only relies on technology as a key factor for its success, but it is also dependent on the socio-political environment within which it functions. Curley and Gremillion (1983: p. 204) point out that 'the literature is full of cases in which users have rejected apparently "good systems"… we now recognise implementation as a political and social process'. Land and Hirshheim (1983) note that IS are not technical systems that have behavioural and social consequences; instead they are social systems, which increasingly rely on information technology. The concept behind strategic IS planning is to provide technology to support the organisation's business strategy, with the intention of leveraging the existing infrastructure for effective deployment and guiding future IT acquisitions (Boynton et al, 1987; Earl, 1993; Mentzas, 1997). Earl (1993: p.1) argues strategic IS planning should address the following areas: i) aligning investment in IS with business goals, ii) exploiting IT for competitive advantage, iii) directing efficient and effective management of IS resources, and iv) developing technology policies and architectures. Earl (1993) argued that the first two issues are concerned with an IS strategy, the third relates to information management, and the fourth is concerned with an information technology strategy. Lederer et al (1988) had also argued that strategic IS planning is a way to identify a complete IS/IT infrastructure in order to meet strategic business objectives. The process of planning is a complex task involving a high degree of dependency between major business processes and technologies. Mentzas (1997) argued that although there are many formal methodologies to assist in IS planning, problems still exist in three areas: (i) the need for the integration of strategic IS planning within the corporate strategy, ii) moderate practical utility of existing strategic IS planning methodologies, and iii) limited management involvement and commitment to strategic IS planning.

Mentzas (1997) had proposed a generalised strategic approach as a foundation for developing strategic IS planning and as a way to overcome these problems. The approach consists of five phases: i) strategic awareness, ii) situation analysis, iii) strategy conception, iv) selecting strategy, and v) planning strategy implementation. Another commonly used approach to IS planning was proposed by Premkumar (1991); it is based on the input of information and resources that are later translated into a set of strategic plans, which when implemented, produce certain outcomes. Synnott and Gruber (1981) argued that the *outcome*s of strategic IS planning are equally important, suggesting the plan should include: i) an IS mission statement; ii) IS objectives; iii) linkage of the IS objectives to organisation goals; iv) an IS action plan for achieving IS objectives; v) the assignment of specific tasks to specific individuals or units; and vi) mechanisms for management control, feedback, and reporting.

Although strategic IS planning should be comprehensive to be effective, Newkirk et al (2003) argued that the incorrect amount of implementation planning could have an opposite effect on the success of strategic IS planning. Newkirk's (2003) study revealed that better planning at an earlier stage during implementation is needed. It has also been recognised that developing strategies alone is not enough; Teo et al (2001) have argued that one of the major problems in IS planning is turning strategies into action plans. Hartono et al (2003) suggested that managers should plan for the implementation of their IS by including explicit actions in the plan in order to use resources efficiently. These plans should identify available resources, change management issues, and change organisational structures (Baker, 1995). In addition, Brown (2008) argued (in relation to the external business environment and external IT environment) for the need to consider not only internal factors, but also external factors, which may have the greatest impact and can make 'a well formulated plan obsolete and impractical'.

9.3. Roadmaps

9.3.1. Background

Based on the outcome of the research in the literature, one strategic plan to achieve an organisation's objectives is to use the roadmap model. A roadmap describes the future environment for a business or organisation, any objectives to be achieved within that environment, and the plan for how those objectives would be achieved. It lays out a framework to help people understand how the pieces of a complicated technological system can fit together, work together, and develop. It links applications, technical challenges, and technological solutions while helping to set priorities that will achieve these objectives (Albright et al, 2003; Albright & Richard, 2002; Kostoff & Schaller, 2000; Williard & McClees, 1987). To put it another way, roadmaps display a set of future objectives and answer a set of 'why-what-how-when' questions in order to develop a 'to-do' list or action plan to attain the objectives (Albright & Richard, 2002; Phaal & Farrukh, 2001). Phaal and colleagues (2004) describe roadmaps as a type of common language and structure for the development and the deployment of strategy and applications that can identify the landscape, the threats, and the opportunities for a particular group of interest groups in a technology or application area (Phaal, 2004). Kamtsiou et al (2006) approach roadmaps as a tool for collaborative and strategic planning, enabling people to develop strategies and take action to attain a desired future, with an emphasis on anticipating changes in technologies and the onset of new business opportunities.

9.3.2. Gap Analysis

Commonly, roadmaps are applied in the fields of science, technology, and corporate strategy. However, they are a concept that can be applied to a wide range of other situations, and their particular use is in analysing the gaps between expected and desired future outcomes. Once these gaps are identified, then actions and recommendations that will bridge these gaps can be proposed; this is a process known as *gap analysis*. A roadmap enables users to identify possible scenarios, but it is not a tool for predicting the future.

9.3.3. Roadmap Uses

The main uses of a roadmap are:

- to develop agreements about a set of needs and the technology required to meet them;

- to provide a way to help experts identify possible technological future developments in specific areas;

- to provide a framework to help plan and coordinate technological development within organisations.

There are a variety of different models for roadmaps but there is one generic form that was put forward by the European Industrial Research Management Association (EIRMA) (1997). This roadmap is a chart using layers that can show a commercial and a technological perspective. The roadmap helps managers explore the evolution of technology over time, while linking between different layers or perspectives. The main benefits of a roadmap are that it provides information to make better decisions. This is achieved by highlighting vital technology needs or gaps in technology that must be met in order to achieve product performance targets. Roadmaps can also demonstrate whether an organisation genuinely understands the needs of the various stakeholders and whether the company can develop the technology to meet those needs (Garcia & Bray, 1997).

Strategic roadmaps are a method of incorporating scientific research within recognised policies and strategic thinking; they do not aim to introduce major changes. The basic roadmap concept can introduce subtly new ways of thinking without enforcing a complicated, top-down

bureaucratic process. Roadmaps enable organisations to use a bottom-up approach, if need be, involving a wide range of people in strategic decision-making through collaborative planning, supporting communication, sharing knowledge, and disseminating visions.

9.3.4. Kuwait E-Health Roadmap

If Kuwait's Ministry of Health (MOH) took the above factors into account, we believe that Kuwait's health system would benefit from 'roadmap thinking'. It is suggested that these benefits could be sustained easily and exploited further in the future. It is proposed that the MOH should:

- improve and propel the adoption of a nationwide electronic health record system;

- increase collaboration between stakeholders at macro, meso, and micro levels;

- reduce the duplication and sub-optimal use of resources arising from lack of co-ordination.

If these proposals were implemented, it would allow the MOH to:

- develop specific measurable goals and objectives;

- identify and analyse the gaps that need to bridged in order to meet the objectives;

- explore and analyse the extent to which the health information system and the organisational environment will need to be reconciled;

- identify a strategy for the concurrent achievement of these goals and objectives subject to actual contextual conditions.

This proposed strategic roadmap model has been generated from two major inputs.

1. An analysis of the international perception of electronic health record (EHR) benefits and barriers, carried out in the first case study (see Chapter seven).

2. An analysis of Kuwaiti primary healthcare professionals' perspectives of the electronic health record system, as seen in the second study (see Chapter eight).

These directional studies provide an evidence-based perspective on the development of a national health information system, which, if used alongside the roadmap model, would enable policy makers in the MOH to prioritise and develop a multi-staged five-year action plan of implementation and evaluation of an EHR system for Kuwait's health care provision.

The strategic roadmap would enable the MOH to identify a long-term vision, with a strong focus on tangible benefits that would be achieved over five years. It would also enable the MOH to establish a suitable governance role that would develop to improve the implementation of the system. It is known that the EHR system has the potential to improve significantly the efficiency and effectiveness of health care services. The EHR system technologies and tools would help patients manage their own care, give health care service providers more time to provide patient care and support patient empowerment, and ensure appropriate planning information is available to strategic planners in order to improve health care services in the future.

The proposed vision for the EHR system in Kuwait can be summarised as follows:

'The electronic health record System will enable a safer, higher quality, and more equitable health system for all users of the system with an integrated, interoperable electronic health record system from which health care information is accessible when and where it is needed to support individual health, health care decision making and health system sustainability.'

The proposed mission of the EHR system is:

'To provide the right information to the right people at the right time that will facilitate improvements for Ministry of Health staff and services to produce the best health results at the point of care, in a timely manner.'

The proposed strategic roadmap has four major objectives that will drive the nationwide development of the EHR system.

1. To inform clinical practice: bringing information tools to the point of care, especially by installing the EHR in health care centres and hospitals.

2. To interconnect clinicians: building an interoperable health information infrastructure, so that records follow the patients, and clinicians have access to critical health information when treatment decisions are being made.

3. To personalise care: using health information technology to give consumers more access and involvement in health decisions.

4. To improve the population's health: expanding the capacity of public health monitoring, quality of care measurement, and brining research advances more quickly into medical practice (Gartee, 2007).

The proposed strategic roadmap covers the following interrelated elements, which are the fundamental requirements for successful and sustainable improvements through the adoption of an electronic health record system:

- establish the core foundations for electronic information exchange across the health sector;

- adopt the electronic health record system solutions and tools to facilitate the delivery of health care and information between the users of the EHR;

- encourage and enable workers who use the health care system to adopt the solutions introduced by the EHR and change their work practices to improve efficacy;

- establish appropriate national e-health governance structures and mechanisms (National e-health Strategy, 2008);

- improve the quality, accessibility, and productivity of health services.

A pilot test was conducted at the Ministry of Health via two senior policy-makers to ensure that the survey meet the objectives of the study. The survey was administered to ensure the validity and reliability of the instrument. Minor changes were made as it suggested by the senior policymakers. Their recommendations were to not exceed the list of evidence statements beyond three, due to the time limitation of participants in this case study. The change was performed to ensure the reliability and validity of case study.

For this case study, the researcher has used the findings of the first and second case studies, and EHR literatures to select the main areas of this case study that are relevant to Kuwait. The researcher has used the Australian National E-health Strategy (2008) to design the third case study, due to the time limitation of this research. Also, the researcher examined the MOH chart (Appendix G) in order to identify the stakeholders. They were contacted via phone, and personally approached to set an appointment for a meeting with them. At the meeting the researcher introduced herself, explained the purpose of the study, and assigned the case study survey to stakeholders. Each participant signed a written informed consent form to protect their personal reputation. The number of participants in this case study were twelve. There were assistant under-secretary of health services, public health affairs, health care, quality control affairs, and private sector; the head director of health regions, head director of primary health care department; and the supervisor of primary health care services in Capital, Hawally, Farwaniaya, Jahra, and Sabah. The administrative secretary at each department, was responsible to return the survey to the researcher after it was completed by each stakeholder.

9.4. Descriptive analysis of Improvement the Adoption of Electronic Health Record System

9.4.1. Establishment of the Core Foundations for Electronic Information Exchange across the Health Sector

9.4.1.1. Identification and Authentication

Electronic Health Record systems and the data they store and process are valuable resources which need to be protected. One of the first steps toward securing an EHR System is the ability to verify the identity of its users. The process of verifying a user's identity is typically referred to as user identification and authentication. The majority of Health Policy-Maker Professionals, who participated in this case study agreed that EHRs with designed and implemented identification and authentication systems for information security provide better "CONTROL" over information and it is highly priority that there should be improvement within the short term.

Table25: Identification and Authentication

Working Priority	Improvement Time Frame	Improvement Priority
Identification and authentication	58% -Short term 42% -Medium term	100%-High

Evidence

- 46.3% of International Health Professionals stated that EHRs provide better CONTROLover Information (Fig22).

- 83.9% of Kuwait Health Professionals stated that EHRs provide better CONTROL over Information (Fig 22).

9.4.1.2. Information Protection and Privacy

Information protection and privacy is a cornerstone for effective governance, risk, and compliance management. Information security prevents and detects breaches or instances of fraud that could adversely impact the integrity of corporate and user data. Establishment of a robust privacy and regulatory system is required to authorize specific E-Health initiatives, and also ensures appropriate privacy safeguards and consent processes for access to and use of health information and participation in EHR initiatives. The majority of Health Policy-Maker Professionals, who participated in this case study, agree that such EHRs are a better system at protecting the "PRIVACY" of patient information but the "current EHRs need some time for complete protection to be covered". Therefore, it is highly priority that there should be improvement within the short term.

Table26: Information Protection and Privacy

Working Priority	Improvement Time Frame	Improvement Priority
Information protection and privacy	75%-Short term 25%-Medium term	100%-High
Comments 1-EHR need some time for complete protection to be covered		

Evidence

- 45.8% of International Health Professionals stated that EHRs is better system at protecting the PRIVACY of patient information(Fig.10)

- 51.4% of Kuwait Health Care Professionals stated that EHR system PROTECT the privacy of patient information(Fig.59)

9.4.1.3. National EHRs Information Standards

Implementation and adoption of standardized EHRs to underpin the consistent and accurate collection and exchange of health information. The majority of Health Policy-Maker Professionals agree that "LACK" of adoption of uniform standards is barrier, but they preferred to implement the standards when the system is" stable". Therefore, it is considered a highly priority that there should be improvement within the short term.

Table27: National EHRs Information Standards

Working Priority	Improvement Time Frame	Improvement Priority
National EHRs information standards	66%-Short term 17%-Medium term 17%-Long term	100%-High
Comments: When the system is stable, standards should be implement		

Evidence

- 48.8% of International Health Professionals stated that LACK of adoption of uniform standards is barrier(Fig.28)

- 78% of Kuwait Health Care Professionals stated that LACK of adoption of uniform standards is barrier(Fig.59)

9.4.1.4. Investment in Computing Infrastructure

It is essential to establish a mechanism to encourage the private sector to invest in the implementation and maintenance of an acceptable baseline computing infrastructure. The majority of Health Policy-Maker Professionals agree that the adoption of EHR would be adversely affected by a "VENDOR" who is not stable enough to provide long-term support, and they agree that one of main barriers of the current system is its poor "RELAIBILITY". As a result of that, the improvement of infrastructure is highly priority that should be done within the medium term by the "private sector, which have a bigger capabilities for computing infrastructure"

Table28: Investment in Computing Infrastructure

Working Priority	Improvement Time Frame	Improvement Priority
Investment in computing infrastructure	33%-Short term 50%-Medium term 17%-Long term	83%-High 17%-Low
Comments: Private sectors has a bigger capabilities for computing infrastructure		

Evidence:

- 63.4% of International Health Professionals stated that the adoption of EHR would be adversely affected by VENDOR, who is not stable enough to provide long-term support(Fig.10)

- 58% of Kuwait Health Care Professionals are dissatisfied with EHRs RELIABILITY(i.e. system speed)(Fig.64)

9.4.1.5. National Broadband Services

There should be a plan to provide broadband connectivity among all care providers, by engaging and collaborating with the government and telecommunications organizations. The majority of Health Policy-Makers Professionals state that communications and remote access features are NOT available. Therefore, the improvement priority is high for "The remote access should be available and fast to facilitate the system use" and this should be improved within the short term.

Table29: National Broadband Services

Working Priority	Improvement Time Frame	Improvement Priority
National broadband services	83%-Short term 17%-Long term	92%-High 8%-Low
Comments Remote access should be available and fast to facilitate the system use		

Evidence:

- 74% of Kuwait Health Care Professionals state that the communications and remote access features is NOT available (Fig. 47)

9.4.2. Adoption of EHRs Solutions and Tools to Facilitating Delivery of Health Care and Information between the Users of EHRs

9.4.2.1. Adoption of Electronic Information Sharing

9.4.2.1.1. Interoperability and Communication of EHRs

Adoption of Electronic information sharing would improve the capability of clinical and practice management systems to support key electronic information flows between care providers. Electronic information sharing provides a basis for improved care planning, coordination and decision making at the point of care. The majority of Health Policy-Makers Professionals believe interoperability and communication of EHRs with each other is very important but is affected by the " lack of agreement and coordination among different healthcare vendors". Therefore, it is a highly priority that needs to be improve within the short term.

Table30: Interoperability and Communication of EHRs

Working Priority	Improvement Time Frame	Improvement Priority
Interoperability and communication of EHRs	58%--Short term 42%-Medium term	100%-High
Comments: 1-Communication EHRs with each other is very important 2-Lack of agreement and coordination among different healthcare vendors 3-Improve access to health care services		

Evidence:

- 63.4% of International Health Care Professionals are consider interoperability and communication of EHRs with each other is very important(Fig.27)

- 96.8% of Kuwait Health Care Professionals are consider interoperability and communication of EHRs with each other is very important(Fig.27)

9.4.2.1.2. Improving   Event summaries   including Discharge Summaries, Specialist Reports and Notifications

In improving event summaries including discharge summaries, specialist reports and notifications, all Health Policy-Maker Professionals agree that the current EHR does " NOT" enable Kuwait clinicians to monitor immunizations and to receive alerts on health maintenance deficiencies. So according to that the improvement of event summaries is a highly priority that should be improved within the short term.

Table31: Improving Event Summaries including Discharge Summaries, Specialist Reports and Notifications

Working Priority	Improvement Time frame	Improvement Priority
Improving event summaries including discharge summaries, specialist reports and notifications	100%-Short term	100%-High
Comments: 1-Immunization modules is under test& will be implemented nationwide soon 2-Other issues like discharge summaries are active consideration , will be implemented as part of HMIS 3-These notifications are very important		

Evidence

- 74% of Kuwait clinicians stated that they are NOT able to monitor immunizations(Fig.47)

- 74%of Kuwait clinicians stated that they are NOT able to receive alerts on health maintenance deficiencies(Fig.47)

9.4.2.1.3. Improving Test Orders and Test Results

In improving test orders and test results, the majority of Health Policy-Maker Professionals agree that orders for laboratory & radiology tests "ARE" available in the EHR system whereas viewing laboratory & radiology tests results is "NOT" available. Therefore, it is highly priority that "should be available" within the short term.

Table32: Improving Test Orders and Test Results

Working Priority	Improvement Time Frame	Improvement Priority
Improving test orders and test results	92%-Short term 8%-Long term	100%-High
Comments: Test results order and results should be available		

Evidence

- 62.7% of Kuwait clinicians stated that orders for laboratory & radiology tests ARE available(Fig.47)

- 74% of Kuwait clinicians stated that viewing laboratory & radiology tests results are NOT available(Fig.47)

9.4.2.1.4. Improving Patient Demographics

In response to the questions related to improving patient demographics, the majority of Health Policy-Makers Professionals agree that patient demographics "IS" available and they" USE" it. Also it is highly priority that needs to develop within the short term.

Table33: Improving Patient Demographics

Working Priority	Improvement Time Frame	Improvement Priority
Improving patient demographics	92%-Short term- 8%-Non	92%-High 8%-Low
Comments: 1-Clinical system already use Civil-ID (unique-ID) of citizens and expatriates 2-Available		

Evidence

- 74% of Kuwait clinicians stated that patient demographics IS available and they USE it(Fig.47)

9.4.2.1.5. Adoption of Electronic Referrals System

In the adoption of the electronic referrals system, the majority of Health Policy-Makers Professionals agree that the Kuwait clinicians are "UNABLE" to manage referrals electronically (i.e. from PHC to ER, and Hospital). So, as result of that, the current system need is a high priority that should be "available" within the short term.

Table34: Adoption of Electronic Referrals System

Working Priority	Improvement Time frame	Improvement Priority
adoption of electronic referrals system	92%--Short term 8%-Medium term	100%-High
Comments: 1-Static Active: To implemented once HMIS integration completed 2-Referrals system should be available		

Evidence

- 74% of Kuwait clinicians stated that they are UNABLE to manage referrals electronically (i.e. from PHC to ER, and Hospital) (Fig.47)

9.4.2.1.6. Enriching the Current Health Profile

Enriching the current health profile, the majority of Health Policy-Maker Professionals point out that the development of clinical notes, review of progress notes and review of vital signs is highly priority that should be improve within the short term as the "system is being integrated".

Table35: Enriching the Current Health Profile

Working Priority	Improvement Time Frame	Improvement Priority
Enriching the current health profile	83%-Short term 17%-Medium term	100%-High
Comments: Existing health profile (allergy, chronic, surgical summary) will further enriched with addition of immunization, HMIS, etc) as system being integrated		

Evidence

- 62.7% of Kuwait clinicians stated that clinical notes, review of progress notes and review of vital signs ARE available and they USE it (Fig.47 & Fig.48)

9.4.2.1.7. Improving Prescription Management Services

In improving prescription management services, the majority of Health Policy-Maker Professionals stated that manage prescription writing "IS" available and is "USED" by Kuwait clinicians since it is e-connected with the pharmacy system. Also, they point out that the improvement of the system is a high priority that should be developed within the short term.

Table36: Improving Prescription Management Services

Working Priority	Improvement Time Frame	Improvement Priority
Improving prescription management services	92%-Short term 8%-Medium term	100%-High
Comments: Prescription management services need more improvement		

Evidence:

- 62.7% of Kuwait clinicians stated that manage prescription writing IS available and they USE it(Fig.47 & Fig.48)

- 87.8% of Kuwait clinicians stated that the pharmacy e-connect system IS available and they USE it(Fig.47 & Fig.48)

9.4.2.1.8. Improving Current Medication List

In improving the current medication list, the majority of Health Policy-Maker Professionals' agree that creation and maintenance of medications list of each patients "IS" available and is "USED " by the Kuwait clinicians. Also, they stated that the improvement of the system is a high priority need, that should be done within the short term.

Table37: Improving Current Medication List

Working Priority	Improvement Time Frame	Improvement Priority
Improving current medications list	92%-Short term 8%-None	100%-High
Comments: 1-Available through current application called PCIS (PRIMARY CARE INFORMATION SYSTEM) 2-Improving medication list is very important		

Evidence

- 74% of Kuwait clinicians stated that creation and maintenance of medications list of each patients IS available and they USE it(Fig.47 & Fig.48)

9.4.2.2. Adoption of Service Delivery Tool

9.4.2.2.1. Decision Support for Medication Management

Decision support for medication management, the majority of Health Policy-makers Professionals agree that monitoring current, past medications and medical refill "IS" available and functions like drug formation are "USED" by Kuwait clinicians. Also , they have indicated that the development of current system is a high priority need, that should be improve within the short term.

Table38: Decision Support for Medication Management

Working Priority	Improvement Time Frame	Improvement Priority
Decision support for medication management	75%-Short term 17%-Medium term 8%-Long term	100%-High
Comments: 1-As indicated current and past medication history is available for clinicians. 2-It may help health providers to improve the quality of services		

Evidence:

- 87.8% of Kuwait clinicians stated that monitoring current and past medications& medical refill IS available and they USE it(Fig.47& Fig.48)

- 87.8% of Kuwait clinicians stated that drug formation IS available and they USE it(Fig.47& Fig.48)

9.4.2.2.2. Decision Support Chronic Disease Management Solutions

Decision support chronic disease management solutions, the majority of Health Policy-Maker Professionals" agree that progress notes review such as "flow chart IS available and it is USED" by Kuwait Clinicians.

Table39: Decision Support Chronic Disease Management Solutions

Working Priority	Improvement Time Frame	Improvement Priority
Decision support chronic disease management solutions	84%-Short term 8%-Medium term 8%-Long term	80%-High 20%-Low
Comments: 1-Aviable as flow chart, for specific chronic diseases prevalent in Kuwait (DM, ALLERGY,ASTHMA, HYPERTENSION, etc)		

Evidence:

- 62.7% of Kuwait clinicians stated that progress notes review IS available and they USE it(Fig.47&Fig.48)

9.4.2.2.3. Tele-health& Electronic Consultation Support

Tele-health & electronic consultation support, all Health Policy-Makers Professionals stated that documentation of telephone messages is "NOT" available. But they have pointed out that tele-health is "in process for implementation at various hospitals". It is a high priority need, that should be developed within the short term due to it effects on "reducing the healthcare services costs without influencing patient care".

Table40: Tele-health& Electronic Consultation Support

Working Priority	Improvement Time Frame	Improvement Priority
Tele-health& electronic consultation support	66%-Short term 17%-Medium term 17%-Long term	100%-High
1- In process for implementing for various hospitals 2- Reduce the health care services costs without influencing patient care		Comments:

Evidence:

- 100% of Kuwait clinicians stated that documentation telephone messages is NOT available(Fig.47)

9.4.3. Encouraging and Enabling the User of Health Care System to Adopt the EHRs Solutions and Change their Work Practices to be able to Use them Effectively

9.4.3.1. National Awareness Campaigns

The majority of Health Policy-Maker Professionals believe that is a high priority need to start development of national awareness campaigns within the short term such as: demonstrating examples of solutions, web based communications of EHR status and success stories. Since there are indications of end users, who "are the most important elements for success of EHRs", that have resistance to EHR adoption.

Table41: National Awareness Campaigns

Working Priority	Improvement Time frame	Improvement Priority
National awareness campaigns	75%-Short term 8%-Medium term 17%-Long term	75%-High 25%-Low
Comments: 1-The end users are the most important elements for success of EHRs		

Evidence:

- 37.5% of International Health Professionals stated that user DON'T have a good knowledge about EHRs(Fig.10)

- 51.4% of International Health Professionals stated that the FEAR of using technology is a barrier (Fig.10)

- 71.6% of Kuwait clinicians stated that lack of EHR AWARRNESS is a barrier(Fig.59)

- 44.3% of Kuwait clinicians stated that they concerned LOSS of personal attention with patient as entering patient information is a barrier(Fig.59)

9.4.3.2. National Care Provider Accreditation

The majority of Health Policy-maker Professionals agreed that there is a need for making the adoption and use of E-health solutions a national prerequisite for professional accreditation of care providers (i.e. similar to ICDL). It is a high priority need that should be done within the short term since the users "ARE" willing to undertake training to "improve their skills in using EHRs" and to "overcome the health professionals resistance" to EHRs.

Table42: National Care Provider Accreditation

Working Priority	Improvement Time frame	Improvement Priority
National care provider accreditation	75%-Short term 8%-Medium term 17%-Long term	100%-High
Comments: 1-The end users should set training to improve their skills in using EHR 2-It would have major effects on overcome the H.P. resistance		

Evidence:

- 68.1% of International Health Professionals stated that users ARE willing to undertake training to improve their skills in using EHRs(Fig.10)

- 55.6% of International Health Professionals stated that users HAVE sufficient computer literacy to use health IT in their workplace(Fig.10)

- 52.8% of International Health Professionals stated that users already HAVE sufficient skills to start using EHRs(Fig.10)

9.4.4. Establishment of Appropriate National E-health Governance Structure and Mechanisms

9.4.4.1. Requirement Adoption of National E-Health Governing Board

The majority of Health Policy-Maker Professionals agree that there is a need to establish a National E-Health governing board, which has a responsibility for setting overall national E-Health directions and priorities, reviewing and approving E-Health strategy, funding decisions and for the monitoring of progress against national E-Health strategy deliverables and outcomes. It is a high priority need that should be applicable within the short term since there is a "need to reassess requirement and to observe the adoption process" of current EHRs.

Table43: Establishment of Appropriate National E-Health Governance Structure and Mechanisms

Working Priority	Applicable	Priority
Requirement adoption of National E-Health governing board	67%--Short term 8%-Medium term 8%-Long term 17%-None	75%-High 8%-Low 17%-Not applicable
Comments: 1- Need to reassess requirement & to observe the adoption process		

9.4.4.2. Establishment of National E-Health Entity

 The majority of Health Policy-Maker Professionals agreed that there is a high priority need to establish the national e-health entity within the short term. The main responsibilities of this body are to coordinate and oversee the E-Health strategy, and oversee investment and the execution of the national components of the E-Health work program. The E-Health entity's operating model should support discrete functions focused on strategy, investment management, work program execution, standards development and E-Health solutions compliance. The national E-Health entity would be overseen and governed by the national E-Health governing board.

Table44: Establishment of National E-Health Entity

Working Priority	Applicable	Priority
Establishment of National E-Health entity	50%-Short term 17%-Medium term 25%-Long term 8%-Not applicable	75%-High 17%-Low 8%-Not applicable
Comments:		

9.4.5. Improving the Health Services

9.4.5.1. Improving the Quality of the Health Care Services

For the query on improving the quality of the health care services, the majority of Health Policy-Maker Professionals' agree that the EHRs would "IMPROVE" the overall quality of patient records and the quality of clinical decisions. So it is a high priority to improve the current system with in the short term.

Table45: Improving the Quality of the Health Care Services

Working Priority	Improvement Time Frame	Improvement Priority
Improving the quality of the health care services	75%-Short term 17%-Medium term 8%-Long term-8%	100%-High
Comments:		

Evidence:

- 22.2 % of International Health Professionals stated that the EHRs IMPROVE the overall quality of patient record(Fig.14)

- 44% of Kuwait clinicians stated that EHRs IMPROVE the quality of clinical decisions(Fig.51)

9.4.5.2. Improving the Access to the Health Care Services

Improving the access to health care services, the majority of Health Policy-Maker Professionals' agree that EHRs would increase "ACCESS" to multiple users and 'IMPROVE" timely access to medical records. So it is a high priority to improve the current system with in the short term.

Table46: Improving the Access to Health Care Services

Working Priority	Improvement Time Frame	Improvement Priority
Improving the access to the health care services	75%-Short term 25%-Medium term	100%-High
Comments:		

Evidence:

- 50% of International Health Professionals stated that the EHRs increase ACCESS to multiple users(Fig.14)

- 59% of Kuwait clinicians stated that EHRs IMPROVE timely access to medical records(Fig.51)

9.4.5.3. Improving the Productivity of Health Care Services

In improving the productivity of health care services, the majority of Health Policy-Maker Professionals agree that the EHRs could "SAVE" physicians time and "INCREASE" healthcare productivity. So therefore, it is a high priority to improve the current system with in the short term.

Table47: Improving the Productivity of Health Care Services

Working Priority	Improvement Time Frame	Improvement Priority
Improving the productivity of health care services	25%-Short term 67%-Medium term 8%-Long term	100%-High
Comments: 1- International health professionals view preferred		

Evidence:

- 15.3% of International Health Professionals stated that the EHRs SAVE physicians time(Fig.14)

- 13.9% of International Health Professionals stated that the EHRs INCREASE healthcare productivity(Fig.14)

- 43.7 of Kuwait clinicians stated that they are concerned about losing PRODUCTIVITY during uses of EHRs(Fig.59)

9.5. Summary

Policy Makers Prospective Roadmap for Improving the Adoption of Kuwait EHRs

| High | Low |

Short Term — Medium Term — Long Term

Foundations

- Identification and authentication
- Information protection and privacy
- National EHRs information standards
- Investment in computing infrastructure
- National broadband services

E-Health Solutions

- Interoperability and communication of EHRs
- Adoption of electronic referrals system
- Decision support for medication management
- Improving event summaries
- Enriching the current health profile
- Improving test orders and test results
- Improving prescription management services
- Decision support chronic disease management
- Improving patient demographics
- Improving current medications list
- Tele-health& electronic consultation support

Change& Adoption

- National awareness campaigns
- National care provider accreditation

Governance

- Adoption of National E-Health governing board
- National E-Health entity

This proposed strategic roadmap covers the following interrelated elements, which are the fundamental requirements for successful and sustainable improvements through the adoption of an electronic health record system:

- establish the core foundations for electronic information exchange across the health sector;

- adopt the electronic health record system solutions and tools to facilitate the delivery of health care and information between the users of the EHR;

- encourage and enable workers who use the health care system to adopt the solutions introduced by the EHR and change their work practices to improve efficacy;

- establish appropriate national e-health governance structures and mechanisms;

- improve the quality, accessibility, and productivity of health services.

The proposed strategic roadmap was based on the Policy-Makers prospective. It indicates that MOH do not have strategic thinking for improving the adoption of EHRs in the long term. The MOH is looking to improve the quality, accessibility, and productivity of health services, but this does not happen only by setting the financial requirement for that. It involves converting strategic thinking into an actual plan. Strategic planning is a very important organizational process that could assure organizational quality adoption of EHRs. Strategic planning has several characteristics: it set the requirements drivers and working on development capabilities for improving the adoption of EHRs. In order to improve the adoption of EHRs, the policy-makers determine the distribution of the responsibility for making decisions, the scope of the decisions that can be made by different organizational functions, and the process to be used for making decisions. Therefore, the policy-makers need to provide support for improving the adoption of EHRs such as: a centralized professional health information system team, whose mainly responsibility is to prioritise the EHR adoption process, and to define the EHR development budget

Chapter Ten: Discussion

10.1. Discussion

Health care systems throughout the world are influenced by a range of trends including a general increase in the age of the global population, an increase in demand for high quality health care services and a rise in the incidence of chronic diseases.

A study on the cost and benefits of an interoperability platform for Luxembourg (2010) conducted by the Price Waterhouse Coopers (PWC) points out that a way to meet these challenges is for health systems to develop electronic health records (EHRs) in order to improve the health and welfare of the whole community by improving the productivity of health care professionals and thus improving the quality of health care services and patient safety. It is suggested that the implementation of EHRs has fundamentally changed the way we collect, store and use health information. This process has ensured the delivery of better quality services that are more effective, efficient and sustainable. As a result of electronic systems providing more easily accessible and accurate information about individuals' health problems and care plans, patients have been empowered to become more involved in their own health care decisions. In addition, health care professionals can deliver better services because they are now able to access more accurate information about their patients and (where appropriate) share this information locally, nationally and internationally.

One example of the strategic implementation of EHRs is the European Commission's action plan, *eEurope 2005,* which was published in 2005; it discussed 'e-health cards', Health information networks and online health services. In the US, many professionals and hospitals had begun to adopt, implement or upgrade EHR technology in order to receive incentive payments. In 2009, the concept of 'meaningful use' was introduced in the US in order to define a way to certify EHRs.

This programme aimed to improve health quality, efficiency and patient safety; reduce health disparities; engage with patients and their families and guarantee privacy rights and security protection for personal health information. This certification of meaningful use was awarded to health professionals and hospitals that were using EHRs to accomplish certain objectives, such as computerised physician order entry systems and e-prescribing.

This research has examined the adoption of an EHR in the Kuwait primary health care (PHC) system and proposes a strategic roadmap that will ensure the benefits of EHRs are maximised. Three major case studies were therefore conducted using the domain theory concept, which consider the three levels of decision making within the system: 1) policy-maker level, 2) decision-maker level and 3) end-user level. The case studies have described, evaluated and identified ways to improve the adoption of EHRs in Kuwait. These results have been applied to a research-based improvement strategy.

Chiasson and Davidson (2004) suggest that health information system research is 'a multidisciplinary body of knowledge related to the design, development, implementation and use of information-intensive technologies in health care settings' (p.156). They examine the publications related to information system research in health-related settings and conclude that this body of literature is growing, but is still relatively small. Although at a national level there is support for EHR adoption, there should be an equal focus on successful implementation (Berner, 2008). Chiasson and Davidson (2004) identify the need for increased research in this area, but recognise that information system theories are unfamiliar to many health care professionals, and the health care context is unfamiliar to much information system research. Therefore, in order to improve the adoption of an EHR in Kuwait, there are a range of factors that must still be addressed, such as social and behavioural issues. Integrated research and diffusion models are therefore needed in order to create multi-level intervention strategies for the development of plans that aim to implement an EHR (Kukafka et al, 2003).

10.2. The First Case Study-International Perception of the Electronic Health Record: Benefits and Barriers

This case study was conducted among health care professionals at *decision-maker* level in different countries, with the objective to *describe* the main barriers and benefits that would affect the adoption of EHRs. As mentioned earlier, the number of participants in this case study included 72 decision makers with different professional backgrounds from 14 countries; the majority of responses were from the US, European countries and Kuwait (as shown in section 6.2., Table 10 and Fig.9).

The results show that the main barriers affecting the implementation of EHRs are: the lack of uniform standards and poor navigation (as shown on sections 6.3. and 6.3.1 part A and Fig.10). The case study also indicates that other obstacles, which can affect the adoption of EHRs, include a mismatch between people who benefit from the system and those who experience an increased workflow from using the EHR, and the different requirements of different professional groups (Fig.11). Moreover, the case study has shown that the key solutions that can help overcome the barriers to an effective implementation of an EHR include: providing a well documented disaster recovery plan and providing multilevel confidentiality (Fig. 12). Cost is considered the most important challenge that can affect the adoption of an EHR (Fig. 13).

There are numerous benefits of EHRs, but the most important benefits that are relevant to this case study are: increased access to patient information for multiple users, more efficient delivery of care and an enhanced quality of care for patients (Fig. 14). The results suggest that adopting EHR models, which provide laboratory results, electronic discharge summaries and appointment and scheduling, can help system users understand and appreciate the benefits of an EHR (Fig. 15). In addition, this case study has pointed out that the perceived usefulness to the system user and their clinical team is considered the most important factor that influences system-user acceptance of an EHR (Fig. 16).

Several factors limit the ability to generalise the case study results to larger populations. First, random sampling was not used to obtain participants. Second, the type of person who agreed to participate in this case study appeared to have some interest in the benefits and barriers of EHR adoption. Third, the small number of participants limits the generalisability of the study. Fourth, it is not easy to determine what bias might exist in the response to this case study as this was entirely volunteer based, but some bias is possible. To respond to these limitations, it would have been beneficial if interviews could have been conducted with some of the other stakeholders to obtain more detail about their views on EHR benefits and barriers; but due to time limitations and participants' locations (they were located in various countries), this was not feasible.

Despite these limitations, the study provided good information relating to EHR benefits and barriers, which was supported strongly by the literature and other studies relating to EHR adoption. If we had the time and more resources, we would have included in our study-sample the Gulf region countries (GCC) and compared their perceptions about the barriers and benefits of EHRs with European countries' perceptions. The results indicate that Kuwait and the other countries involved in our case study throughout the world share the same concerns about EHRs, despite their differences in geographical size, population size and available resources.

10.3. The Second Study-Kuwait Healthcare Professionals perspectives' on Electronic Health Record System

This case study was chosen to *evaluate* the adoption of EHRs in Kuwait's primary health care centres. It was conducted in 26 centres in Kuwait and the participants were physicians, nurses and pharmacists who are consider the *end users* of the EHR. There were 327 health professionals using the EHR in these primary health care centres. The majority of responses were from females (Fig.40) and from professionals in the age group of 40–49 years (Fig. 41). Three quarters of the participants were doctors and the rest (in equal proportion) were nurses and pharmacists (Fig.42). These participants indicated that they had been using a 'hybrid' EHR for more than 5 years (Fig.45) and most participants pointed out that they had not received training to use the EHR (Fig. 46).

The features of the EHR that the participants had been using included patient demographics, lists of patients' problems and prescription lists to help manage individuals' medication (Fig.47). Most common features of the EHR at Kuwait primary healthcare centres are used by physicians (as shown in Fig.49 and Fig.50). The end users of the EHR system reported that it would (Fig.51): improve overall quality of care to patients; improve timely access to medical records; ensure that chronic illness care meets required guidelines; improve the management of repeat prescriptions; avoid medication errors.

Furthermore, the end-users of the system indicated that lack of awareness, system maintenance, system downtime and loss of clinical data are the main barriers that affect the adoption of an EHR (Fig. 59). Also, the majority of participants in this case study demonstrated overall satisfaction with EHRs in terms of ease of use, use for pharmacies and writing reports. However, participants reported their main dissatisfaction of EHRs in terms of frequent failure of the system and inability to share medical information among other system users (Fig. 64). Finally, the system training was initially provided when the system was introduced, but later on the training was stopped as the system was considered so friendly that no training was needed. However, no studies were undertaken of user satisfaction. Users find it easy to use, but not delivering the functions users need.

The current case study included only health care professionals working at 26 primary health care centres. This segment of the health 'community' represents a significant and possibly the most active portion of system users, yet it does not represent the entire population of EHR users. It would have been ideal to conduct a similar study among hospital-based health care professionals because EHRs also support the sharing of care between hospitals and primary health care centres. However, this could not be achieved due to a number of factors, including lack of permission to conduct the study in the hospital setting, time constraints and the primary goals of the study (to collect primary health care data relating to EHR benefits and barriers). In future, it would be useful to apply the same survey to health care professionals working in hospitals in order to compare those results with the outcome of this case study.

This end-user case study is significant because it assesses the views of users of the system who:

- have used the system regularly for over five years;

- have used the system that was especially designed and implemented by the Ministry of Health;

- have used the system that has not been updated or improved in light of end-user needs.

10.4. The Third Case Study-Kuwait E-Health Strategic Roadmap

This case study was conducted at the Kuwait Ministry of Health with 12 participants at *policy-maker* level. The aim of the case study was to *improve* the adoption and implementation of an EHR by proposing the development of a strategic roadmap. The study covered four basic elements:

1. the foundations for electronic information exchange across the health sector;

2. the adoption of EHR solutions and tools;

3. encouraging and enabling providers and users to adopt EHRs;

4. establishing national e-health governance boards.

The policy-makers' strategic roadmap demonstrated that, in the short term, there is a need to adopt four interrelated elements of a strategic roadmap (Fig. 74). It was found that EHRs can improve the quality of health care services, improve access to health care services and improve their productivity. For the first element of the e-health strategic roadmap, which is the core foundation for the development of an EHR, the policy makers indicated the need for setting up a national broadband service, information protection/privacy and the need to adopt EHR standards. In relation to second element of the e-health strategic roadmap, which is adoption of EHRs solutions and tools, the policy-makers pointed out that adopting electronic information sharing helps to improve the processes that are carried out currently in primary health centres, which consequently improves the development of effective tools to support service delivery.

The third element of the e-health strategic roadmap, which is to encourage and enable system providers and users to adopt an EHR system, the policy makers stated that there is a simultaneous need to develop a national-awareness campaign and a national care-provider accreditation process through a certificated EHR training programme. Finally, for the fourth element of the e-health strategic roadmap, which is establishing national e-health governance board, the policy-makers indicated the need for the development of a national e-health governing board and setting the national e-health entity.

The limitation of this case study is that many of the senior policy makers who were interviewed about strategic roadmaps were possibly enthusiastic to protect themselves and their reputations within Government, and had to be definitive about their strategic priorities. As a result, many of them identified short-term roadmap priorities. With more time and resources, we would conduct a focus group study with the senior policy makers from the public and private health sectors to determine an EHR roadmap that would identify key long- and short-term national priorities. The results of this case study highlight the most important priority areas for the development and implementation of Kuwait's EHR from policy makers' perspectives.

10.5. Categorisation of EHR Benefits and Barriers

We can categorise the overall potential benefits of EHRs from the participants' perspectives in our three case studies, as follows:

The top priorities for policy makers are to:

1. improve the quality of healthcare services;

2. improve the access to health care services;

3. improve the productivity of healthcare service.

The most important advantages of EHRs for decision makers are:

1. increase access to multiple users;

2. make delivery of care more efficient;

3. enhance the quality of patient care.

The most important advantages of EHRs for end users are:

1. improve the overall quality of care to patient;

2. timely access to medical records;

3. delivery of chronic illness care that meets that guidelines;

4. prescription refills;

5. Avoiding medication errors.

Based on our results, we can categorise the barriers to adopting EHRs in Kuwait's primary health care centres as:

Decision-maker level:

1. adoption of uniform standards;

2. poor navigation;

3. mismatch between who benefits from the EHR system and who increased workflow from using EHRs;

4. different requirement by different groups;

5. cost.

End-user level:

1. awareness of EHRs;

2. system maintenance;

3. system downtime;

4. loss of clinical data;

5. frequency failure of EHRs.

Policy makers are:

1. national broadband services;

2. information protection and privacy;

3. adoption of EHRs standards;

4. improving/updating the electronic information sharing system;

5. setting the national awareness campaign;

6. setting a national e-health governing board.

It is interesting to examine the stated benefits and barriers of EHRs from the perspectives of each individual user level. Each of the three levels defines EHRs according to their own expected outcomes: what they need from EHRs, what EHRs can provide them and how an EHR will influence their work environment. Taking a top-down approach to examine the perceived benefits to an EHR system, we see that policy makers appear to assess EHRs from a financial or resource perspective. For example, they want EHRs to provide direct tangible benefits that affect the work environment. Decision makers judge the main benefits of EHRs from the perspective of operational implementation. For example, will adoption fit within the budget provided by the policy makers, particularly in relation to saving money, for example, a system that can:

- be accessed by multiple users simultaneously;

- reduce the length of stay for patient at inpatient facilities;

- monitor prescriptions or (unnecessary) examination requests.

End users define EHR benefits according to their work requirements; they want the system to improve the quality and safety of patient care, so they tend to look at EHRs as a tool that can satisfy their own work demands.

In order to achieve any of the identified benefits suggested by the system users from the three levels, the perceived barriers need to be overcome first. When we examine the barriers, it is useful to consider the responses using a bottom-up approach, since it is the end users who are the heaviest users of the EHR. End users utilise the EHRs as a tool to complete their daily work so it needs to be available and reliable at all times. In their responses, the end users emphasised that the main barrier to the effective adoption of an EHRs is lack of awareness of how it can work and how it can support them in their job. Decision makers stated that the main barriers to adopting an EHRs were the lack of standards of use, the lack of recognition that the EHRs should be designed to meet the requirements defined by the different system users and the costs (which are limited by the policy makers).

The policy makers emphasised barriers to the adoption of EHRs as:

- the lack of national broadband services inhibiting multiple access to the system;

- information protection and privacy requirements (which can lead to reducing complaints and reimbursements);

- updating and improving the existing system;

- establishing a national e-health governing board to monitor and improve EHR adoption.

It is interesting to note that the policy-makers' demands were all set within the context of a short timescale. This might have two explanations; 1) they perceived budget issues as short-term problems, or 2) having heard other users' and providers' views, they began to appreciate the need to increase quickly the EHR budget.

From an examination of the results of this study, it is clear that Kuwait's EHR, which has been designed for the primary health care setting, is designed for management needs rather than clinical and service requirements. This research has demonstrated that the design process should be amended to facilitate the development of a strategic roadmap in order to improve the adoption of EHRs in Kuwait's PHC. The roadmap should be designed by health information system experts, health care professionals (medical and paramedical), IT staff and senior policy makers.

The overall objectives of the roadmap would be to allocate appropriate resources, such as money and staff, and to improve the adoption of Kuwait's EHRs.

From the three case studies, there is empirical evidence to suggest that if the process of adopting EHRs was improved, it would have a significant effect on Kuwait's health care system and ultimately on the health of the nation. Policy makers have direct responsibility for devising policies to speed up the adoption of EHRs and increase efficiency (Taylor et al, 2005). Strategic decisions that can enable the implementation of EHRs include: reducing the costs for adopting an EHRs using financial or non-financial incentives; providing subsidies for buying EHR systems; providing subsidies for developing networks with standards and infrastructures that facilitate information exchange (Taylor et al, 2005).

It is clear that decision makers need to take an active role in the adoption of EHRs by raising awareness of its benefits among health care providers and patients. They need to highlight the need for privacy and security when using EHRs to ensure consumer safety. In addition, decision makers need to ensure EHRs can exchange effectively health information among health care providers and among different care settings. Finally, research shows that end users would agree to use an EHRs that is reliable and readily available to improve the overall quality of patient care and safety. This complements the literature, which suggests that health care professionals' attitudes and understanding of the benefits of an EHRs are central to its successful implementation.

10.6. The Stakeholders Perceptions

In different organisational environments, there are specific factors that can affect the implementation of new systems, which can subsequently determine the success or failure of proposed changes. One particular element that affects the successful adoption of an EHRs is the

concept of mismatch and match between and within factors that make up the health care environment. Therefore, when implementing an EHR system, there needs to be an assessment of what should be changed in order to adopt the system to ensure there is more of a match than a mismatch (Heeks et al, 1999). In terms of overall organisational change, organisational structures need to be adapted to meet the needs of the organisational environment (Butler, 1991).

In the context of EHRs, the 'environment' to which the system can be adapted is the health environment (Heeks et al, 1999), which encompasses a range of elements – including social and organisational factors. It should be noted that, as Anderson (1997: p.89) suggests, adopting the EHR system is not about matching it only with the technological environment:

'Past experience suggest that efforts to introduce clinical information systems into practice setting will results in failures and unanticipated consequences if their technical aspects are emphasised and their social and organisational factors are overlooked. … Several decades of experience with computer-based information systems make it clear that critical issues in the implementation of these systems are social and organisational, not solely technical.'

Social and organisational factors not only include objective realities, such as work processes or organisational structures, but they also include subjective perceptions (Heeks et al, 1991). For example, Dodd and Fortune (1995) and Dhillon (1998) highlight the role of stakeholder assumptions, expectations and perspectives as contributing factors in the failure of health care information system adoption. These authors, and Roberts and Garnett (1998) also note that problems arise when there is a difference (a mismatch) between what the end users expect of an EHR model during its construction and the perceptions of key stakeholder groups. Thus, Heeks et al (1999) point out that a successful health information system will be one that matches its general environment to the specific factors defined by the key stakeholders, e.g. technical, social and organisational factors. In essence, if we assess the views of the stakeholders in the health environment, the purpose of an EHR system is to support and bring about organisational change in order to improve the functioning of health care organisations, and improve patient care (Heeks at al, 1999).

10.7. The Reality Gap of EHRs Adoption at Kuwait PHC

The other major theme that we need to emphasise in relation to EHR adoption in Kuwait's PHC is the design of the current EHR system, which has not been developed in response to the views of the various stakeholders who use (directly or indirectly) the system. As shown by the second case study's findings, the EHR system in Kuwait's PHC has been developed by technical-based groups and its design suggest there is a conspicuous disparity (GAP) between the views of multiple stakeholders. All three case studies' results also suggest that the design of Kuwait's EHRs reflects the relationships between the various stakeholders; policy makers, decision makers and end users, which are linear and not reciprocal, and this has influenced negatively the potential for improving the adoption of the EHRs. At this point, it would be useful to discuss the ITPOSMO model (Heeks & Bhatnagar, 1999), which is a model that represents health information system conception-reality gaps. The seven dimensions of this model are necessary and useful in providing an understanding of conception-reality gaps. The seven elements of the ITPOSMO model are:

- **I**nformation

- **T**echnology

- **P**rocesses

- **O**bjectives and values

- **S**taffing and skills

- **M**anagement and structures

- **O**ther resources; money and time.

The system was designed mainly by technical staff, and there were significant conception-reality gaps along a number of the ITPOSMO dimensions.

- Information: the EHR in Kuwait's PHC is designed for managerial purposes, which is based on the content (what) rather than the process (how); for example, producing

statistical information (i.e. number of visits to the PHC). The system consists of limited lists of EHRs features.

- Technology: the EHRs in Kuwait's PHC needed quite a robust technological infrastructure, such as record architecture standards, terminology standards, communication standards and security feature standards.

- Process: the EHR system in Kuwait's PHC was primarily designed so that it supported the information-seeking by managerial levels.

- Objectives and values: the EHRs in Kuwait's PHC design does not match well with the objectives and values of health care professionals, such as improving the overall quality of patient care and patient safety by establishing decision support system applications.

- Staffing and skills: the technical staff are mainly responsible for designing and implementing the EHRs in Kuwait's PHC. In addition, it is mandatory that staff use the EHRs, yet they have not received sufficient training or education materials to support this, which creates a significant gap between knowing what is expected and the actual needs of the end users

- Management and structure: the Kuwait Ministry of Health is hierarchical and has a centralised management structure, which can limit effective adoption of an EHR system because there is limited understanding and ownership of its implementation. In addition, there is lack of professional staff (e.g. health information system professionals), which can have a negative effect on facilitating the adoption of the EHRs.

- Other resources: the cost of adopting the EHRs in Kuwait is limited due to the financing arrangements controlled by the Kuwait Government.

From this analysis, it can be seen that there are a number of significant gaps in Kuwait's current EHR system that would have a negative impact on achieving some of the potential benefits. Heeks et al (1999) has proposed some methods that could reduce these gaps, as follows:

Legitimising and mapping organisational reality. A key part of an effective health information system is to understand properly the current realities.

Reality-supporting not rationality-imposing applications. These include assumptions about the presence of rational information, processes, objectives and values and management structures, etc. The rationalities should pre-exist within the organisation or be imposed upon it.

Customisation to match realities. Individuals and organisations throughout the health sector must be recognised, and have expressed their opinions to ensure the system responds to their unique requirements.

Change agents. The ITPOSMO model is a reminder that a focus on technology is too narrow and that health information systems must be seen as part of a multi-dimensional process of change. Professionals must therefore see themselves as 'change agents' (Markus & Benjamin, 1996) and help others to develop new skills during implementation. Alternatively, they can take responsibility for implementing the changes. Therefore, they must have technology skills *and* change management skills. To support this, there must be a change in the health care organisation's structures and management processes that deal with information systems, and a move away from a 'central IT unit' model.

End-user development. There are gaps between developers and users. One way to close these gaps is through end-user development, which means system development is organised through a single individual. This can reduce information design–reality gaps, and gaps between objectives and values. It can also reduce significantly the cost and time resources as end users are not likely to create complex levels of change for themselves on the other ITPOSMO dimensions.

Therefore, end-user development should increase the chance of producing a successful health care information system (for an example, please see Edwards & Bushko, 1995).

Hybridisation. Current IT professionals need to be 'hybridised' into broader change agents who combine IS and IT skills with an understanding of the health care context and of change management; they need a wider range of skills that includes an understanding of information systems and information technology as well as skills in communication, negotiation and advocacy. For example, training must aim to create 'the informatics nurse', who can fully participate in health information system initiatives (van Aulst & Springer, 1995).

Incrementalism. It is important to introduce a new health information system slowly and incrementally in order for effective adoption (for an example, see Slater, 1996; Hoogewerf & Lowe, 1998).

Chapter Eleven: Conclusion

11.1. Conclusion

The aim of this research is to realize the benefits and barriers to the effective adoption of an electronic health record (EHRs) in Kuwait's primary health care system, with a view to identifying ways in which the system can be improved. The development of an EHRs presents Kuwait with an ideal opportunity to improve the quality and delivery of its health care services. The benefits of EHR systems are clear, as a report from the Congress of the United States (2008: p.6) indicates, 'no aspect of health IT entails as much uncertainty as the magnitude of its potential benefits'. The benefits of an EHR are affected directly and indirectly by how individuals use the system – health professionals' are particularly positive about EHR systems if they understand that it is a tool to improve patients' health and the quality of services, rather than concerned with budget savings and government efficiencies.

It is hoped that the Government of Kuwait will recognise the significance of EHRs and the process through which they should be adopted. The EHRs is a tool that can empower users of the system, as well as patients, to exchange effective, high quality information in a confidential and secure environment, with the ultimate aim of improving health. An EHR system cannot be forced on to a health care system from the top down, or drafted in to law by politicians, as this does not develop ownership of the system's aims or implementation. Nor is an EHR system a simple matter of technology – computerising old (and possibly unhelpful) procedures and practices. The technology is a medium through which objectives for reform are achieved, including changes in the way public and private sector departments, agencies and individuals think, act, analyse and share information – both on a national and international level.

It is therefore suggested that Kuwait's political leaders at the Ministry of Health need to establish a broad vision for how an EHRs will be developed in the future. This vision must be influenced by all the main stakeholders. By consulting with these stakeholders and thus involving them in defining the EHRs, it ensures their support throughout the adoption, development and maintenance of the EHRs. To ensure that the adoption process runs smoothly and never loses direction, it is proposed that Government staff should prepare a strategic roadmap, which will enable resources and actions to be prioritised to ensure effectiveness and efficiency. The strategic road map 'tool' has become increasingly important in dealing with the continually changing environment of the health care setting, so it is well placed to monitor the health system for any potential threats or issues. The strategic road map can also be used to coordinate stakeholder involvement, monitor and utilise policy changes, coordinate the involvement of potential users in the design and implementation of the system, assess and priorities finances and coordinate human resources; it is a tool to sustain direction and action.

11.2. Proposed Roadmap

Based on the EHRs literatures; the benefits of EHRs, which is improve the quality, accessibility, and productivity of health services; countries experiences such as European Countries; the overall outcomes of three case studies; and issuing budget from Kuwait MOH (Appendix. I) to activate the health information system (HIS). The researcher proposes a strategic roadmap (Fig. 75) that would improve the adoption of EHRs in the state of Kuwait. Also table 48, provides further description of a strategic roadmap (Fig.75).

Fig.75: A strategic Roadmap

| | Short Term | Medium Term | Long Term | High Priority | Low Priority |

Change & Adoption
- National Awareness Campaigns
- National Care Provider Accreditation

E-health Solutions
- Adoption of EHRs Sharing System
- Adoption of Service Delivery Tools
- Tele-health & Electronic Consultation Support

Foundation
- Identification and authentication
- Information protection and privacy
- National EHRs information Standards
- Investment in computing infrastructure
- National broadband Services

Governance
- National E-health Governing Board
- National E-health Entity

The proposed a strategic roadmap (Table 48) includes the following interrelated elements, that are the primary requirements for profitable and supportable improvements through the adoption of an electronic health record system:

Table 48: Description Table of A Strategic Roadmap

Strategy Elements	Action	Description of Action	Time-Frame	Priority
Establishments of appropriate national E-health Governance structure and mechanisms	Action1:National E-health Governing Board	Have accountability for setting overall national E-Health direction and priorities, for reviewing and approving E-Health strategy and funding decisions and for the monitoring of progress against national E-Health strategy deliverables and outcomes.	Short-Term	High
	Action 2:National E-health Entity	Coordinate and oversee the E-Health strategy, investment and the execution of the national components of the E-Health work program. The E-Health entity's operating model should support discrete functions focused on strategy, investment management, work program execution, standards development and E-Health solutions compliance. The national E-Health entity should be overseen and governed by the national E-Health governing board.	Short-Mid Term	High
Establishment of the core foundations for electronic information exchange across the health sector	Action 3: Identification and authentication	Design and implement an identification and authentication system for information security.	Short-Term	High
	Action 4: Information protection and privacy	Establishment of a robust privacy and regulatory system to: authorize specific E-Health initiatives, and ensure appropriate privacy safeguards and consent processes for access to and use of health information and participation in EHRs initiatives.	Short-Term	High
	Action5: National EHRs information standards	Implementation and adoption of the EHRs standards to underpin the consistent and accurate collection and exchange of health information.	Short-Term	High
	Action6: Investment in computing infrastructure	Establishment mechanisms to encourage private sectors to invest in the implementation and maintenance of an acceptable baseline of computing infrastructure.	Short-Mid-Long Term	High
	Action7: National broadband services	Providing connectivity between all care providers, by engaging and collaborating with the government and telecommunications organizations to extend planned broadband connectivity infrastructure to all health care provider.	Mid-Long Term	Low

Continued Table 48: Description Table of A Strategic Roadmap

Strategy Elements	Action	Description of Action	Time-Frame	Priority
Establishments of E-health solutions and tools to facilitating delivery of health care & information between the users of EHRs	Action8: Adoption of Electronic information Sharing	Adoption of Electronic information sharing would improve the capability of clinical and practice management systems to support key electronic information flows between care providers. Electronic information sharing provides a basis for improved care planning, coordination and decision making at the point of care.	Short-Mid-Long Term	High
	Action 9: Adoption of Service Delivery Tools	Encouraging the development of specific tools that improve the quality of health services.	Mid-Long Term	High
	Action10: Tele-health & Electronic Consultation Support	The development of remote care and consultation support mechanism.	Long-Term	Low
Encouraging and enabling the users' of healthcare system to adopt the EHRs solutions and change their work practices to be able to use system in effective manner	Action11: National awareness campaigns	Making care providers aware of EHRs solutions that are available to them and the benefits that use of these E-Health solutions may provide, by involving media campaigns, to demonstrate examples of solutions web based communication of EHRs status and success stories.	Short-Mid-Long Term	High
	Action12: National care provider accreditation	Making adoption and use of E-health solutions as national prerequisite for professional accreditation of care providers (i.e. similar to ICDL).	Mid-Long Term	Low

11.3. Future Research

This study has addressed the perspectives and opinions of stakeholders in Kuwait's primary health care centres, however, in future studies, there is a need to elicit the perspectives of stakeholders at secondary and tertiary health care levels.

Comparative studies could also be carried out between Kuwait and the Gulf Region Countries (GCC) to determine their differing perspectives regarding EHRs adoption, benefits and barriers.

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Appendix A: The First Case Study

International Perception of the Electronic Health Record: Benefits & Barriers

Despite emerging evidence about the benefits of Electronic Health Records (EHRs), there are considerable barriers to their adoption. Understanding these benefits and barriers is necessary to support the development and acceptance of EHRs. This questionnaire supports a study aiming to examine stakeholder opinions about EHR systems in four areas:

1. Attitudes regarding the barriers that actually affect the implementation of Electronic Health Records in different countries;

2. Attitudes regarding possible or actual strategic solutions to overcome these barriers;

3. Attitudes regarding the benefits of the Electronic Health Record;

4. Attitudes regarding the priorities for using the Electronic Health Record.

Note that for the purposes of this questionnaire, the terms computer-based patient record (CPR), computerized physician order entry (CPOE), electronic medical record (EMR) and electronic health record (EHR) are collectively referred to as EHRs.

This study is part of a PhD being undertaken at University College London. All answers will be treated in confidence.

Section 1- Demographics

1- What is your name?

2- In which country are you working now, and to which your answers in this questionnaire apply?

3- What is your main professional background?

4- What is your job role with respect to the adoption of the EHR?

Section 2- Barriers Affecting EHR Systems Adoption

Please describe what you consider to be the general position of Electronic Health Record systems users in your country, from their perspective.

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
Users have a good knowledge of using an EHR system.					
Users consider EHR systems to be useful in their field but think that the costs for a full EHR implementation are too high.					
Users are willing to make changes in their workflow in order to make more efficient use of HER systems.					
The fear of using technology is a barrier to the adoption of EHR systems by health care professionals.					
The adoption of an EHR system would be adversely affected by a vendor who is not stable enough to provide long term support.					
Users think that EHR systems are better at protecting the privacy of patients than paper-based medical records.					
Users think that EHR systems give patients better control over who has proper authorization to access their information.					
Users have sufficient computer literacy to use health IT technology in their workplace.					
Users already have sufficient skills to start using HER systems.					
Users are willing to undertake training to improve their skills in using EHR systems.					

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
Health professionals would prefer not to use computers directly but would rather someone else do the computer-related work for them.					
Users consider poor navigation in EHR systems a significant barrier.					
Users consider EHR systems to be more available than paper medical records.					
Users consider EHR system to be more reliable than paper medical records.					
Users consider interoperability and communication with other hospital EHR systems to be very important.					
Users believe that the lack of adoption of uniform standards limits the use of EHR systems.					

Please tick what you believe to be the 2 most significant obstacles from this list that effect the adoption of EHR systems in your country?

( ) Poor application design

( ) Different requirements by different professional groups

( ) The non-standard and exceptional nature of medical work

( ) The shift in the balance between the managerial and clinical uses of the EHR

( ) Mismatch between who benefits and who has increased work from using EHR systems

Is there another obstacle that you believe is more important than those in the list above?:

What are the 2 most important solutions to overcome theses barriers?

( ) Increased funding for the development of EHR systems

( ) Adoption of a uniform set of standards and terminology

( ) Provide in-service education and educational resources for health care   professionals

( ) Provide multilevel confidentiality for record sharing between healthcare organizations

(   ) Provide a well documented disaster recovery plan for the event of EHR system failure

Is there another solution that you believe is more important than those in the list above?:

What is the most important challenge that effects the adoption of the EHR Systems? Please tick only one answer.

(   ) Cost

(   ) Privacy and Confidentiality

(   ) Litigation Risks

Is there another challenge that you believe is more important than the one you have ticked above

Section 3- Attitude regarding the Benefits of the Electronic Health Record Systems

What are the 3 most important anticipated benefits of adopting Electronic Health Record Systems in your country?

(   ) Increase access and availability of patient information to multiple users

(   ) Improve the overall quality of the patient record

(   ) Make delivery of health care more efficient

(   ) Improve patient safety

(   ) Enhance the security and confidentially of health record information

(   ) Make management of chronic conditions more effective

(   ) Enhance the quality of patient care

(   ) Improve clinical decision making

(   ) Save money in the long term

(   ) Save physicians' time

(   ) Improved communication between health care professionals

(   ) Increase healthcare productivity

Is there another benefit that you believe is more important than the ones you have ticked above?

Section 4- Adoption approach of EHR Systems

1-Which are the 3 EHR systems modules or functions that you believe would show most benefits from early adoption (an early win).

(   ) Electronic discharge summaries (communicated to the patient's GP)

(   ) Review/sign-off of inpatient observation charts

(   ) Laboratory results (communicated to the wards, clinics and GPs)

(   ) Medical images (communicated to the wards, clinics and GPs)

(   ) Surgical notes (accessible across the hospital)

(   ) Appointments and scheduling (including availability for booking by GPs)

(   ) Patient financial data (for reimbursement, insurance, episode costing etc.,)

Other (please write your comments):

2- From the following list, please choose what is the most important factor that influences user acceptance of EHR systems?

(   ) Perceived ease of use

(   ) Perceived usefulness to the user and the user's clinical team

(   ) The ability to share information beyond the local care team

Other (please write your comments):

*Please could you provide your e-mail address if you would be happy for us to contact you later to arrange a short telephone interview to expand on some of your answers.

Thank you!

Bashayer Almutairi

Appendix B: The Second Case Study

KUWAIT HEALTHCARE PROFESSIONALSPERSPECTIVE ON ELECTRONIC HEALTH RECORD SYSTEM

(The information collected   is purely for study/research purpose and kept strictly confidential)

Section I – Demographic:

Date of Evaluation: Your Name:

   Your Gender: (   ) Female   (   ) Male

Your Age Group: (   ) Under 29 years (   ) 30-39 years   (   ) 40-49   (   ) 50 years or over

Years in Practice: Your title:

You are specialized in: (   ) Primary Care; (   ) Secondary Care; (   ) Tertiary Care Facility;

Your Email address (optional; if provided will help to contact for any further information):

Section II – Electronic Health Record System Existence and Availability:

Is an Electronic Health Record System implemented in your Healthcare Facility?

(   ) Not implemented at all – The healthcare facility does not have any Electronic Record System

(   ) Partially implemented – The healthcare facility has some Electronic Record System modules

      Installed in some units such as:_____

(   ) Hybrid system – The healthcare facility has Electronic Record System as well as Manual Records

Because_____
__

(   ) Fully implemented – The healthcare facility has a complete Electronic Health Record System and

      Paper based records are not used at all.

Date the EHR went into use in your organization:

How long have you yourself used this EHR in months?

Is electronic health record system in the hospital is connected to all the departments of the hospital?

( ) Yes   ( ) No   ( ) Don't Know

Are you good in using the Electronic Health Record System?

( ) Yes   ( ) No   ( ) Managing slowly

Have you received training course on the use of Electronic Health Record System?

( ) No   ( ) Getting trained   ( ) Yes

Section III: Does your Electronic Health Record System at your facility have below given features?

Features	Availability		Use			
	Yes	No	I do not use	I use some of them	I use most or all of the time	Not applicable to my facility
1. Patient Demographic						
2.Patient problem lists						
3. Order for laboratory tests						
3.1. If yes, are order sent electronically to lab?						
3.2. Viewing Lab result						
3.3. If yes, are out of range levels highlighted?						
4. Order for radiology tests						
4.1.If yes, are orders sent electronically to radiology						
4.2. Viewing Imaging results						

4.3. If yes, are electronic image easy to use and modified (i.e. able to enlarge it and viewing similar to manual x-ray system)					
5. Orders for other tests					
6.Clinical notes					
6.1. If yes, medical history , physical exam and progress notes using only "point and click technology (not typing, transcription or voice recognition)					
6.2. Create "free form" notes from transcription, typing or voice recognition					
6.3.Create notes using a combination of point-and-click and free-from technologies					
6.4.Create telephone messages					
6.5.Identify allergies					
6.6.Review progress notes					
6.7.Review prior vital signs					
6.8. Monitor current and past meds and medical refills					
6.9.Document patient care (overall)					
7. .Create and maintain					

medication list of each patient					
7.1.Receive drug-interaction alerts when writing prescription					
7.2.Receiving drug-allergy alerts when writing prescriptions					
7.3.Receive drug formulary information and alert when writing prescriptions					
7.4.Connect electronically or by e-fax to pharmacy					
7.5. Manage prescription writing (overall)					
8. Reminders for guideline-based interventions and/or screening tests					
9. Public Health reporting					
9.1. If yes, are notifiable diseases sent electronically?					
10. Monitor immunizations					
10.1. Receive alerts on health maintenance deficiencies					
10.2. Track health maintenance items (e.g., Pap, mammogram, colonoscopy)					
10.3.Track preventive care (overall)					

11. Identify providers covered on a patient's insurance						
12. Manage referrals (overall)						
13. Send e-faxes to outside physicians						
14. Access records remotely (e.g., chart access from home or remote transcriptionist access)						
15. Communications and remote access (overall)						

Section IV - BENEFITS OF ELECTRONIC HEALTH RECORD

Please answer the following questions:

Benefits	Strongly Agree	Disagree	Neutral or Uncertain	Agree	Strongly Disagree
Do you think Electronic Health Record System Improve the following and overall rendering efficient patient care……					
1. The quality of clinical decisions					
2.Communication with other providers					
3.Communication with your patients					
4.Timely access to medical records					
5.Prescription refills					
6.Avoiding medication errors					
7.Delivery of preventive care that meet guidelines					
8.Delivery of chronic illness care that meets guidelines					
9. Patient appointment/scheduling system					
10. The overall quality of care to patient					

Section V - BARRIERS OF ELECTRONIC HEATLH RECORD SYSTEM

From the following list, please indicate; how much of a barrier it is to adoption, even if you have no immediate plan to adopt.

Barriers	Major barrier	Minor barrier	Not a barrier
1.Lack of Electronic Health Record awareness			
2. Resistance to new technology			
3.Concern about loss productivity during the use of EHR System			
4.Lack of experience with use of computers			
5.Confidentiality and privacy concerns			
6. Security concerns regarding the use and access to EHR system			
7. Cost of Electronic Health Record System			
8. Instability of software providers			
9.Electronic Health Record software quality and ease of use			
10.Lack of adoption of uniform standards			
11.System maintenance and downtime			
12.Concerns that the system will become obsolete in providing the care for the patient			
13. Concern that the system is time consuming			
14. Inadequate hardware (PCs) in all the units of the hospital			
15.Concerns about loss of personal attention with patient as entering patient information in to the computer			
16. Concerns about loss of memory power due to			

availability of names of investigations, medications list etc. in the computer			
17. Concerns the EHR minimizes user data input			
18. Concern the EHR does not allow individual user-specific customization			
19. Concern of loss of clinical data			
20. What is your major barrier? (Please specify (list) them:			

Section VI – How Satisfied are you with each of the following aspect of your Electronic Health Record System?

Satisfaction	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
1.Ease to use the system					
2.Reliability of the system (i.e. system speed)					
3.Frequency of system failures					
4. Sharing of the medical information with other department or hospital					
5. Overall, how satisfied are you with the system at your facility					
6. Software interfaces between your EHR and another system					
6.1.Practice management system					
6.2. Laboratory system					

6.3.Radiology system					
6.4.Commercial pharmacies					
6.5. Hospital information system					
7. Can obtain previous records of patient instantly					
8. My writing work is reduced and feel comforTable with the system					
9. Indicate your overall satisfaction					
10. If you are very Satisfied OR Dissatisfied with the EHR system; please list the reason:					

Appendix C: The Third Case Study

Center for Health Informatics and Multiprofessional Education
at
University College of London

KUWAIT E-HEALTH STRATEGIC ROADMAP

By

BASHAIR ALMUTAIRI

Project Supervisors

PROFESSOR DIPAK KALRA

With

DOCTOR HENRY POTTS

ABSTRACT

The emerging health care system toward implementation of health information system particularly electronic health record introduces drastic changes into healthcare services. Therefore, the study would propose a strategic roadmap of E-health adoption for Kuwait Healthcare System by identifying solutions to overcome E-health barriers such as; technological, and organizational barriers and improving the quality and efficiency of E-health, such as; improving individual health care and maintenance of health, facilitating timely, accurate, and comprehensive communication among caregivers, ensuring confidentially and integrating of health-related information about individuals.

The E-health strategic framework is a directional study that propose high-plan to improve the development and implementation process of E-health for Kuwait Healthcare system. The E-health strategic roadmap describes a long-term vision with strong focus on tangible benefits that would be achieved over the next two-to-five years. The E-health strategic roadmap also describes the governance role that would take place in improving implementation process of the system.

Aim: To determine the fundamental requirements for successful sustainable implementation of e-health in Kuwait

Objectives:

- To determine the working priority for establishment of the core foundations for electronic information exchange across the health sector.
- To determine the working priority for adoption of EHRs solutions and tools to facilitating delivery of health care &information between the users of EHRs
- To determine the working priority for encouraging and enabling the user of health care system to adopt the EHRs solutions and change their work practices to be able to use them effectively
- To determine the working priority for establishment of appropriate national E-health governance structure and mechanisms
- To determine the working priority for improving quality, access, and productivity of health services

* Please note for the purpose of this study, the term E-health is collectively referred to as Electronic Health Record system

Improvement of Electronic Health Record System

Action 1: Identification and authentication

Working Priority	Improvement Time Frame	Improvement Priority
Identification and authentication	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Design and implement an identification and authentication system for information security

Evidence:

- 46.3% of International Health Professionals stated that EHRs provide better CONTROL over Information
- 83.9% of Kuwait Health Professionals stated that EHRs provide better CONTROL over Information

Action 2: Information protection and privacy

Establishment of a robust privacy and regulatory system to: authorize specific E-Health initiatives, and ensure appropriate privacy safeguards

and consent processes for access to and use of health information and participation in EHRs initiatives

Working Priority	Improvement Time Frame	Improvement Priority
Information protection and privacy	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 45.8% of International Health Professionals stated that EHRs is better system at protecting the PRIVACY of patient information
- 51.4% of Kuwait Health Care Professionals stated that EHR system PROTECT the privacy of patient information

Improvement of Electronic Health Record System

Action3: National EHRs information standards

Implementation and adoption of the EHRs standards to underpin the consistent and accurate collection and exchange of health information

Working Priority	Improvement Time Frame	Improvement Priority
National EHRs information standards	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 48.8% of International Health Professionals stated that LACK of adoption of uniform standards is barrier
- 97% of Kuwait Health Care Professionals stated that LACK of adoption of uniform standards is barrier

Action4: Investment in computing infrastructure

Establishment mechanisms to encourage private sectors to invest in the implementation and maintenance

of an acceptable baseline of computing infrastructure

Working Priority	Improvement Time Frame	Improvement Priority
Investment in computing infrastructure	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 63.4% of International Health Professionals stated that the adoption of EHR would be adversely affected by VENDOR,
  who is not stable enough to provide long-term support

- 58% of Kuwait Health Care Professionals are dissatisfied with EHRs RELIABILITY(i.e. system speed)

Improvement of Electronic Health Record System

Action5: National broadband services

Providing connectivity between all care providers, by engaging and collaborating with the government and telecommunications organizations to extend planned broadband connectivity infrastructure to all health care provider

Working Priority	Improvement Time Frame		Improvement Priority	
National broadband services	☐ Short term ☐ Medium term ☐ Long term		☐ High ☐ Low	
Comments:				

Evidence:

- 100% of Kuwait Health Care Professionals state that the communications and remote access features is NOT available

Action6: Adoption of Electronic information Sharing

Adoption of Electronic information sharing would improve the capability of clinical and practice management systems to support key electronic information flows between care providers. Electronic information sharing provides a basis for improved care planning, coordination and decision making at the point of care.

Working Priority	Improvement Time Frame		Improvement Priority	
6.1. Interoperability and communication of EHRs	☐ Short term ☐ Medium term ☐ Long term		☐ High ☐ Low	
Comments:				

Evidence:

- 63.4% of International Health Care Professionals are consider interoperability and communication of EHRs with each other is very important

- 96.8% of Kuwait Health Care Professionals are consider interoperability and communication of EHRs with each other is very important

Improvement of Electronic Health Record System

Working Priority	Improvement Time frame	Improvement Priority
6.2. Improving event summaries including discharge summaries, specialist reports and notifications	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
<u>Comments</u>:		

Evidence:

- 74% of Kuwait clinicians stated that they are NOT able to monitor immunizations
- 74% of Kuwait clinicians stated that they are NOT able to receive alerts on health maintenance deficiencies

Working Priority	Improvement Time Frame	Improvement Priority
6.3.Improving test orders and test results	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
<u>Comments</u>:		

Evidence:

- 62.7% of Kuwait clinicians stated that orders for laboratory & radiology tests ARE available
- 74% of Kuwait clinicians stated that viewing laboratory & radiology tests results are NOT available

Working Priority	Improvement Time Frame	Improvement Priority
6.4. Improving patient demographics	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
<u>Comments</u>:		

Evidence:

- 74% of Kuwait clinicians stated that patient demographics IS available and they USE it

Improvement of Electronic Health Record System

Working Priority	Improvement Time frame	Improvement Priority
6.5. adoption of electronic referrals system	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 74% of Kuwait clinicians stated that they are UNABLE to manage referrals electronically (i.e from PHC to ER, and Hospital)

Working Priority	Improvement Time Frame	Improvement Priority
6.6. Enriching the current health profile	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 62.7% of Kuwait clinicians stated that clinical notes, review of progress notes and review of vital signs ARE available and they USE it

Working Priority	Improvement Time Frame	Improvement Priority
6.7. Improving prescription management services	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 62.7% of Kuwait clinicians stated that manage prescription writing IS available and they USE it
- 87.8% of Kuwait clinicians stated that the pharmacy e-connect system IS available and they USE it

Improvement of Electronic Health Record System

Working Priority	Improvement Time Frame	Improvement Priority
6.8. Improving current medications list	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 74% of Kuwait clinicians stated that creation and maintenance of medications list of each patients IS available and they USE it

Action 7: Adoption of Service Delivery Tools

Encouraging the development of specific tools that improve the quality of health services

Working Priority	Improvement Time Frame	Improvement Priority
7.1. Decision support for medication management	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 87.8% of Kuwait clinicians stated that monitoring current and past medications& medical refill IS available and they USE it

- 87.8% of Kuwait clinicians stated that drug formation IS available and they USE it

Working Priority	Improvement Time Frame	Improvement Priority
7.2. Decision support chronic disease management solutions	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 62.7% of Kuwait clinicians stated that progress notes review IS available and they USE it

Improvement of Electronic Health Record System

Working Priority	Improvement Time Frame	Improvement Priority
7.3. Tele-health& electronic consultation support	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
<u>Comments</u>:		

Evidence:

- 100% of Kuwait clinicians stated that documentation telephone messages is NOT available

Action8: National awareness campaigns

Making care providers aware of EHRs solutions that are available to them and the benefits that use of these

E-Health solutions may provide, by involving media campaigns, to demonstrate examples of solutions web

based communication of EHRs status and success stories

Working Priority	Improvement Time frame	Improvement Priority
National awareness campaigns	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
<u>Comments</u>:		

Evidence:

- 37.5% of International Health Professionals stated that user DON'T have a good knowledge about EHRs
- 51.4% of International Health Professionals stated that the FEAR of using technology is a barrier
- 71.6% of Kuwait clinicians stated that lack of EHR AWARRNESS is a barrier
- 44.3% of Kuwait clinicians stated that they concerned LOSS of personal attention with patient as entering patient information is a barrier

Improvement of Electronic Health Record System

Action9: National care provider accreditation

Making adoption and use of E-health solutions as national prerequisite for professional accreditation of care providers (i.e. similar to ICDL)

Working Priority	Improvement Time frame	Improvement Priority
National care provider accreditation	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 68.1% of International Health Professionals stated that users ARE willing to undertake training to improve their skills in using EHRs

- 55.6% of International Health Professionals stated that users HAVE sufficient computer literacy to use health IT in their workplace

- 52.8% of International Health Professionals stated that users already HAVE sufficient skills to start using EHRs

Action10: Establishment of a National E-Health governing board

Include accountability for setting overall national E-Health direction and priorities, for reviewing and approving E-Health strategy and funding decisions and for the monitoring of progress against national E-Health strategy deliverables and outcomes

Working Priority	Applicable	Priority
Requirement adoption of National E-Health governing board	☐ Short term ☐ Medium term ☐ Long term ☐ Not applicable	☐ High ☐ Low
Comments:		

Improvement of Electronic Health Record System

Action11: Establishment of a National E-Health entity

This body should coordinate and oversee the E-Health strategy, investment and the execution of the national components

of the E-Health work program. The E-Health entity's operating model should support discrete functions focused on strategy,

investment management, work program execution, standards development and E-Health solutions compliance.

The national E-Health entity should be overseen and governed by the national E-Health governing board

Working Priority	Applicable	Priority
Establishment of National E-Health entity	☐ Short term ☐ Medium term ☐ Long term ☐ Not applicable	☐ High ☐ Low
Comments:		

Action12: Improving the quality of the health care services

Working Priority	Improvement Time Frame	Improvement Priority
Improving the quality of the health care services	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 22.2 % of International Health Professionals stated that the EHRs IMPROVE the overall quality of patient record
- 44% of Kuwait clinicians stated that EHRs IMPROVE the quality of clinical decisions

Improvement of Electronic Health Record System

Action13: Improving the access to the health care services

Working Priority	Improvement Time Frame	Improvement Priority
Improving the access to the health care services	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 50% of International Health Professionals stated that the EHRs increase ACCESS to multiple users
- 59% of Kuwait clinicians stated that EHRs IMPROVE timely access to medical records

Action14: Improving the productivity of health care services

Working Priority	Improvement Time Frame	Improvement Priority
Improving the productivity of health care services	☐ Short term ☐ Medium term ☐ Long term	☐ High ☐ Low
Comments:		

Evidence:

- 15.3% of International Health Professionals stated that the EHRs SAVE physicians time
- 13.9% of International Health Professionals stated that the EHRs INCREASE healthcare productivity
- 43.7 of Kuwait clinicians stated that they are concerned about losing PRODUCTIVITY during uses of EHRs

Appendix D: The First Request Letter to Conduct First Case Study at International Level

ROYAL FREE AND UNIVERSITY COLLEGE MEDICAL SCHOOL
UCL CHIME
Centre for Health Informatics and Multiprofessional Education

29th May 2008

Dear ISO, CEN, HL7 colleague

One of my university students is undertaking a PhD to investigate the barriers, benefits and incentives for the adoption of electronic health records in Kuwait. As part of her research, she would like to canvass opinions on the EHR barriers, benefits and incentives from those engaged in e-Health and health informatics standards adoption in other countries.

I would be grateful if you would be prepared to complete this 10-15 minute questionnaire, and to hand the paper copy back to me during our time in Goteborg (by Sunday lunch-time).

The survey will be reported anonymously in her thesis, but we have asked for your name and e-mail address in case we need to contact you for clarifications of your answers.

Please let me know if you have any questions about this survey.

With thanks and best wishes,

Dipak Kalra

d.kalra@chime.ucl.ac.uk

Appendix E: The Second Request Letter to Conduct First & Second Case Studies at National level (Kuwait)

ROYAL FREE AND UNIVERSITY COLLEGE MEDICAL SCHOOL
UCL CHIME
Centre for Health Informatics and Multiprofessional Education

24 June 2008

To whom it may concern

Subject : Potential Benefits of Electronic Health Record System for Kuwait Primary Care

Miss Bashair Almutairi a PhD student at University College London is currently collecting information to assist her with her dissertation entitled " Potential Benefits of Electronic Health Record System for Kuwait Primary Care ".

Please forward the survey to your stakeholders in the Ministry of Health at Kuwait who are interested in supporting Miss. Almutairi in gathering information to assist with her research.

Your time and effort in assessing Miss Almutairi in obtaining her PhD is very much appreciated

Yours faithfully,

Dr Dipak Kalra
Clinical Senior Lecturer in Health Informatics
Deputy Head of Department

Appendix F: The Ministry of Health Permission to Conduct First & Second Case Studies

STATE OF KUWAIT
MINISTRY OF HEALTH

دولة الكويت
وزارة الصحـــــة

Reference

Date

الرقم : وزصحا ع/.....ه.٦.٨
التاريخ : ٢٠٠٠.م/.٧.ا/....

السيد الدكتور/ وكيل الوزارة

تحية طيبة وبعد ،،

يرجى الإحاطة بأن اللجنة الفرعية المفوضة من اللجنة الدائمة لتنسيق البحوث الطبية والصحية لدراسة بروتوكولات أبحاث الطلبة قد قامت بدراسة البروتوكول المقدم من مبعوثة العامة للتعليم التطبيقى والتدريب) نظم معلومات صحية /.جامعة لندن ـ الهيئة دراسة الدكتوراة الباحثة /.بشاير عبدالله المطيرى التصور الدولى للملف الالكترونى : فوائده والحواجز المتعلقة به (تحت علوان :

International perception of the electronic Health record.

وقد أوصت اللجنة بتاريخ 2008/7/21 بالموافقة على البحث مع مراعاة تعهد الباحثة بالمحافظة على سرية البيانات الشخصية وعدم استخدام أي معلومات خارج نطاق الدراسة .

وحيث أن البحث يتم باستخدام إستبيان لأستطلاع وجه نظر عند 200 من السادة / مديراء المناطق الصحية والإدارات المركزية والمستشفيات ورؤساء الرعاية الأولية والأقسام وشاغلى المناصب الإشرافية بمراكز العمل المختلفة بالوزارة ، يرجى الاطلاع ومخاطبة السيد / الوكيل المساعد لشئون الرعاية الصحية والسيد / الوكيل المساعد لشئون ضبط الجودة والسيد / الوكيل المساعد لشئون الخدمات الطبية المساندة لإتخاذ اللازم لتسهيل مهمة الباحثة وفقاً للنظم والضوابط والإمكانيات المتاحة ، مع مراعاة ضرورة التزام الباحثة بالحصول على الموافقة المستنيرة المسبقة من المشاركين بالبحث (INFORMED CONSENT) وعدم تحمل الوزارة لأى تكاليف إضافية

وتفضلوا بقبول فائق الاحترام ...

رئيس اللجنة الدائمة
لتنسيق البحوث الطبية والصحية
الدكتور على يوسف السيف
وكيل الوزارة المساعد
للشئون المعاونة العامة

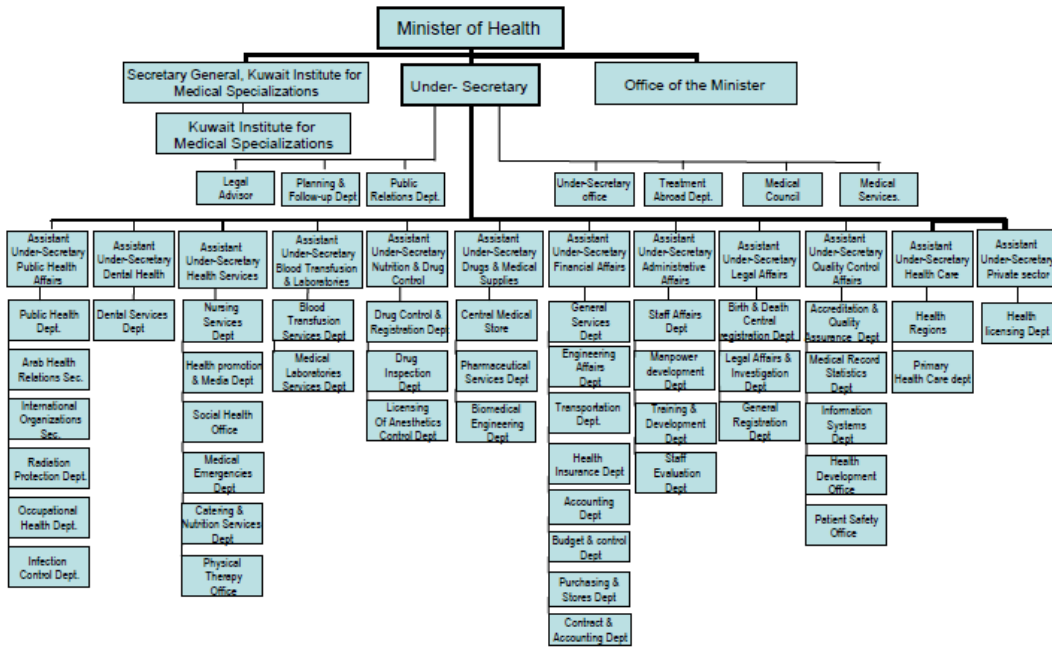برقيا : صحة الكويت
الوزارة المالية
ص . ب : ٥   ١٥١٩
الرمز البريدى للوزارة   ١٣٠٠١

المستودعات
٢٢٥٧٥

Cables : HEALTH KUWAIT
Admin.   Financial Affairs   Medical Stores
P.O. Box : 5   1519   #22575
E-Mail : health @ moh. gov. kw
Zip Code : 13001

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Appendix G: The Organizational Chart, Ministry of Health Kuwait

ORGANIZATIONAL CHART, MINISTRY OF HEALTH KUWAIT 2006

Minister of Health

Secretary General, Kuwait Institute for Medical Specializations

Under- Secretary

Office of the Minister

Kuwait Institute for Medical Specializations

Legal Advisor

Planning & Follow-up Dept

Public Relations Dept.

Under-Secretary office

Treatment Abroad Dept.

Medical Council

Medical Services.

Assistant Under-Secretary Public Health Affairs

Assistant Under-Secretary Dental Health

Assistant Under-Secretary Health Services

Assistant Under-Secretary Blood Transfusion & Laboratories

Assistant Under-Secretary Nutrition & Drug Control

Assistant Under-Secretary Drugs & Medical Supplies

Assistant Under-Secretary Financial Affairs

Assistant Under-Secretary Administrative Affairs

Assistant Under-Secretary Legal Affairs

Assistant Under-Secretary Quality Control Affairs

Assistant Under-Secretary Health Care

Assistant Under-Secretary Private sector

Public Health Dept.

Dental Services Dept

Nursing Services Dept

Blood Transfusion Services Dept

Drug Control & Registration Dep

Central Medical Store

General Services Dept

Staff Affairs Dept

Birth & Death Central registration Dept

Accreditation & Quality Assurance Dept

Health Regions

Health licensing Dept

Arab Health Relations Sec.

Health promotion & Media Dept

Medical Laboratories Services Dept

Drug Inspection Dept

Pharmaceutical Services Dept

Engineering Affairs Dept

Manpower development Dept

Legal Affairs & Investigation Dept

Medical Record Statistics Dept

Primary Health Care dept

International Organizations Sec.

Social Health Office

Licensing Of Anesthetics Control Dept

Biomedical Engineering Dept

Transportation Dept.

Training & Development Dept

General Registration Dept

Information Systems Dept

Radiation Protection Dept.

Medical Emergencies Dept

Health Insurance Dept

Staff Evaluation Dept

Health Development Office

Occupational Health Dept.

Catering & Nutrition Services Dept

Accounting Dept

Patient Safety Office

Infection Control Dept.

Physical Therapy Office

Budget & control Dept

Purchasing & Stores Dept

Contract & Accounting Dept

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Appendix H: The Ministry of Health Permission to Conduct Third Case Study

السيد وكيل الوزراة الصحة   المحترم

السيد الدكتور/ إبراهيم العبدالهادي   المحترم

تحية طيبة وبعد،،

مراقبة السجل العام
قسم الوارد
المرجع: ١١
الرقم الآلي: C٤٨٨
التاريخ: ٢٠١٠/١٠/٦

الموضوع: استبيان اراء السادة القياديين بالوزراة حول الصحة الاكترونية

بالاشارة الى الموضوع موافقتكم السابقة على قيامى باجراء دراسة رسالة الدكتوراة تحت عنوان: التصور الدولى للملف الصحى الاكتروني: فوائده والحواجز المتعلقه به. وذلك بعد توصية لجنة البحوث الطبية والصحية.

يرجي التفضل بالموافقة على تعميم استبيان المرفق على السادة القياديين بالوزراة لاستطلاع ارائهم حول موضوع الصحة الاكترونية استكمال لبحثى فى هذا الخصوص.

وتفضلوا بقبول فائق الاحترام والتقدير،،،

مقدمة الطلب
بشاير عبدالله المطيري
باحثة دكتوراة في
مجال نظم المعلومات
الصحية

٩٩٢٥٧٦٦١

د. إبراهيم عبدالله العبدالهادي
وكيل وزارة الصحة

*مرفق نسخة من تعميم الموافقة المسبقة

Appendix I: The Kuwait Government IT Projects/Activating the Role of Health Information

Project name:	Activating the Role of Health Information*	
Execution period: 4 years	Estimated cost (Per Thousand Dinars):	40,000

* Project budget in the context of the implementation of programs and targets in different government authorities in cooperation with the Ministry of finance.

Project objectives:

- Comprehensive application of information technology in all Ministry facilities to ensure the full mechanization of procedures and transactions and the database configuration for the sick and the reviewers.
- Create Portal which will link all the regulations of the Ministry of health, which operates on the Ministry of the Interior network (ENTERNAT) and with the Web (INTERNET).
- The Ministry's electronic service delivery through the Internet through E-Government Portal.
- Linking with all health offices via the Internet to take advantage of electronic file and other acts of the Ministry.

Participants:

- The Ministry of health
- The Ministry of finance
- Central Agency for information technology
- Civil Service Bureau

Operational steps:

Steps	09/2010	10/2011	11/2012	12/2013
- Expand the applications of automated system for primary health care (electronic file) and systems of hospitals and dental services and other facilities.				
- Completing the automated system of insurance/health insurance.				
- Application of automated system of financial affairs				
- Training and development of the performance of Ministry staff in the field of computing				
- Run the automated system of births and deaths				
- Run the automated system for port and border health				
- Information transfer network				
- Application of decision support system				
- Create Portal				
- Processing of emergency mechanism Chamber calculators				
- Create automated system for Engineering Affairs and public services				

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Appendix J: Glossary of Terms

ACHI : Advisory Committee on Health Infrastructure.

ADL : Archetypes Description Language.

AHIC : American Health Information Community .

AMA : American Medical Association.

AMIA : American Medical Informatics Association .

ASTM : American Society for Testing and Materials.

AIDS: Acquired immune deficiency syndrome

CAGR. : Compound Annual Growth Rate.

CCHIT : Certification Commission for Health Information Technology .

CCR : Continuity of Care Record.

CD-ROM.: Compact Disc Read-Only Memory.

CDA : Clinical Document Architecture.

CDA : Clinical Data Architecture .

CDC. : Centers for Disease Control and Preventation.

CDN : Canada Health Infoway's.

CDSSs : Computerised Clinical Decision Support Systems.

CEO : Chief Executive Officer .

CHIME : Centre for Health Informatics & Multiprofessional Education.

CIA. : Central Intelligence Agency.

CME : Continuing Medical Education.

COSTAR : COmputer Stored Ambulatory Record.

CPHIE : Customised and Personalised Health Information and Education .

CPOE : Computerised Provider Order Entry.

CPR : Computer-Based Patient Record.

CPRI : Computer-Based Patient Record Institute.

CRS : Care Record Summary.

CRS : Care Records Services.

DALE. : Disability -Adjusted Life Expectancy.

DALY. : Disablity-Adjusted Life Years.

DCHT : Danish Centre for Health Telematics .

DSL. : Digital Subscriber Line.

E-health : Electronic Health.

E-prescribing : Electronic Prescribing .

EC : European Commission .

EHCR : Electronic Health Care Record.

EHR : Electronic Health Record.

EMR : Electronic Medical Record.

EPR : Electronic Patient Record.

Es : Essential Elements.

FOM: Faculty Of Medicine.

GDP. : Gross Domestic Product.

GFATM. : Global Fund to Fight, Tuberculosis and Malaria.

GPs. : General Practitioners.

HCMIS. : Health Care Managment Information System.

HELP : Health Evaluation through Logical Processing.

HFMA : Healthcare Financial Management Association .

HHS : Health and Human Services.

HIMSS : Health Information and Managment Systems Socitey.

HIPAA : Health Insurance Portability and Accountability Act .

HIS. : Health Information System.

HIT : Health Information Technology.

HITSP : Healthcare Information Technology Standards Panel.

HIV/AIDS. : The human immunodeficiency virus/Acquired immune deficiency syndrome

HL7 : Health Level Seven.

HLF. : Health For All. `

HTA : Health Technology Assessment.

IBM. : International Business Machines.

ICD : International Classification Diseases.

ICDL. : International Computer Driving Licence.

ICEHR : Integrated Care Electronic Health Record.

ICT. : Information and Communication Technologies.

ICT : Information and Communication Technology.

IHE : Integration the Healthcare Environment.

IHTSDO: International Health Terminology Standards Development Organisation.

IOM : Institute of Medicine.

IP : Internet Protocol.

IPSec : Internet protocol security.

ISO : International Standards Organisation.

ISO/TC : International Standards Organisation/Technical Committees.

ISPs. : Internet Service Providers.

ISs : Information Systems.

IT. : Information Technology.

ITU. : International Telecommunication Union's.

JCAHO.: Joint Commission on Accreditation of Healthcare Organization.

KD. : Kuwait Dinner.

KFAS. : Kuwait Foundation for the Advancement of Sciences.

LHP : Lifetime Health Plan.

LOINC : Logical Observation: Identifiers, Names, and Codes.

MCH. : Maternal and Child Health.

MMS : Massachusetts Medical Society .

MOH. : Ministry of Health.

MPI. : Master Patient Index.

MRI : Medical Records Institute .

NAHIT : National Alliance for Health Information Technology.

NCPDP : National Council for Prescription Drug Programs'.

NEHTA : National eHealth Transition Authority .

NGOs. : Non-Govermental Organisations.

NHIS/SA : National Health Information System for South Africa Committee .

NHS. : National Health Service.

NIH : National Institutes of Health

NITA : National Information Technology Agenda .

ONC : Office of the National Coordinator for Health Information Technology.

ONCHIT : Office of the National Coordinator for Health Information Technology.

PAAET : Public Authority for Applied Education and Training .

PAHO. : Pan American Health Organization.

PC : Personal Computer.

PCs. : Personal Computers.

PHC. : Primary Health Care.

PIPEDA : Personal Information Protection and Electronic Document Act .

PKI : Public Key Infrastructure.

SDOs : Standard-developing organizations .

SEHR : Sharable Electronic Health Record.

SMS. : Short Message Service.

SNOMED-CT : Systematised Nomenclature of Human and Veterinary Medicine-Clinical Terns.

SSL : Secure Socket Layer.

TC : Telehealth Consultation Applications .

TMR : The Medical Record.

TRICARE : Health Care program Serving Uniformed Service Members, Retirees and their Families Worldwide.

TV. : Television.

UAE: United Arab Emirates.

UK.: United Kingdom.

UNDP.: United Nation's Development Programme.

UNICEF. : United Nations Children's Fund.

UNIX.: UNiplexed Information and Computing System.

UNMIK. : United Nations Mission in Kossovo.

US : United State.

VHA : Veterans Health Administration.

VistA : Veterans Health Information System and Technology Architecture.

WHO. : World Health Organization.

WSIS. : World Summit on the Information Society.

Wi-Fi: Wireless Standard for Connecting Electronic Devices

XML : Extensible Markup Language.

YLD. : Year Lived With Disability.

YLL. : Years Of Life Lost.

3G:Third Generation