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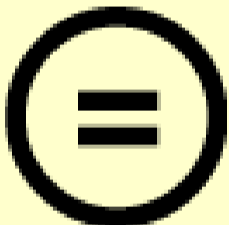
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***Electronic Patient Records System in Hamad Medical  
Corporation, Qatar: Perspectives and Potential Use***

***By***

***Foziyah H. Abdullah***

***A Doctoral Thesis Submitted in Partial Fulfilment of the Requirements  
for the Award of the Degree of Doctor of Philosophy of Loughborough  
University***

***August 2007***

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## ***ABSTRACT***

Since the 1990 the use of Electronic Patient Records (EPR) in health services has become increasingly prevalent world wide. EPR has become an important aspect of the continuous improvement of patient care. Transferring all patient records from paper based to electronic is now a priority for many health services.

The research reported in this thesis is sponsored by Hamad Medical Corporation (HMC) to provide opportunity to explore the potential role for EPR in the Medical Records Department. The study has been designed to gain better understanding of the users perspectives with regard to the use of patient records. In order to analyse and understand the complex dynamic involved in the management and use of patient records, it was recognised that systems thinking offered an appropriate framework for this research. Soft System Methodology (SSM) was therefore applied to the analysis of the data and used to inform the development of a conceptual model.

Using SSM in combination with the structured questionnaire survey and telephone semi-structured interview, triangulation of methods was achieved. Use of these generated rich data revealing for example the general dissatisfaction expressed with the existing manual patient records system, the lack of confidentiality, poor legibility, shortage of space and the frequent misfiling of records. The need to address these problems has informed the strategic plan for the development and implementation of EPR for HMC. The research has successfully addressed the stated aims and research questions and guided the formulation of proposals for improvements.

**Keywords:** Medical Records Department, Hamad Medical Corporation (HMC), Qatar, Electronic Patient Records, Soft System Methodology (SSM), Sociotechnical Systems, Information Technology (IT), National Health Services (NHS).

## ***DEDICATION***

This thesis is dedicated in loving memory of my mother Zalikha and father Hussain, and husband Ali who have been delightful and supportive during this period. Finally, I dedicate this thesis to my wonderful beloved children, Abdullah, Sheikha, Hussain, and Al-Maha, without their encouragement, patience and selfless support, the thesis would not have been possible and which made this dream come true.

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# Table of Contents

<b>Chapter 1</b> .....	1
<b>Introduction</b> .....	1
1.1 Background to the Development of Electronic Patient Records .....	1
1.2 Wider Context.....	3
1.3 Motivation for Undertaking this Study .....	4
1.4 Statement of the Study Problem .....	5
<i>Research Questions:</i> .....	5
1.5 Study Aims and Objectives.....	6
1.5.1 Study Aims: .....	6
1.5.2 Study Objectives: .....	7
1.6 Definition of Terms.....	7
1- Medical Records .....	7
2- Manual Patient Records .....	8
3- Electronic Patient Records (EPR) .....	8
1.7 Justification of the Study .....	8
1.8 Significance of the Study .....	9
1.9 Structure of the Thesis .....	9
<b>Chapter 2</b> .....	13
<b>Literature Review</b> .....	13
2.1 Introduction.....	13
2.2 Sources Used.....	13
2.3 History and Development of Medical Records.....	13
2.3.1 From Earliest Times to 1969.....	13
2.3.2 <i>The History and Development of Manual Medical Records from 1970-2000</i> .....	16
2.3.3 <i>The Introduction of Electronic Patient Record (EPR)</i> .....	18
<i>Access to Information</i> .....	25
<i>Retrieval of Information</i> .....	26
2.4 Development of Electronic Patient Records (EPR) .....	28
2.5 International Adoption of EPR Systems .....	30
2.5.1 Development of European EPR Systems.....	30
<i>United Kingdom (UK)</i> .....	30
2.5.1.1 <i>Main Issues Pertaining to the Introduction of EPR in UK</i> .....	31
2.5.1.2 <i>Legal Issues with EPR in UK</i> .....	34
2.5.1.3 <i>Main Issues Pertaining to the Introduction of EPR in Other European</i> <i>Countries</i> .....	35
2.5.1.4 <i>Legal Issues in EPR in European Countries</i> .....	37
2.5.2 <i>Introduction of EPR in Australia and New Zealand</i> .....	38
2.5.3 <i>Development of EPR in United States of America (USA) and Canada</i> .....	39
2.5.3.1 <i>Legal Issues in EPR in USA and Canada</i> .....	41
2.5.4 <i>Introduction of EPR in Israel</i> .....	43
2.5.5 <i>Introduction of EPR in Japan and Hong Kong</i> .....	44
2.5.6 <i>How EPR Could Develop in the Middle East</i> .....	45
2.6 Advantages and Benefits of the Electronic Record System.....	46
2.6.1 <i>The Benefits of EPR System for Doctors, Medical Staff, and Administrators</i> .....	46

2.6.2	<i>How EPR Systems Can Save Time and Space</i>	49
2.6.3	<i>The Benefits of EPR Systems for Patient Care</i>	52
2.6.4	<i>Financial Advantages of EPR System</i>	54
	<i>Cost Saving</i>	54
2.7	<i>Difficulties &amp; Disadvantages of EPR System</i>	55
2.7.1	<i>Difficulties in Introducing an EPR System</i>	55
2.7.2	<i>Confidentiality</i>	57
2.7.3	<i>Financial Problems</i>	61
2.8	<i>Systems Thinking</i>	62
2.8.1	<i>Applications of Soft System Methodology (SSM)</i>	62
2.9	<i>Gaps in the Literature</i>	64
2.10	<i>Summary</i>	64
Chapter 3		67
<i>Research Methods</i>		67
3.1	<i>Introduction</i>	67
3.2	<i>Definition of Research</i>	69
3.3	<i>Research Philosophy</i>	69
3.3.1	<i>Positivist Approach and Quantitative Research</i>	69
3.3.2	<i>Constructivist/Interpretivist Approach and Qualitative Research</i>	70
3.4	<i>Research Approaches</i>	71
3.5	<i>Research Design for Study in Qatar</i>	75
3.5.1	<i>Quantitative and Qualitative Research Methods</i>	75
3.5.1.1	<i>Quantitative Research Methods</i>	75
3.5.1.2	<i>Qualitative Research Methods</i>	76
3.6	<i>Data Collection Tools</i>	77
3.6.1	<i>Questionnaires</i>	77
	<i>Advantages and Disadvantages of Questionnaires</i>	78
	<i>Likert Scales</i>	79
	<i>Questionnaire Design</i>	79
	<i>Pilot Study for Questionnaires</i>	82
3.7	<i>Interviews</i>	83
3.7.1	<i>Semi-Structured Interviews</i>	83
	<i>Strengths and Weaknesses of Semi-Structured Interviews</i>	84
3.7.2	<i>Telephone Interviews</i>	85
	<i>Advantages of Telephone Interviews</i>	86
	<i>Disadvantages of Telephone Interviews</i>	87
3.8	<i>Soft System Methodology (SSM)</i>	88
	<i>The Seven Stages of Soft System Methodology</i>	91
3.9	<i>Data Analysis</i>	99
	<i>Coding</i>	101
3.10	<i>Triangulation</i>	103
3.11	<i>Validity and Reliability</i>	104
3.12	<i>Ethical Considerations and Access</i>	105
3.13	<i>Research Procedure for this Study</i>	107
	<i>Pilot Study for Telephone Interviews</i>	110
	<i>Analysis and Importance of the Pilot Study Semi-Structured Telephone Interviews</i>	111
3.14	<i>Limitations of the Study</i>	115
Chapter 4		117



<i>The State of Qatar and its Health Services</i> .....	117
4.1 Introduction.....	117
4.1.1 <i>Geography and Population of Qatar</i> .....	117
4.1.2 <i>Independence of Qatar</i> .....	119
4.1.3 <i>Development of Qatar's Economy</i> .....	119
4.2 The Health Services System in the State of Qatar .....	120
4.3 Hamad Medical Corporation (HMC).....	121
4.4 Profiles of Hamad Medical Corporation Sites .....	124
4.4.1 <i>Hamad General Hospital (HGH)</i> .....	124
4.4.2 <i>Women's Hospital</i> .....	124
4.4.3 <i>Rumailah Hospital</i> .....	125
4.4.4 <i>Al-Amal Hospital</i> .....	125
4.5 The Medical Records Department .....	127
4.5.1 <i>Filing Section</i> .....	128
4.5.2 <i>Transcription Section</i> .....	129
4.5.3 <i>Coding Section</i> .....	129
4.6 Staffing Implications.....	131
4.7 Electronic Patient Record .....	133
4.8 Summary .....	133
<i>Chapter 5</i> .....	135
<i>Data Findings of the Questionnaire</i> .....	135
5.1 Introduction.....	135
5.2 Preliminary Findings.....	136
5.3 Response Rate .....	138
5.4 Data Analysis .....	139
5.4.1 <i>Demographic Data</i> .....	139
5.4.1.1 <i>Age and Gender</i> .....	139
5.4.1.2 <i>Academic Qualifications</i> .....	140
5.4.1.3 <i>Nationality</i> .....	141
5.4.1.4 <i>Position</i> .....	141
5.4.1.5 <i>Departments</i> .....	142
5.4.1.6 <i>Profession by Age Profile</i> .....	143
5.4.1.7 <i>Years of Experience by Age Profile</i> .....	144
5.4.1.9 <i>Years of Experience by Gender Profile</i> .....	145
5.4.2 <i>Opinions and Attitudes towards the EPR</i> .....	146
5.4.2.1 <i>Improving Patient Care</i> .....	146
5.4.2.2 <i>Patient Satisfaction</i> .....	150
5.4.2.3 <i>Physician Satisfaction</i> .....	152
5.4.2.4 <i>Medical Error Reduction</i> .....	155
5.4.2.5 <i>Cost Reduction for EPR System in the Long Term</i> .....	157
5.4.2.6 <i>Education and Training</i> .....	160
5.4.2.7 <i>Standard Terminology</i> .....	164
5.4.3 <i>Security and Confidentiality Issues</i> .....	166
5.4.3.1 <i>Security of EPR Access</i> .....	166
5.4.3.2 <i>EPR secure from Unauthorised Access</i> .....	168
5.4.4 <i>The Main Benefits of EPR Systems</i> .....	172
5.4.4.1 <i>Reduction of Healthcare Delivery Costs</i> .....	172
5.4.4.2 <i>EPR Support Access at Remote Location</i> .....	174
5.4.4.3 <i>EPR will Reduce Medical Errors</i> .....	175

5.5 Summary .....	178
<b>Chapter 6</b> .....	180
<i>Interview Analysis</i> .....	180
6.1 Introduction.....	180
6.2 Analysis and Importance of the Pilot Study Semi-structured Telephone Interviews.....	181
6.3 Difficulties Encountered in the Telephone Interviews .....	181
6.4 Reactions to the Existing Manual Patient Records System .....	182
6.4.1 <i>Difficulty in Obtaining Patient Records</i> .....	182
6.4.2 <i>Experiences with Handwriting in the Existing Patient Records System...</i>	186
6.4.3 <i>Transfer of the Manual Information from one Hospital to Others</i> .....	188
6.4.4 <i>Lack of Confidentiality in the Existing Manual System</i> .....	192
6.5 Attitudes Towards the Introduction of an Electronic Patient Record (EPR) System.....	195
6.5.1 <i>Advantages of EPR System</i> .....	195
6.5.2 <i>Disadvantages and Barriers of Introducing an EPR System</i> .....	198
6.5.3 <i>Training</i> .....	200
6.6 The Difficult Issue of Changing from Manual to Electronic Patient Record ..	202
6.7 Summary .....	205
<b>Chapter 7</b> .....	206
<i>Systems Intervention</i> .....	206
7.1 Introduction.....	206
7.2 SSM Stage One: Analysing the Current Problem Situation .....	207
7.2.1 <i>Decision Makers' Perspective</i> .....	209
7.2.2 <i>Administrative Issues in Relation to Patient Records</i> .....	210
7.2.3 <i>Perspective of the Medical Records Users</i> .....	210
7.3 SSM Stage Two: The Problem Situation Expressed (Structured) .....	214
7.3.1 <i>The Rich Picture (RP) Expression</i> .....	215
7.4 Stage Three of SSM: Root Definition of the Relevant System .....	218
7.4.1 <i>Problem Themes Identified</i> .....	218
7.4.2 <i>Root Definitions</i> .....	220
7.5 SSM Stage Four: Creating Conceptual Models .....	222
7.6 Summary .....	227
<b>Chapter 8</b> .....	228
<i>Discussion</i> .....	228
8.1 Introduction.....	228
8.2 Characteristics Affecting the Introduction of EPR .....	230
8.3 Investigation of the Existing Manual System .....	232
8.3.1 <i>Difficulties Experienced with the Existing Manual System</i> .....	232
8.3.2 <i>Confidentiality in the Existing Manual Patient Record System</i> .....	235
8.3.3 <i>Legibility</i> .....	237
8.4 Introducing an EPR System .....	240
8.4.1 <i>Management of Change</i> .....	241
8.4.2 <i>Security System in EPR</i> .....	245
8.4.3 <i>Confidentiality issues in EPR system</i> .....	248
8.4.4 <i>The use of an EPR system to improve patient care</i> .....	251
8.4.5 <i>Cost</i> .....	255
8.4.6 <i>Cultural Attitudes</i> .....	256
8.4.7 <i>Barriers to the Introduction of an EPR System</i> .....	256

8.5 Contribution of the Soft Systems Analytical Approach to Medical Records ..	258
8.6 Summary .....	259
<i>Chapter 9</i> .....	261
<i>Conclusions and Recommendations</i> .....	261
9.1 Introduction.....	261
9.2 Overview of the Study Findings .....	261
9.2.1 <i>Manual Patient Records at HMC</i> .....	262
9.2.2 <i>Investigating the potential use and management of EPR at HMC</i> .....	263
There was general agreement that an EPR system would provide immediate access at .....	264
a distance from all locations, and this would improve the management of medical records.....	264
9.2.3 <i>Standardisation of patient records</i> .....	265
9.2.4 <i>Training Needs</i> .....	266
9.3 The Relationship of the Study Findings to the Research Questions.....	268
9.4 Reflection on methodology for this study.....	270
9.5 Limitations of the study .....	271
9.6 Recommendations.....	272
9.7 Suggestions for Further Research .....	275
<i>References</i> .....	277
<i>Appendices</i> .....	327
Appendix 1 Questionnaire Participants Letter .....	328
Appendix 2 Questionnaire .....	329
Appendix 3 Permission for Telephone Interview .....	333
Appendix 4 Approval Letter from Administration Director.....	334
Appendix 5 Telephone Interview Questions.....	335

## ***List of Figures***

Figure 1.1 Overview of the Research Process.....	12
Figure 2.1 Comparison between manual and electronic patient record systems.....	25
Figure 2.2 Comparisons between Manual and Electronic Patient Record in Time/Access Levels.....	27
Figure 2.3 Benefit of an Electronic Patient Record System.....	66
Figure 3.1 Research Methods.....	68
Figure 4.1 Qatar Map.....	118
Figure 4.2 HMC Organization Chart.....	123
Figure 4.3 Hamad Medical Corporation.....	126
Figure 4.4 Medical Record Department.....	130
Figure 4.5 HMR organisation chart.....	132
Figure 4.6 Conceptual Map of Electronic Patient Records.....	134
Figure 5.1 Age of the Respondents.....	140
Figure 5.2 Qualifications of Respondents.....	141
Figure 5.3 Current Position of Respondents.....	142
Figure 5.4 Working Place Respondents.....	143
Figure 5.5 Profession by age profile.....	144
Figure 5.6 Years of experience by age profile.....	145
Figure 5.7 Years of experience by gender profile.....	146
Figure 5.8 Respondents age and improvement of patient care via EPR.....	147
Figure 5.9 Years of experience and improvement of patient care via EPR.....	148
Figure 5.10 Level of education and improvement of patient care via EPR.....	149
Figure 5.11 Gender and improvement of patient care via EPR.....	150
Figure 5.12 Nationality and increasing patient satisfaction via EPR.....	151
Figure 5.13 Respondents' profession and increase in patient satisfaction via EPR..	152
Figure 5.14 Age and increase in physician satisfaction via EPR.....	153
Figure 5.15 Gender and increase in physician satisfaction via EPR.....	154
Figure 5.16 Qualifications and increasing physician satisfaction via EPR.....	155
Figure 5.17 Age and medical errors reduction via EPR.....	156
Figure 5.18 Profession and medical errors reduction via EPR.....	157
Figure 5.19 Gender and healthcare costs reduction via EPR.....	158
Figure 5.20 Nationality and healthcare costs reduction via EPR.....	159
Figure 5.21 Years of experience and healthcare costs reduction via EPR.....	160
Figure 5.22 Age of respondents and advantage of training for the EPR.....	161
Figure 5.23 Qualification and advantage of training for the EPR.....	162
Figure 5.24 Nationality of respondents and advantage of training for the EPR.....	163
Figure 5.25 Age of respondents and the important of standard terminology for EPR system.....	164
Figure 5.26 Profession of respondents and the important of standard terminology for EPR system.....	165
Figure 5.27 Nationality of respondents and the security of EPR access.....	166
Figure 5.28 Qualification of respondents and the security of EPR access.....	167
Figure 5.29 Age of respondents and the security of EPR from unauthorised access	168

Figure 5.30 Qualification of respondents and the security of EPR from unauthorised access.....	169
Figure 5.31 Profession and confidence of erasure and corruption of EPR.....	170
Figure 5.32 Hospital experience of respondents and confidence in erasure and corruption of EPR.....	171
Figure 5.33 Age and reduction of healthcare costs via EPR.....	173
Figure 5.34 Profession and reduction of healthcare cost via EPR.....	173
Figure 5.35 Gender and support access at remote locations via EPR.....	174
Figure 5.36 Profession and support access at remote locations via EPR.....	175
Figure 5.37 Profession and reduction of medical errors via EPR.....	176
Figure 5.38 Hospital experience respondents and reduction of medical errors via EPR.....	177
Figure 7.1 Research Problem Situation (Stage 1).....	208
Figure 7.2 Rich Picture: holistic view.....	217
Figure 7.3 Conceptual model of the socio- technical system.....	225
Figure 7.4 Conceptual model of the information management and cooperation system .....	226
Figure 8.1 Roadmap of Issues Discussed.....	229

## *List of Tables*

Table 3.1 The Stratified Sample .....	109
Table 3.2 The Participants in Telephone Interviews (HMC).....	112
Table 5.1 Simple Stratified Random Sampling .....	138
Table 9.1 Outline Recommendations.....	272

## *Acronyms and abbreviations*

<i>Abbreviation</i>	<i>Meaning</i>
ACS	The American College of Surgeons
BMA	British Medical Association
BMJ	British Medical Journal
CAQDAS	Computer Assisted Qualitative Data Analysis
CBPR	Computerised Based Patient Record
CPRI	Computerised Patient Record Institute
CPR	Computerise Patient Record
DOH	Department of Health. Responsible for healthcare in England and Wales
EEGs	Electroencephalogram
EHR	Electronic Health Record
EMRs	Electronic Medical Records
EPR	Electronic Patient Record
GCC	Gulf Co-Operation Council
GP	General Practitioner, this is used in the UK and Australian sense of a family doctor or family physician
HMC	Hamad Medical Corporation
HMR	Hamad Medical Record
ICD-10-CM	International Classification Diseases
IOM	Institute of Medicine

IS	Information System
IT	Information Technology
IVF	In Vitro Fertilization
MGH	Massachusetts General Hospital
MJA	Medical Journal of Australia
MPI	Master Patients Index
MRD	Medical Record Department
NHS	National Health Service
PAC	Point and Click
PBR	Paper Based Record
PHC	Primary Healthcare
PIN	Personal Identification Number
PRIMIS	Primary Care Information Services
SHC	Secondary Healthcare
SPSS	Statistical Package for the Social Sciences
RD	Root Definition
RP	Rich Picture
SSM	Soft System Methodology
TB	Tuberculosis
TV	Television
UAE	United Arab Emirates
UK	United Kingdom
UPR	Unified Patient Record
USA	United State of America
WHO	World Health Organisation



## *Chapter 1*

### *Introduction*

#### *1.1 Background to the Development of Electronic Patient Records*

The latter half of the 20<sup>th</sup> century saw a rapid development of the use of information technology, fuelled mainly by advances in computing technologies. In the 1960s and 1970s the functions of computers were limited to simple applications run on a mainframe the size of a large filing room. Successful attempts at increasing computing power while decreasing size and cost saw the introduction of the first personal computer in the early 1980s. A linear relationship between computing power and time meant that the speed of execution of computer algorithms doubled every 18 months, again with cost and size decreasing over time at a similar rate. This linear relationship became known as 'Moore's Law' after Gordon Moore, the CEO of Intel Corporation who first reported this phenomenon. As health systems have always provided an opportunity for early adoption of technologies, the development of patient data management systems from the 1960s progressed to electronic patient record (EPR) system in the 2000s.

The introduction of a nationwide electronic system involves training staff from different sections of the medical services, so that all are able to access, where appropriate, information which has been recorded in a standard way. Computerised

training materials would need to be developed in addition to practical sessions with typical examples of how information about patients and their treatments are to be recorded, so that all become familiar with the accepted methods. All types of EPR systems have the advantage that they enable patient records to be available instantly and simultaneously in different places, where data can also be entered thus reducing administrative problems. The speed at which electronic records can be generated, accessed and amended is a major benefit, in addition to legibility. The rationale includes improving obtaining, storing and distributing information. One important benefit of an EPR system is that records need to be made once only, eliminating possible of errors in copying data for a variety of uses. Manual records in hospitals are often not readily available, because they are used by a variety of people, and vital time can be lost in locating them during emergencies, whereas EPR can be accessed simultaneously at different locations. When manual patient records are stored by individual hospitals there can be fatal delays in emergencies if patients are treated at different hospitals. Sometimes patients' manual records of previous treatment are elsewhere causing delays and difficulties which could be detrimental, and would not occur if EPR systems were used.

### ***Content of this Chapter***

This chapter describes the development of EPR and explains the rationale and motivation for conducting this study in the context of the health services and hospitals in Qatar. The aims, objectives and research questions are specified and the terms used are defined. Finally the structure of the thesis is explained and presented in diagrammatic form to assist understanding of the contents.

The overall purpose of this study is to improve patient record keeping in the Qatar health services which at present uses a manual system for both hospitals and GP (General Practitioner) records. This study has three components: the first analyses and documents the current system. The second investigates the benefits and difficulties of introducing electronic patient records nationwide. The third component addresses the future requirements for planning design.

The literature on electronic systems in use in other countries and the problems of introducing them has been reviewed to inform this research and is reported in Chapter 2.

## *1.2 Wider Context*

From the general literature, it is evident that the introduction of EPR usage has resulted in beneficial outcomes in many cases: it appears that international reactions have often been favourable wherever the system has been implemented. A characteristic of the change to EPR in the countries where it has been adopted is that the new systems have been more readily accepted than anticipated (Seland, 2002; Young, 2000; Hippisley et al 2003; and Brian & Shabot, 2005 ).

Some significant disadvantages to implementing EPR have also been identified but these are in the minority (Hayrinen et al 2004; Faber 2003; and Loomis & Ries 2002). Much has been written about the problems associated with manual record systems in comparison with EPR. The problems cited include the loss of information or the inadequacies of recorded information, and the length of time involved in

retrieving it. The introduction of EPR has been highlighted in medical literature in recent years as a significant development (Novak, 2005 and Smith, 2003).

### ***1.3 Motivation for Undertaking this Study***

This study was undertaken to in order to benefit stakeholders in the health sector and through minimising the incidence of errors in managing patient records. More specific motivations were to gain understanding of the issues associated with patient records; to identify the needs of their users; to explore the potential for introducing EPR; and to develop plans for possible implementation of a future EPR system in Qatar.

Personal experience of the health service record system in Massachusetts General Hospital (MGH) in Boston, USA was the motivation for investigating how improvements could be made in Qatar, which would benefit both patients and medical professionals. The problems and the benefits of introducing electronic record keeping for patients have therefore been the focus of investigation in this study.

Having investigated the use of the computerised systems in USA & UK, similar systems can be introduced in Qatar to facilitate access to information in patient records. However, several obstacles are anticipated, which include the difficulty of changing traditional attitudes, designing an appropriate training programme and the need for a 'backup' system. Management of change will therefore need to be undertaken systematically.

### ***1.4 Statement of the Study Problem***

As Mauch & Park (2003, p.110) noted “the statement of the problem is a short section but perhaps the most important. Do not promise more than is necessary”.

This study will investigate and analyse the current PR situation in the Hamad Medical Corporation in the capital of Qatar. The deficiencies in the existing system will be identified.

The literature suggests that the greatest anxiety associated with patient records relates to privacy, and it is essential for both patients and staff to be assured that an electronic system fulfils this requirement satisfactorily (Waters & Murphy 1983). Confidentiality and security were also reported to be of greatest importance and the information recorded tended to be that which clinicians rather than other users required. (Cassidy 2002, Mount et al 2000).

The literature and the personal experience of the researcher suggest the need for a unified system for all medical records in Qatar in order to provide a framework which will enable easy access for authorised staff whilst preserving confidentiality for patients. This study seeks to examine this proposition systematically and to provide answers to the following research questions:

#### ***Research Questions:***

1. What are the potential advantages and disadvantages of introducing and using an EPR system for medical records in Hamad Medical Corporation (HMC) in

the context of increasing use of Information Technology (IT) in the health services?

2. What are the design requirements for the developing an effective EPR system in HMC?
3. What are the attributes of a conceptual model for an EPR system which is appropriate within the existing culture in HMC?

## ***1.5 Study Aims and Objectives***

### ***1.5.1 Study Aims:***

1. To examine the documented advantages and disadvantages of the use of EPR systems implemented in other countries.
2. To investigate systematically the potential for using an EPR system in HMC.
3. To develop an appropriate conceptual model of an EPR system suitable for use in HMC in Qatar, considering the cultural attitudes and environment, together with the practical considerations.

**1.5.2 Study Objectives:**

1. To investigate the use of the existing manual patient records system at HMC hospitals in Qatar.
2. To investigate how an EPR system could improve access to and management of HMC medical records.
3. To establish how patient records could be standardised.
4. To identify training needs for the HMC staff (clerical and medical).
5. To investigate possible barriers to the introduction of an EPR system.
6. To develop a strategic plan for the development and implementation of an EPR.

**1.6 Definition of Terms****1- Medical Records**

Medical record is to be understood to refer to any record kept on a patient in an outpatient or inpatient department of a medical institution, which provides a history of a patient and serves as the basis for diagnosis and treatment of patients.

***2- Manual Patient Records***

The term Manual Patient Records is used to refer to any system which is organised around a Paper Based Record (PBR) and human means of access of such records. These records are in conventional handwritten formats, and record patients' treatments and progress.

***3- Electronic Patient Records (EPR)***

Electronic Patient Records are used to refer to systems which are automated and Computer Based Patient Records (CBPR), access to which is highly depended on security features.

***1.7 Justification of the Study***

This study aims to investigate in detail the user requirements and benefits of an EPR system in Qatar, where at present all patient records are manual. These manual systems delay the provision of good services to improve the quality of patient care. Misfiling is a major problem faced by most physicians which affected patients by causing delays in their treatment services and progress. The remedy for these problems would be to utilize an improved information technology system through the application of an Electronic Patient Record System to provide a good quality of care, quick, and accurate information for medical staff and patient. To achieve the main objective of this study, an investigation on the best practice of EPR systems in other countries was seen to be important aspect in avoiding any problems they encountered. This study was undertaken at Hamad Medical Corporation (HMC) and included a consideration of social and economic aspects and their possible effects.



### ***1.8 Significance of the Study***

This study of an aspect of health care in Qatar is unique. There has been no previous examination of the use of an electronic patient record (EPR) system at HMC carried out in detail for practical as well as theoretical use. The government places high expectations on the health care system and this research could result in effective means for the enhancement of medical provision in Qatar.

This study will provide new opportunities to consider the development of patient care in HMC and provide guidelines for the introduction of a more proficient system of creating and using patient records. It will also assist in identifying any gaps in the existing manual patient record system and rectifying them. It should also raise awareness of the problems experienced in the existing system and how they can be overcome as well as providing guidance for future development plans.

### ***1.9 Structure of the Thesis***

This study consists of nine chapters described as follows:

Chapter One gives an overview of the thesis and introduces the existing patient record system at HMC. It covers the identification of the research problem, the research questions, the reasons for undertaking this research, also aims and objectives are outlined. It considers briefly all aspects of the research.

Chapter Two contains a historical literature review including the history of medical records and brief comparisons with alternative systems. The advantages and disadvantages of EPR are discussed in conjunction with major problems and issues

such as security, confidentiality in the electronic patient record system and how the system has been introduced elsewhere. Development of EPR systems is included.

Chapter Three considers the research methods used and the methodological approaches. Questionnaires, and semi-structured telephone interviews are discussed. It reviews the major research strategies used in the field of introducing EPR and the review highlights the strengths and weaknesses of each strategy in general, and discusses the role of systems thinking. The rationale for the particular approach chosen in this study, Soft System Methodology (SSM) is presented and its seven stages are also discussed for this study.

The setting of Qatar is described in Chapter Four including the health services, the history of the area, current political and economic situations, and medical record keeping at HMC.

Chapter Five considers quantitative analysis of questionnaire responses, including details of a pilot questionnaire survey and any modifications necessary for the final questionnaire are discussed. Data findings are analysed to reveal an understanding of existing issues that surround the introduction of an EPR system in Hamad Medical Corporation (HMC). Descriptive and frequency tables of questionnaire variables are analysed.

Chapter Six analyses qualitative data obtained via telephone semi-structured interviews with key people in Qatar.

Chapter Seven discusses systems intervention in terms of the application of Soft Systems Methodology to the problem situation analysed by the data collected from the questionnaires and telephone interviews. The four stages of the methodology (Mode 1) and creating the conceptual model are identified.

Chapter eight includes a synthesis of the arguments that constitute the thesis, from literature review through to interpretation of empirical findings. Also discussed are the main findings of the study and, in addition, the research contribution of the study was also discussed.

Chapter nine provides conclusions reached, their value in introducing the proposed system of EPR and presents the main findings of the research with recommendations for further study.

The overall plan and how the chapters are linked is shown in Figure 1.1 below.

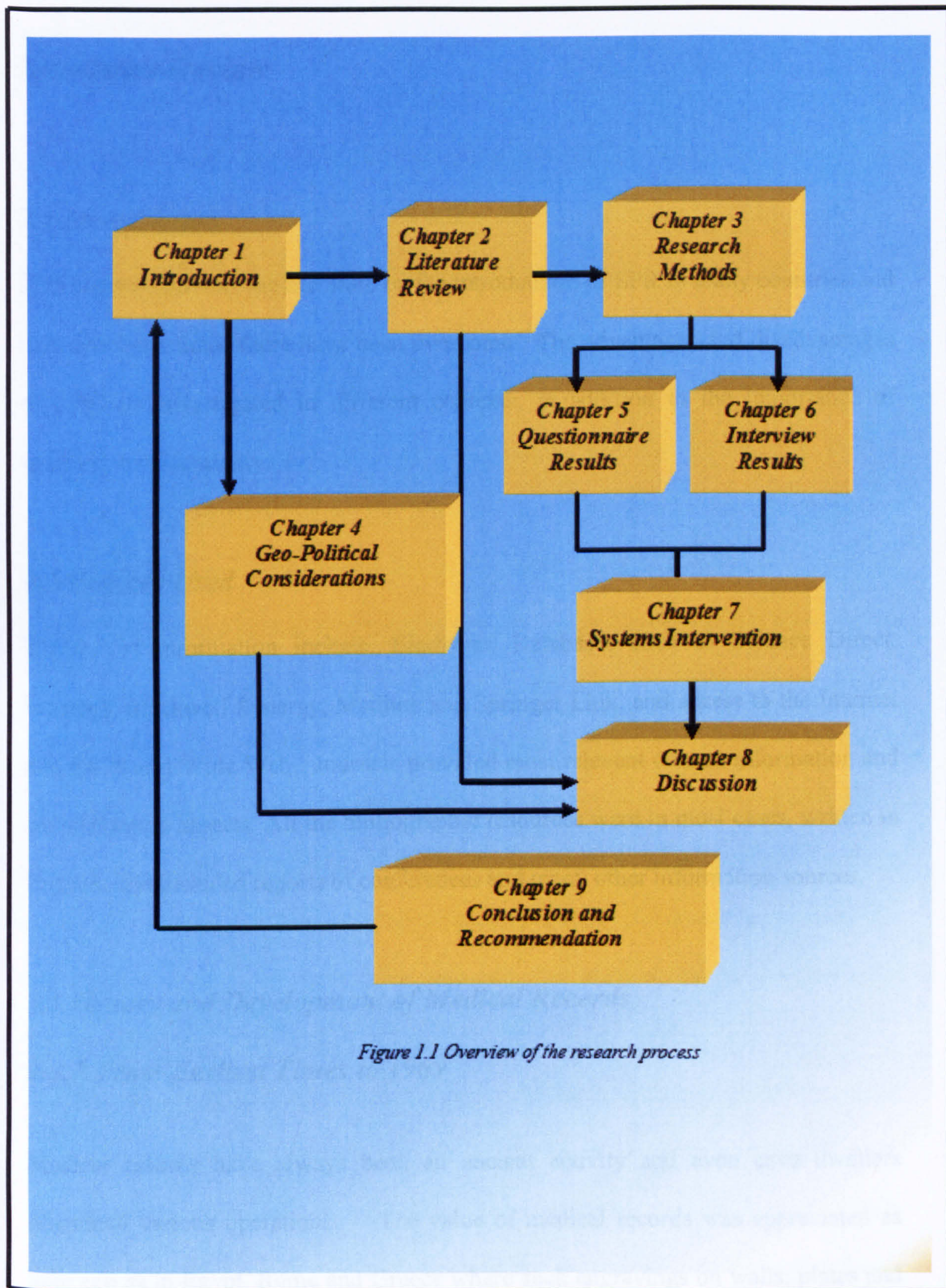


Figure 1.1 Overview of the research process

Figure 1.1 Overview of the Research Process

## *Chapter 2*

### *Literature Review*

#### *2.1 Introduction*

This chapter explores the literature on the introduction of EPR in many countries and how problems faced there have been overcome. The advantages and disadvantages of EPR are investigated in different contexts, in addition to the importance of ensuring confidentiality.

#### *2.2 Sources Used*

Sources of information include, Electronic Databases such as Science Direct, Emerald, Blackwell Synergy, Medline and Springer Link, and access to the Internet and the World Wide Web. Journals provided most relevant current information and covered many aspects. All the bibliographic resources were in most cases, written in English, and included reports of conferences and many other information sources.

#### *2.3 History and Development of Medical Records*

##### *2.3.1 From Earliest Times to 1969*

Medical records have always been an ancient activity and even cave dwellers illustrated various operations. The value of medical records was appreciated as long ago as in Egypt, Rome and Greece where such engravings on walls, plates and papyrus have been found (Huffman, 1981).

Hippocrates in 5<sup>th</sup> century B.C. was aware of the value of such records which indicate the cause and the progression of disease (Bemmel et al, 1997).

In the 20<sup>th</sup> century, Wilson (1905) at the American Medical Association made recommendations for recording full medical records. However, he also noted the reluctance of doctors to do this because they did not like clerical work and there was some reluctance by them to maintain adequate records. Hospitals began to use some brief records but from 1900 the necessity of individual detailed record keeping became essential. The American College of Surgeons (ACS) in 1918 introduced a system of management for health information. This emphasised the need for individual detailed records for every patient (Huffman, 1981). The content of medical records had been based on patient centred collections of various paper-based information originally located in a manual folder (Flexner, 1910). These folders contained paper-based records such as patient medical history (diagnosis progress, treatment, laboratory and radiology results). Interest in the development of medical records was becoming widespread in the 1940s. Kurtz (1943) examined the early medical records of the Columbia Medical Centre in the USA where personal file systems had been in use from 1916 onwards. The purpose was to determine the patient record standards.

Whereas the above authors examined the records for the purpose of recommending proper documentation, Acheson (1967) found that there was a lack of incentive and clerical help which made National Health Services (NHS) doctors' records of little value for research, though they included medical history and any hospital or home treatments. He also noted a need for a standardised method of medical record

keeping and noted that Sir John Simon, Medical Officer of the Privy Council in 1863 was interested in hospital statistics for comparison of various treatments. Acheson also emphasised the issue of confidentiality which, in the U.K, has been upheld by law. However, many medical staff may be involved with any one patient, so detailed and accurate records are essential.

Despite the above authors' recommendations for proper standards for medical records, the literature reveals that by the late twentieth century some patients in the USA had multiple records, from their different health care practitioners. Some metropolitan areas have four million paper records (Kurland & Molgaard 1981). As Huffman (1981) noted, it was not until the 1970s that national attempts were made to achieve uniformity.

Huffman defined medical records standards as follows:

“Accurate and complete medical records must be written for all patients and filed in an accessible manner in the hospital, a complete medical record being one which includes identification data; complaint; personal and family history, history of the present illness; physical examination; special examinations such as consultations, clinical laboratory, x- ray and other examinations” (Huffman, 1981, p.101).

Weed (1968) noted that medical staff were often frustrated and those using paper records needed to develop a positive attitude to the computerisation of medical records. However, the complexity of lifelong patient records, as Davis et al (1968) noted, required a complex programme to provide a computerised record which

would meet all needs. Both direct and remote access would be needed. All entries would need to comply with an agreed procedure and to include all the patient data in an approved format. The standard entry would be in English and with agreed names for standard procedures.

Berner et al (2005) emphasised that the changes in record keeping in 1960 were designed to promote medical use of computerised methods which would reduce clinical errors. The development of hospital records from 1970 involved the financial systems and for this the records of discharged patients were analysed. Subsequently when mini computers were available for laboratory, radiology and pharmacy departments their individual systems were established ( Abdelhak et al, 1996).

### ***2.3.2 The History and Development of Manual Medical Records from 1970-2000***

Hospital Medical Records, (of the American Hospital Association 1972), document the course of a patient's illness and treatment as an in-patient, or out-patient, assisting planning and evaluation of care and communication between doctors and carers. The records also may be necessary to meet the legal requirements of hospital or doctors, or to provide data for research. Additionally, data may be acquired for other research than patient care use. Caution is advised about legal aspects of medical records which vary in different states in the USA. Without a clearly defined system there would be waste of time and paper, and the need for frequent reviews.



Confidentiality and security are important at all stages including the time after patients have been discharged.

In order to facilitate the application of these recommendations, the American Hospital Association Guide to Medical Record Keeping (1972) saw four essential steps for any record system: 1) Organising the information. 2) Identifying each record. 3) Filing records. 4) Keeping track of the records. Hospital records include ambulatory and emergency patients, and home care given by staff. All involvement with staff needs to be included. The two main problems were a) what information to keep? and b) how to co-ordinate these hospital records with those of the patients' GPs.

In addition to the above, Payne and Brown (1974) posed questions such as: what information was essential?, how to record it?, who needed the information?, and how it could be retrieved?. They aimed for 'management' and 'automation' e.g. programming a computer so that, for example, if a patient failed to attend three appointments, a computerised message arranged a health visitor's enquiry. They considered magnetic tape files as advantageous for large numbers of records and where a large quantity of data needs to be retained and these are now widely used. Furthermore, Benjamin (1980) mentioned the purpose of medical records through posing questions such as:, who needs the information?, what type of information?, how much?, what for and when?

The American Hospital Association (1972) identified several disadvantages of manual records. They include their availability only in one place and the time taken to access them, together with the cost of retrieval from centralised storage. There is a risk that documents could be lost if they have to be manually transferred from one department to another. A danger is also that files could be misplaced accidentally and even when available, considerable time can be taken in accessing them. Other problems included the amount of space required for storage, poor legibility and lack of standard format. These disadvantages of Manual Patient Records were supported by Gerald (1994) who emphasised that all these records need large storage space, and require multiple inaccessibility of data information. Difficulties in manual record keeping cause additional problems such as ease of loss of patient documents, illegibility of handwriting and duplication of patient files during delivery of care. The authors above concluded that manual record keeping caused inaccurate, inefficient and redundant patient management.

Doctors and those directly involved in patient care could benefit from information about alternative methods of record keeping. Administrators need information to plan and monitor resources. Researchers require information to improve preventive and therapeutic care. In addition, past medical history, environmental and social conditions are important, use of, and the need for social services and modifications of life style are also relevant.

### ***2.3.3 The Introduction of Electronic Patient Record (EPR)***

Due to the difficulties identified with the use of manual patient records, there was a need to introduce a system that would improve patient care by having a more

appropriate record system. Schmitz (1979 p.74) described an early EPR system at a time when “there is as yet no such thing as a fully electronic medical record”. The benefits were then seen to be “timeliness, accuracy, completeness and availability” resulting from “having physicians interact directly with an electronic management information system” (Schmitz 1979, p.75). He seems to have been one of the pioneers in anticipating the potential of EPR, and the benefits from professional input. The above observations were also argued by Kovner (1990), who considered the use of electronic records for patient history and current treatments. For example, he noted that in 1985, computers could be more widely used in developing standards for diagnosis and treatment, in addition to improving the quality of care reviews. He emphasised the cost of manpower involved as a restriction, but felt that future developments would be of benefit to clinicians and patients, and that the government would regulate the system.

The availability of computer systems from 1990 onwards further helped to prove the arguments raised by the two authors above. This availability changed medical record keeping to electronic methods, which were beneficial in many ways.

Electronic methods of recording have reduced the size of records despite the fact that they contain very much more information. By using computers, doctors can easily access information from more than one source. The organisation of records for ease of access is essential for efficiency and the importance of the service is recognised by supervisors in charge. Good organisation and management requires good leadership to ensure efficiency and co-operation and a constant improvement in performance. In addition to the above observations, Bickford (1995) noted the

potential that EPR systems have for improving patient health care, and reducing costs, adding satisfaction for providers, researchers and administrators.

Dick and Steen (1991) argued that patient records should include more information than just treatment details as proposed by earlier researchers such as Kovner (1990), for example, guiding problem solving, “decision analysis, reminders, and risk assessment”, and other relevant details (Dick & Steen 1991, p.37). The system could prompt staff about additional considerations not available in paper records. The system would be accessible at all times. Similarly, a report by the Institute of Medicine (IOM 1997) helped to argue further that an electronic patient record is to be understood as the one that is specifically designed to support users through availability of complete and accurate data, practitioner reminders and alerts, clinical decision support systems, links to bodies of medical knowledge and other aids.

The argument by Dick and Steen (1991) was further supported by Massengill (1995) who had 25 years experience of medical record keeping, who noted that a Computer Based Record (CBR) system consists of a variety of different clinical activities, from diagnostic and treatment recommendations to patient monitoring, alerts and reminders, in addition to analysis of results. From Massengill’s experience, it was noted that data in many records were not structured. Therefore, in order for a system to avoid overloading there must be a clearly defined protocol for essential data, to meet the requirements of clinicians, administrators and researchers. Furthermore, Massengill considered the balance between access and confidentiality, when not only medical administrators and physicians require information, but also perhaps

insurance companies and employers. Miller (1995) concurs with Massengill (1995) by arguing that different staff require different information and considers it necessary to have a system to provide specific information for legitimate users. This would ensure that confidentiality was more likely to be preserved, and that quality care was maintained.

Waegemann (1995) considered the computerised medical record to be almost the same as paper records, but with the advantage that X-rays, for example, can readily be included. In-patient and Out-patient records could include EEGs (Electroencephalogram), etc. rather than each being stored separately. "The computerised record system can often be the first step for unifying existing file sections in order to make all information available, as the computerised medical record uses the principles of indexing of the paper records, its user acceptance has traditionally been limited" (Waegemann 1995, p.157). It seems strange that if both paper and computerised records use the same format, that Waegemann (1995) considers computerised records as 'a passive system', when in fact medical staff can add information whenever necessary so the record is always completely up to date.

On the other hand, contrary to Waegemann's (1995) argument about paper and electronic being similar, McGuire (2004) noted that, past, present and in particular automated patient records can be available universally to appropriate practitioners, unlike paper records which take time to access. Prior to electronic records, patients may have had separate details at a number of different locations where they had received treatment. A universal system necessitates consideration of privacy and

security requirements which may be different in different countries. Also it must be able to record details of care correctly and accurately. There could be both advantages and disadvantages to electronic records, and also the initial cost of an electronic system and its use is considerable. These important considerations are not always mentioned when reviewing the benefits of electronic record keeping though they are of universal importance.

Various authors have identified a number of characteristics for an efficient EPR system. For instance, Weed & Weed (1999) emphasised the importance of detailed patient records in assisting diagnosis. For this purpose they should include information given by the patient, using appropriate software, in addition to results of tests, observations and procedures. "The medical records should have a problem oriented structure" (Weed & Weed 1999, p.1279) which would improve decision making. New methods are essential to improve inputs by all concerned.

Ganguli (1990) included other elements such as the identity of patient, diagnosis, justification of treatment and results. Records should be current, authenticated, legible and complete. In addition to the immediate availability of information there is the advantage that it could be accessed simultaneously. Online information about all medical records and possible treatment could save time and lives whilst preserving confidentiality and was in an accessible format. The system also provided validity checks and prompts for additional data. Other advantages included fewer complaints, availability of latest information, and use of standardised data. According to Ganguli (1990) disadvantages of electronic records are few, but

include a high level of investment in the training period and a possible problem of equipment failure, in addition to ensuring confidentiality and security of the database from virtual and real threats as shows in Figure 2.1.

In 1991 the Computerised Patient Record Institute (CPRI) in USA was established to facilitate the new system, and to create models. It was planned to examine organisational, institutional, legal and administrative issues and their resolution. Eventually, when the plan was implemented, it was noted that EPR replaced paper records whilst providing information necessary for clinical, legal, and administrative purposes, as was earlier envisaged. In addition more data could be included, processed and integrated to assist making appropriate decisions (CPRI 2000).

Abdelhak et al (2001) studied patient records as an indication of the quality of physician education. The availability of computers encourages redesign of patient records and their linkage to other data resources e.g. medical libraries. Clinical databases can include medical life histories and also individual problems and their treatment. The computer based system is primarily to support patient care but also to record information for other purposes.

Thomson & Wright (2003) emphasised the need for a standard format, and the saving of time. Reduction of costs was seen as a result and easy accessibility for research, in addition to time saving which could be life saving, and also he supported a Unified Patient Record (UPR) containing all the details of the treatment and progress. Benefits were better, communication between disciplines, lack of

repetition, time saving, universal standards maintained, and latest details readily available, all of which necessitated a culture change.

Gillies (2003) challenged assumptions about “good” systems by comparing those in UK, Australia and Canada, which have different aims. The author considered the health care delivery consists of encounters between people i.e., patient and professional or care giver. However, planning decisions and policy are at the macroscopic level in hospitals. In analysing the UK system which Gillies considered very cost effective, the scope for improvement was limited because it would involve more expenditure. Patients and professionals see lack of integration inhibiting improvement in the quality of care. Australian policy could be described as “an insurance system regulated by the public sector” (Gillies 2003, p.100). He considered this to be an improvement on the UK system but in primary care Australian practitioners were cynical about their system. The Canadian system provided most citizens with a range of free medical services and generally shorter waiting times than in the UK. Costs of the system have risen considerably. Its future may be dependent on the political system and whether the ruling party remains in office.

To summarise the above arguments about the introduction and characteristics of an EPR system, most authors have highlighted similar aspects, including using appropriate software, currency, authentication and legibility of the systems. Others include completeness, using standardised formats, investment in training, improved confidentiality, cost effectiveness and time saving as shows in Figure 2.2.



### Comparison between manual and electronic patient record systems

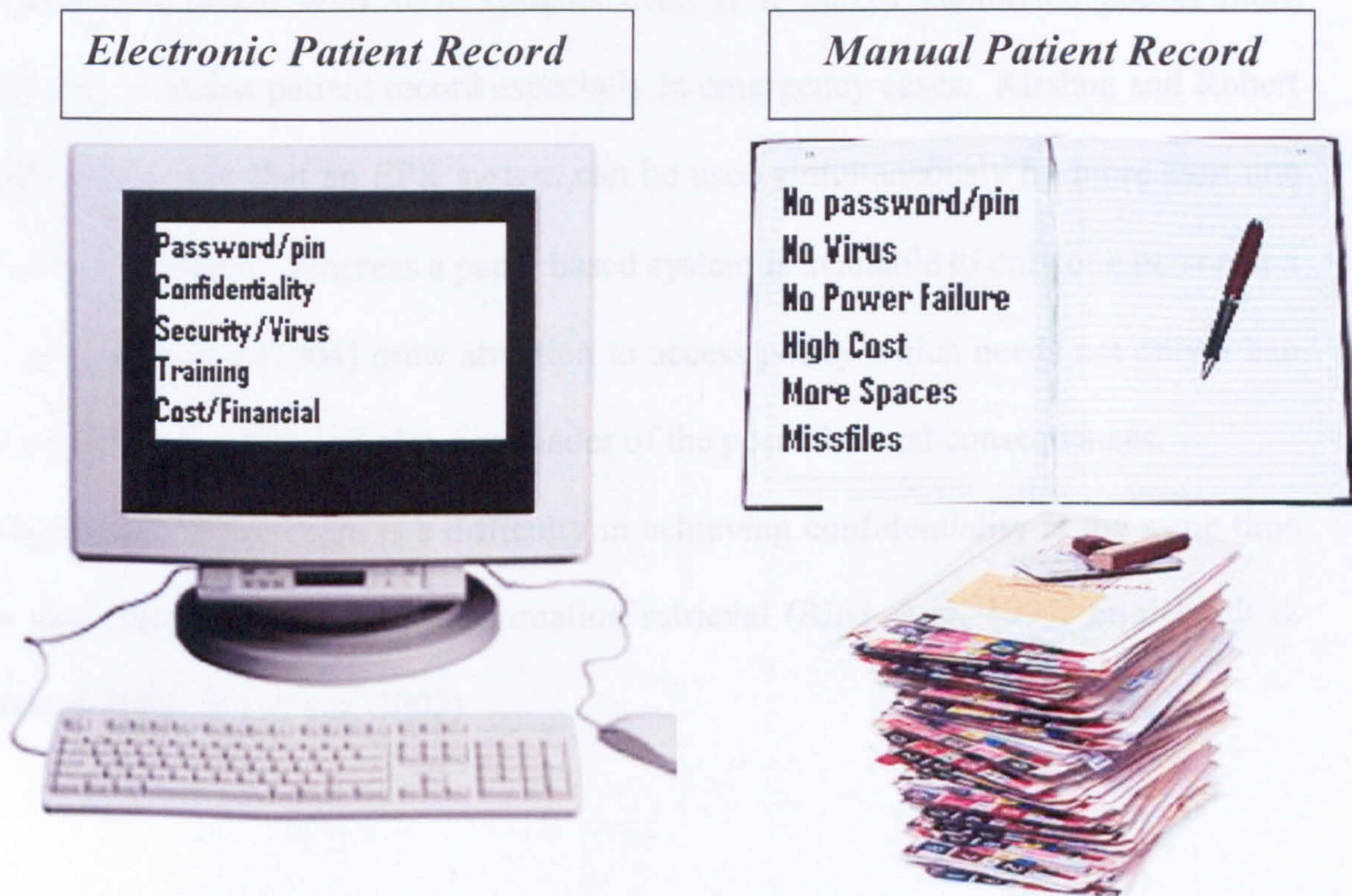


Figure 2.1 Comparison between manual and electronic patient record systems

#### Access to Information

Abdullhak et al (1996) and Young (2000) state that physical control of a file provides adequate security. However, sometimes as many as 30% of paper records are not always available, EPR data can be accessed at any approved workstation, which is not possible with paper records, However Mandl et al (2001), Englebardt and Nelson (2002) and Reynolds (2003) agree that an increasing number of information seekers causes difficulties in ensuring that all of them are authorised and

require the information for the right reason. As the NHS specify, access should be restricted to those needing to know (NHS, 2005).

Friedman (2005) considered security for confidentiality must be ensured and this is especially relevant with EPR systems even if it makes authorised access more difficult to access patient record especially in emergency cases. Kirshna and Robert (2002) point out that an EPR system can be used simultaneously by more than one authorised person. Whereas a paper based system is available to only one person at a time. Amatayku (2004) drew attention to access policy which needs not only a ban or sharing passwords but also a reminder of the possible legal consequences.

All are agreed that there is a difficulty in achieving confidentiality at the same time as easy access for authentic information retrieval (Rind et al, 1997, Englebardt & Nelson 2002, & LaTour, 2002).

### ***Retrieval of Information***

Fischer and Bloude (1999) agreed with Wellen et al (1989) findings that the retrieval of paper records was time consuming and finding the required information amongst many documents for certain patients could be a lengthy process.

Wellen et al (1998) emphasised the advantage of EPR because it enables information to be available quickly about specific requirements.

Time is saved by EPR in not requiring the whole patient file to be used to find perhaps just one piece information. Tahil (2003) similarly pointed out that EPR quickly provides specific information if it is well organised, Coiera (2003) added that information such as allergies to particular drugs could be obtained instantaneously with EPR instead of requiring a search through many documents.

The NHS information strategy states that in the EPR system the patient records should be secure, accurate, and legible. They can be easily accessed by authorised staff and in addition to use for individual patients can be incorporated in research. Data can also be available for the improvement of quality (NHS, 2005).

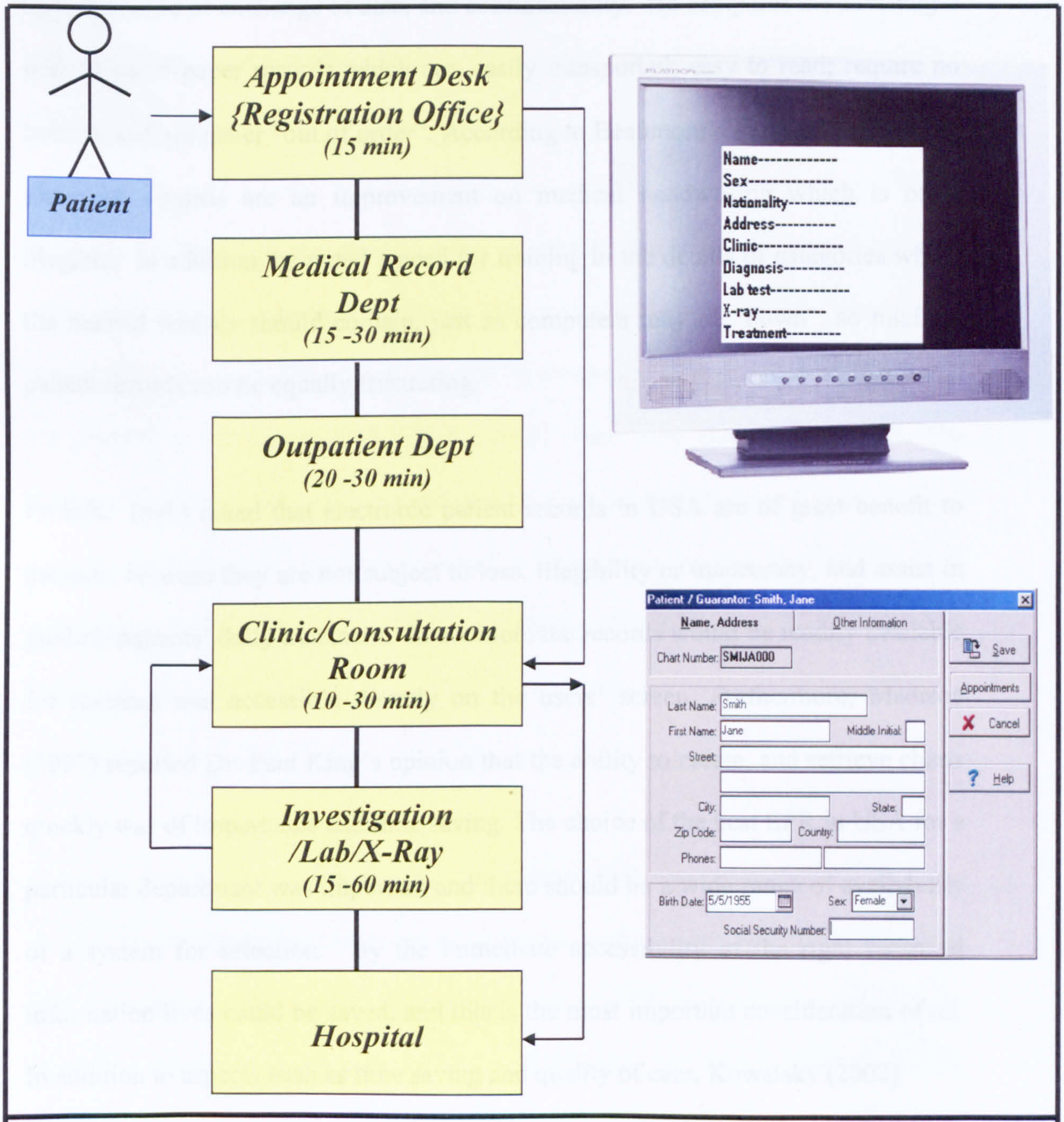


Figure 2.2 Comparisons between Manual and Electronic Patient Record in Time/Access Levels

### ***2.4 Development of Electronic Patient Records (EPR)***

The development of EPR in most countries has been rapid in recent years with some differences to meet local requirements. Beaumont (1999) noted the advantage of electronic records in the UK, including simultaneous access from multiple locations, legibility, ease of exchange of data, and confidentiality. He compares the advantages with those of paper records which are: easily transported; easy to read; require no training and are never “out of order”. According to Beaumont’s personal experience, electronic records are an improvement on medical handwriting which is often illegible. In addition, he noted a need for training in the details of categories which the manual records should contain, just as computers may be “down”, so misfiled patient records can be equally frustrating.

Frolick, (n.d.) noted that electronic patient records in USA are of great benefit to patients, because they are not subject to loss, illegibility or inaccuracy, and assist in guiding patients’ daily treatment. In addition, the records would be readily available for research and accessible directly on the users’ screen. Furthermore, Madison (1997) reported Dr. Paul King’s opinion that the ability to create, and retrieve charts quickly was of importance and time saving. The choice of the best EPR in USA for a particular department was important and there should be a wide range of availability of a system for selection. By the immediate accessibility of the right technical information lives could be saved, and this is the most important consideration of all. In addition to aspects such as time saving and quality of care, Kowalsky (2002)

observed that, to make the system comprehensive and cost effective was a large task and integrating existing systems was difficult.

From reviewing the literature, several authors have also referred to the difference between doctors' own and hospital records and the reluctance of some doctors to make their full records available to hospitals (Rind and Safran, 1993; Hippisley-Cox and Pringle, 2003).

Much as the EPR systems are suggested to provide the best solutions to improve patient record keeping, several authors have observed a number of challenges to them. For example, Fields & Duncker (2003) mentioned that although EPR systems are planned to be universal in UK by 2008, there were doubts about this. The complexity of the task and the need to complete it rapidly caused concern after previous NHS computerisation problems. There was anxiety and the need to convince staff of the benefits of the system. Bishop (2003) referred to availability, as being able to use the information or the source desired i.e., hardware, software or networks.

The same issues were discussed by Singh et al. (2004) who noted that primary care in USA is complex and includes safety problems, with no two providers being alike. EPR imposed on any health system can have unpredictable effects, reducing or increasing safety. To some extent EPR could distract a GP from properly recording observations, but, if used correctly, would greatly assist in providing immediate and accurate information. In practice it is essential that all staff are familiar with EPR

systems, if these are to be used effectively, and all aware of hazards and how to avoid them.

Similarly, Pizziferri et al (2005) considered one factor which inhibits the use of EPR in USA was the concern that it may take more time than paper records. A study of 20 physicians' use of time at primary health centres was recorded, before and after the introduction of EPR, and a decrease in time was noted. This was also the case with dictating notes, reading, and writing; however searching for data was much faster than before. The researchers concluded that EPR took less time than manual records but that there was a need to identify EPR users who had difficulty with the system.

Brailer (2005) examined more than 60 comments about the improvements resulting from EPR in USA. Immediate access to records minimises errors and 87.4% of respondents in the Medical Record Institute survey were in favour of the system.

## ***2.5 International Adoption of EPR Systems***

### ***2.5.1 Development of European EPR Systems***

#### ***United Kingdom (UK)***

The NHS was established in August 1948 by the Department of Health (DOH) for a population of 57 million. Its introduction has been examined by different studies including Levitt & Wall (1992) who found that the NHS was one of the most comprehensive systems introduced at that time. Moreover, patients may combine

free NHS treatment with private health care or use NHS facilities or private services only.

Burns (1998) in considering the NHS emphasised the necessity of records which resulted in the best possible medical care. These would include details of previous medical care elsewhere, in addition to those of present treatment with information from primary healthcare GPs, in addition to hospital treatments, providing “fast, reliable and accurate information about the individual patients in their care” ( Burns 1998, p. 51).

### ***2.5.1.1 Main Issues Pertaining to the Introduction of EPR in UK***

In order to introduce such a new system successfully, it is essential to gain the co-operation of all who use it. Weston (2000) however, noted that this may not always be the case. For example in the original strategic plan in 2008 the NHS was supposed to have electronic patient records for all hospitals. Despite this goal, all targets were missed; this was, in many instances, due to some financial difficulties. There was also the possibility of technological obsolescence, so that because of delays a system could become out of date even before it was used. He also felt that users’ attitudes were important and there was a need to convince all of the benefits of EPR systems.

Wainwright & Waring (2000) focused on the Information System (IS) in the NHS and the importance of EPR. They saw the rapid rate of progress causing problems when implementing new systems and transferring existing records. Knowledge of

Information Technology skills in the NHS could be improved. To succeed, time needed to be made available to introduce new systems.

The NHS EPR system was examined by most authors and was considered to have many advantages and some potential disadvantages. Benefits to patients resulting from the introduction of EPR include a reduction of delays in their treatment which was noted by Granger (2003) Director General of NHS IT service and he felt that patients would benefit by being more involved in their care, with access to their NHS care records enabling them to make choices and speed up some procedures. Delays and failures could be reduced by the system.

The NHS hoped the system would be universal by 2008 despite the size of the task and difficulties of integration and the development of the NHS in providing a fully computerised record system for 50 million patients, available 24 hrs a day to those with authorised access (Brewin, 2003; NHS 2003).

Pringle (2003) considered health information in the U.K. to be inadequate, although most GPs used computer systems to assist clinical care, primarily for data management requirements e.g. immunisations and prescribing. Data quality was improving and the NHS was financing Primary Care Information Services (PRIMIS). The aim was to have an electronic record for each patient and a summary 'patient health record' transferable if the patient moved to another area. This record would be accessible to the patient who could add comments and corrections, and it would also be available to health professionals with the patients consent. Connah & Lancaster (1998) noted that practitioners may choose not to be part of the NHS



mainly due to differences in salaries especially for those who work in private clinics. They may further choose to work for either NHS or private clinics or both. However, most hospitals are NHS administered. If the financial basis of the NHS is compared with that in other European countries, it is found to be less. In 1999, 90% of health costs were met by the NHS, including 98% of hospital bills.

Thiru et al (2003) examined the quality of EPR data in primary care. Most previous studies had considered patient identification and diagnostic data, but there was no uniformity, because standardised assessment methods of data in EPR were not available, so comparisons were difficult to make. The universal chosen standards should be clearly stated.

Kirshbaum's research (2004) examined attitudes of hospital staff to the use of EPR in the UK. Out of 878 questionnaires distributed, 479 (54%) were returned, the results indicated that the majority of responses were positive attitudes to the use of EPR system. Nurses' responses however were mainly negative towards the use of EPR system and revealed anxiety about the system. It was obvious that many respondents were insufficiently aware of the potential of the system to assist their work, and, overall, there was a need for planned information sessions including access to computer terminals. Availability of time for training was seen to be essential.

Jones (2004) in 1988 noted that UK electronic patient records would be beneficial and some local systems were implemented but the scheme had not been extended.

He examined the acute sector over 15 years, and possible explanations for lack of progress, as well as future implications. The National Strategic Programme had drawn attention to information technology in the NHS, but the indications were that it had not been universally adopted. It should be possible to learn from mistakes rather than dismissing the system as impractical.

Bate and Robert (2005) considered the results likely to follow from proposed choice of National Health Service (NHS) record provisions, because choice may cause problems of “overload resulting in more anxiety and stress” (Bate and Robert, 2005, p.1488). The Public Administration Select Committee requested the Government to consider more carefully the problems and limitations caused by ‘choice’.

### ***2.5.1.2 Legal Issues with EPR in UK***

Anderson (1995, p.109) criticised the security of the NHS record system “the proposed network falls far short of reasonable standards; its security would not be acceptable in other government departments or, for that matter, in industry”. However, “data protection within the UK, as Feldbaum & Dick (1997, p.91) noted, is overseen by the data protection registrar who gains authority from the Data Protection Act of 1984”.

Confidentiality is defined as “secret; in private; in confidence. Entrusted with private matter, the education and training of issues akin to confidentiality should be an integral part of all induction programmes and be based upon current guidelines

issues from the government, professional or voluntary organisations”. (Tingle, 2002. p.117.

Braunold et al (2005) considered proposed changes to NHS National Care Record Services planned for 2006. Who should have access to the records which will be on a central database, and, in what circumstances? Confidence in the security of the system was essential, and the reliability of EPR needs to be explained to patients. The system of the Care Record Service would be known as ‘the Spine’ and provision would include the possibility of some information being kept in a sealed envelope to be available only for emergency use.

### ***2.5.1.3 Main Issues Pertaining to the Introduction of EPR in Other European Countries***

Electronic Patient Record systems have been introduced in various countries in Europe. Seland (2002) considered how healthcare workers in Norway acquire knowledge gained through experience, and how this affects the introduction of EPR. Six nurses contributed ideas about EPRs and how they could be useful, as well as mentioning features that the system should include. The limitations of this method were also considered and suggestions made for further development.

Mikkelsen & Aasly (2005) of the neurology department at St Olave’s Hospital, Norway analysed electronic patient records and how the system affected performance, e.g. the ability to access information. Records for a neurological department were of variable accuracy because of lack of precise definitions, and

were a potential threat to the safety of the system. Strict procedures are required to ensure accuracy and sufficient relevant information.

Delpierre et al (2004) noted that the system adopted nationally in France had general approval though there were some concerns about the effect on patient-physician relationships, but 25 publications published from 2000-03 helped to familiarise users with the system and its use in practice. Both practitioners and patients expressed satisfaction, but the impact of EPR was not clearly understood by them. Most observations did not include qualitative data such as disease characteristics, the type of patients observed, and interactions between all professionals involved. Now a broad review of the system has been planned.

Nohr and Anderson (2005) studied how Denmark aimed to establish communication in the primary health care sector. "To optimise the learning effect between different projects it is essential that they should be open and willing to disseminate results. Also it is essential that workflow analysis, and evaluation activities are performed on a sound and explicit methodological basis" (Nohr and Anderson, 2005.p.234).

Much can be learned from the countries which have introduced EPR systems; the various European computerised systems could also be considered by other countries, so that patients obtain their electronic patient records in print. Allaert & Teuff (2004) and Carter (2000) described also how most patients in Europe can obtain their medical records in print. Direct access to computerised files does not threaten

medical confidentiality. Strict identity checks are required and the records are signed by the practitioner. This would seem possible for other countries to adopt.

Beun (2003) noted that the EPR system in the Netherlands is comprehensive. It covers various records of logistic and administrative data, medical, paramedical or nursing care. Data can be provided by various carers and also the patient, to mutual benefit. Advantages include no transport of records, no duplicate tests, and improving the quality of care; patients are provided with details of their medical condition in easily comprehensible terms. However legal implications include the relationship of confidence between patient and physician.

#### ***2.5.1.4 Legal Issues in EPR in European Countries***

Most authors have highlighted similar aspects of the importance of confidentiality and security. In Holland, Louwse (1998) described the legislation for confidentiality and access control. The author states further that technical facilities improve security but that “training and awareness and constant attention for procedures are at least as important as the various technical measures” (Louwse 1998, p.43).

Naszlady (1998) noted that some European countries have adopted computerised systems and the use of smart cards. The cards were accessible only by a doctor personal identification number (PIN) coded key card. From the literature, one of the chief concerns was the possibility of Smart Cards being lost or accidentally destroyed by patients and by medical organisations, but there are solutions, and it is

essential to reassure both staff and patients that the system is secure. The use of passwords known only to the patient and the organisation could provide the necessary security.

Lovis & Baud (1998) considered security at a Geneva Hospital where it was suggested that an Internet browser should be incorporated within the EPR allowing both secure patient data and Internet access to be available without compromising security.

France (2004) noted a regulation resulting from the Council of Physicians in Belgium 2001, where only patient-authorised people including physicians, nurses and paramedics can access EPR records. In 2002 the law gave patients the right to see their records within 15 days of a request. He noted also that an open EPR may be accessed by medical staff, para-medical personnel, and other persons, e.g. medical students, secretaries and record coders. Each EPR was signed and closed three months after discharge, or one month after an outpatient visit. Only clinicians can access “closed” records. Practical considerations considerably influenced security policy.

### *2.5.2 Introduction of EPR in Australia and New Zealand*

There appears to be little information about technical, legal and economic aspects of the introduction of EPR and its effects in Australia and New Zealand. Douglas however (2001) considered that healthcare information systems were inadequate and

that there was support for the use of electronic record keeping to improve the situation (Gillies 2003).

Hunter's (2002) research revealed that few patients were aware of how records were kept in New Zealand and he felt that the security and benefits of electronic records needed to be publicised.

### ***2.5.3 Development of EPR in United States of America (USA) and Canada***

There has been considerable discussion about introducing EPR in USA and Canada as Sicott et al (1998) examined the results of an electronic system for four Canadian hospitals and these revealed its complexity. Many obstructions hindered the improvement of care and information processes, but because of financial constraints more hospitals began to consider using EPR systems to reduce running costs, improve quality of care and flow of information. The researchers concluded that there were two important factors: (1) the difficulty of imposing uniformity of record keeping on professionals used to working independently. (2) the varying nature of the information needs of different professionals, which were required for the complexity and variety of treatments available. The argument by Sicott et al (1998) was further supported by Bristol (2005) who considered electronic patient records in USA less advanced because private health providers have not developed the necessary technology. Peter Waegemann, Chief Executive of Medical Records Institute (Boston) says "it is really a big puzzle. There's no consensus for what system really is effective" (Bristol 2005, p. 1611).

James (2001) suggests that by incremental steps, electronic patient records in USA would be possible by 2010 and they could be accessible with appropriate security safeguards from many locations. Important research findings could also be readily incorporated into routine clinical practice. The argument by James (2001) was further questioned by Gunter & Terry, (2005) contrasting USA and Australian proposals. The USA aims for every citizen to have a standardised EPR by 2014, which could be error reducing and cost saving. However, the issue is whether such a system could instead result in still more costs and errors. The balance between improved care and patient privacy is important and influences the development of EPR in any country.

Assumption about the problems caused by insufficient patient records system have been confirmed by Bria & Shabot (2005), who noted that 95,000 patients per year die in USA hospitals because of medical errors, which, with better information systems, would be avoidable. As President Bush commented in 2004, “by computerising health records we can avoid dangerous medical mistakes, reduce costs, and improve care” (Bria & Shabot 2005, p.56). These statistics would seem to provide the strongest support for the proposed change to EPR, which would help to reduce medical mistakes. However, Lamont (2005) was optimistic about the acceptability of EPR in USA. To promote cost savings and improve care EPR was introduced, resulting in significant reduction in medical errors. Physicians could then monitor patients’ use of prescribed medicine as pharmacy records become part of the system. Hospitals also recorded the business processes related to different departments. Similarly, Meyer & Pyles (2005) aimed to introduce in USA an



electronic health information network (without the patient consent) which would increase efficiency and reduce costs. They felt that Information Technology (IT) should be used with the same standards of confidentiality as traditional medical records. This was essential to maintain trust between doctor and patient, or vital information may be withheld by the patient. The authors doubt whether there would be savings because of the need for continual updating and staff training. Also they feared that any failure of a computer system could result in deaths, and also that patients may withhold important information because they are suspicious of the confidentiality of the system. Health Information Technology (HIT) should uphold traditional medical ethical standards and trials would be necessary to monitor any such system which must be seen to be safe and effective.

Putting patient care at the centre of each health system is the ultimate aim of USA health care in the 21<sup>st</sup> century as Frist, (2005) suggested in his article. He also foresaw access to the best treatment and quality of care, becoming available regardless of patients circumstances. However, he focused on Information Technology (IT) seen as essential in all medical procedures to obtain or record information, and, though initially EPR is expensive, once established and fully implemented the system would dramatically improve care and reduce costs nationwide.

### ***2.5.3.1 Legal Issues in EPR in USA and Canada***

In the United States, each State has different laws. However, the literature about legal issues in EPR in the USA does not reflect the above observation. For example,

Annas (2003) stated that new regulations in USA included directions that patients must be informed about who was able to see their records, what uses would require patients' authorisation, and that patients should have the right to inspect, copy and amend their medical records, with the exception of notes from psychotherapy. In addition, Geveras (1983) argued, that the traditional view of confidentiality does not give enough regulation to deal with the privacy risks posed by a present health care system in an information based culture. When patients were given access to files and were empowered to command amendment or removal of certain data, it was likely that this danger might be reduced. A right to correction or removal of data can serve as a useful additions to the health care provider's responsibility to preserve precise records but files may include information which is unrelated. The same views have been shared by Beun (2003). Likourezos et al in 2004 noted that a medical team in USA considered the benefits of EPR use in an Emergency Department, and the satisfaction of the users, both clinicians and nurses, who found the EPR system time saving though some concern was expressed about confidentiality.

Hassol et al (2004) studied 1421 patients, the majority of whom were satisfied with their EPRs, and most were unconcerned about confidentiality. Patients preferred written records and physicians preferred to see the need for both written records and direct conversation with patients. The USA Medical Institute of in general considered Information Technology (IT) to be one of the factors required to improve health care. More research was needed to quantify benefits and disadvantages.

Ethical security is one of the main concerns in the storage and use of patient records, the security system needs to be specified, universally agreed, and easily understood. It may be necessary to have an independent body to ensure that protocols and policies are being correctly observed (Kluge 2004). This would seem to be essential to ensure the acceptability of the system by all concerned.

Leonard's (2004) Canadian study of lung transplant patients considers security and regulation as significant issues amongst the public in general, and the need for support from professionals who will use the electronic patient record system. He recommended a research project involving patients with a secured internet site, providing the best information for decision making by health carers.

#### *2.5.4 Introduction of EPR in Israel*

Darr et al (2003) examined the reactions of doctors and nurses in Israel to the introduction of EPR, and found that senior physicians thought the records were beneficial but junior doctors had more negative reactions whereas nurses saw benefits for quality of treatment and administration. It was noted that administrative changes resulted from the records and that clinical practice could change also. A detailed study of a hospital using an EPR system successfully enabled researchers to discover the most important aspects of its benefits. By consulting staff at all levels when introducing a new EPR system, the designers can prevent many difficulties and achieve a positive response.

Electronic Patient Record use and physician-patient communication was the topic studied by Margalit 2005 in Israel. Video tapes were made of three physicians using

EPR methods when visiting patients. The conclusion was that the physicians tended to observe their computers more than their patients and dialogue was reduced. It appeared that the computers received more attention than the patients. However patients had the benefit of printed materials to help their understanding of their conditions and treatment. The training of physicians should include suggestions of how to maintain good contact with patients, whilst using computer screens etc. to assist diagnosis (Margalit et al 2005).

### ***2.5.5 Introduction of EPR in Japan and Hong Kong***

There are some articles detailing the development and introduction of EPR in Japan and Hong Kong. In 1999, Japan introduced an EPR system which hospitals and clinics were free to choose instead of paper records. Takeda & Maksumura (2000) considered that it was necessary to have a formal system for sharing and exchanging patient records, with a standard format and great security procedures.

Hong Kong developed an EPR system in 1999 to include health information and patient records. Care was taken to provide the means of adding additional information to records when necessary, and having standardised training for all who dealt with them. The system was designed to have low running costs and to provide quick access to radiology images (Cheung et al 2005).

The researchers concluded that the advantages of EPR in comparison with manual record systems outweighed the problems of identifying those who would need appropriate training to make the change with minimal difficulty.

### ***2.5.6 How EPR Could Develop in the Middle East***

In the Middle East there is now general familiarity with the use of computers in industry and commerce but, as yet, no computerised record systems for medical purposes. To introduce EPR systems would require careful preparation to reassure both professionals and patients that confidentiality could be preserved and that the benefits would justify the initial costs. There are very few articles debating the possible benefits or disadvantages of introducing EPR systems as Choudhury et al (1997) considered existing patient records in Kuwait as unsatisfactory at Sabah Hospital. Critical data were not readily available, lack of uniformity made it difficult to locate vital information quickly, and some records were very lengthy. Usually “the more organised the record system is, the better the patient care” (Choudhury 1997, p.1) and a review of methods was required, A ‘point and click’ (PAC) system was introduced in 1997 which included the essential information previously recorded and it proved easy to use.

Al-Shorbaji (2001) of the World Health Organisation, Cairo, analysed the benefits of computerised patient records, especially accessibility, legibility and format, but simultaneous access at different locations and standardised format were essential. This type of record enabled the practitioner to have all the necessary information in an agreed sequence. From a set of several patients’ records the design of further research could be planned e.g. it could be used to reveal any relation to geographical areas or certain age groups. Information can be easily shared with other hospitals electronically. The storage capabilities of electronic records assist quick access to a whole range of information e.g. X rays, pathology reports etc, without taking up a large amount of space. In addition, to ensure the essential confidentiality in all

records, legal and technological aspects must be considered simultaneously. It requires consideration of international norms, patient rights, legal aspects and general local customs.

Akber & Gough (2003) also considered innovative methods for electronic patient records in Kuwait, including both health and illness and the importance of Information Technology (IT) for medical research. Reading available information about a patient can assist more relevant and effective treatment. The costs of implementing an Information Technology (IT) System are considered to be high and were a problem in Kuwait.

The same was the case for most above authors who described the existing system and characteristics as unsatisfactory. In addition, there is a lack of uniformity, records are not well organised and are extremely lengthy. However, most authors have highlighted similar aspects and argued for the necessity of introducing EPR which will give the most benefits and effectiveness for patient care. These advantages will increase the importance of information technology.

## ***2.6 Advantages and Benefits of the Electronic Record System***

### ***2.6.1 The Benefits of EPR System for Doctors, Medical Staff, and Administrators***

EPR systems have to a greater extent improved patients records and facilitated the selection of the most appropriate treatment. Amongst these advantages, Burton et al

(2004) commented that the time taken to make adequate and legible records has been reduced to take only a few minutes per patient, when physicians' time is tightly scheduled. However, Soper (2000) observed that more time to see a patient, together with the patient's input can be created when records are retrieved much faster. Furthermore, the above author noted that accessibility of records at a distance is made possible. Electronic records are more legible and can resolve the problem of misplaced documents and the opportunity to show parents the records of their children if required.

Lane & Hayward (1999) investigated the value of electronic patient records for GPs and found them to be considerable, but there were doubts about the system on a larger scale in hospital use.

Furthermore, training the users in manipulating EPR systems has proved to be easier (Atkinson 1997; British Medical Association 2002). The training of users on EPR systems motivates them to familiarise themselves with other aspects of computer applications. Mansoor (2002) supports the above observation in that physicians use computers for administrative purposes as well as EPR systems, and are keen to acquire computer skills and knowledge to enhance their clinical practice. They learn how to access computer based information and to how to make the best use of such resources.

Bush (2002) recommended introducing and using an appropriate EPR system since it helps to reduce costs and ongoing expenses in providing multiple users access to

information, data protection and backups. An EPR backup system is more economical than the manual system since it saves space, time to locate and access information and maintenance costs. Svenningsen (2003) found the advantages of EPR included no loss of records, ease of access for all medical staff, some reduction in medication errors, better documentation, and more co-ordination between professionals. The same was the case for Smith, (2003) who considered good planning, strong physician leadership and supportive staff were essential for a successful EPR system. Benefits include accurate medication lists, legible notes and prescriptions. Having experienced EPR he would never revert to paper records. This seems to summarise the general point of view of those who have experienced the change from manual to electronic systems.

Amatayakul (2005) emphasised the value of EPRs providing reminders to alert hospital staff to particular problems which may arise, and improve decision making, in addition to reducing errors. At the same time much information is still being handwritten in many hospitals and the electronic records do not necessarily include information which would assist decision making. Also it was helpful to have systems which work similarly in different places e.g. surgeries, clinics and hospitals.

Novak (2005) considered EPRs as time saving which can be life saving, cost effective whilst maintaining confidentiality and, making transfers to other physicians easy and immediate. A personal EPR can contain a total medical history, however complicated.



The benefits of EPR as outlined by Ginneken (2002, p.115) included “Flexibility in content and use, integration and adaptability to change. Once consensus is reached on terminology, architecture, and legislation, the EPR will become as established as the Hippocratic Oath record has been for centuries”. It seems from the literature that benefits have been obvious in all the countries that have adopted the system, and even those who originally had difficulties in making the changes now express no regrets, because they have experienced the great advantages of electronic systems.

### ***2.6.2 How EPR Systems Can Save Time and Space***

Johns (1997) noted that EPR were becoming the topic of much research, with benefits seeming to outweigh the initial costs. Medical staff would be able to access patient information rapidly, and add to it, and without paperwork being involved. This time saving was valuable.

Nikula & Elberg (2000) noted that to provide an efficient service, physicians can benefit from an electronic patient record system which they operate themselves. This would perhaps enable them to treat more patients at no greater cost. The advantages of EPR were great enough to overcome the reluctance to change familiar systems, though clinicians hesitate to abandon their traditional and well tested systems until they were convinced of the benefits.

Meijden et al (2000) measured the attitudes towards electronic patient record among physicians and nurses. The researchers noted that the experienced physicians and nurses were more positive, whereas the inexperienced ones found EPR to be more

time consuming for data entry and retrieval, and they were concerned about their familiarity with computers and the need for training. This study implies that one has to be experienced in making the optimum use of EPR systems. Furthermore, an EPR system proves to have more effect on improving quality of patient care.

Hassey & Gerrett, (2001) emphasised that whilst there could be savings of time and cost by using EPR, the emphasis on these considerations is of less importance than quality of care which can result. Clinicians at all levels, doctors, nurses, physiotherapists etc in all specialties will need to co-operate and a standard system for patient's records will benefit all concerned. To provide an efficient service Lusk (2002) noted that physicians can benefit from an electronic patient records system which does not require much training time.

Coiera (2003) outlined how EPR involves more than just the input and retrieval of informative paper records which are portable and familiar but occupy space, can be used only by one person at a time and may be lost or misplaced.

Simultaneous access at different locations is an advantage mentioned by Haak and Wolf (2003) who also noted that there would be no problem in storing large quantities of information when necessary, and legibility would improve. The use of EPR's optimises accuracy, and completeness, in addition to costs and effects of clinical processes and their results.

Jones et al (2005) considered the role of EPR not only for decisions about medical treatment but also for clinical audit and research. Originally EPRs were seen mainly as providing improved access to clinical data but, whilst facilitating access to

information, other EPR benefits cannot be assumed. When planning a new system, the benefits of existing systems need to be considered. New EPR systems can not be assumed to improve an existing system, they may increase risks. There is need for caution when considering modifications to a record keeping system, to avoid new problems. A new system could be considered as a better one but it needs to meet all existing requirements. Gates and Urquhart (2007) analysed the use of electronic patient record systems and found them to be time saving and space saving and there was no need to make telephone calls to pharmacies or hospital departments to obtain patient information and the records were legible. Voice recognition software is time saving for secretarial staff. Both cost and patient care benefit from use of all these aspects of EPR. They also mention the need for all staff to receive training if paperless records are to be reliable. For the system to be effective it is essential to have the support and back up of the technological providers of the electronic data.

Manual records involve delays in obtaining information “when a medical practitioner called to discuss a patient, they waited on the telephone while the secretary went to the filing cabinet to retrieve the record (taking longer if it was not in the file or was file incorrectly), then walked to the consultant’s office who then opened the file, read it and then spoke to the medical practitioner waiting patiently on the telephone” p.109.

An EPR is reported to be easy to install, cost effective, and available instantly at any distance, which was an impossibility with a manual system.

### ***2.6.3 The Benefits of EPR Systems for Patient Care***

Computers can help people interact with various organisations and individuals relevant to their medical condition, as Dick (1991) stated that computer based patient records were advocated by the Institute of Medicine as an essential technology for health care and also he expressed to view that the EPR 'smart system' would redefine the physician's role and the quality of care.

The value of reminders to patients and alerts to clinicians was important. As Woodward (1995) emphasised, computer based patient records (CBPR) would be 'complete and accurate' and also that a single format would meet all requirements, "business, clinical, research, public health" etc (Woodward 1995, p. 1420).

Weber (1995) examined the advantages of having patient records of different medical treatments available electronically, avoiding loss, duplication or lack of details. "Clinical and financial benefits would outweigh the initial investment" (Weber 1995, p.134).

The benefits of EPR were not only financial, as Wang & Middleton (2003) felt they included also quality of care, reduced medical errors and better access to information. Also Haak & Wolf (2003) emphasised the importance of providing accurate records to support patient health care. For cross-institutional EPR they stressed the importance of data security and protection. Awareness, training and education in data security will ensure a system which is expected to improve the quality of patient care without compromising confidentiality.

The value of EPRs in relation to justifying decisions taken about the timing and nature of patient treatment, as Bakker (2004) considered that EPRs could be used to monitor professional performance and standards, and to check whether the physician did, or did not, have certain information at a particular time. These are important considerations which justify introducing an EPR system because it would be difficult to obtain such information quickly using the present procedures, and systems which have been in use for some time have proved to be most effective.

Sprague (2004) reported optimism about the use of EPR and their contribution to the quality of patient care but, noted also, that the enthusiasts remain positive, while sceptics remain unconvinced of the benefits. The deciding factor was whether EPRs contribute to better care for all, and the challenge was to present a convincing case for this.

Anderson (2005) considered the role of pharmacists in patient care, especially when more than one is involved. He emphasised the importance of having records of prescriptions which could reduce problems, and electronic records would reduce the possibility of dangerous and costly errors. In addition to EPR, the inclusion of medical, laboratory and pharmacy records would provide a complete view of patient treatment and the author saw this as revolutionising patient safety. In the interest of confidentiality, patients need to be reassured that the pharmacist will receive only information directly related to prescribing medication.

Honeyman et al (2005) interviewed 109 patients resulting in the conclusion that they were more interested in access to their electronic records than their manual paper records. They felt the former would improve their communication with clinicians and were satisfied that their records would be secure. Patients were confident that electronic records would sustain confidentiality and the possibility of access to their own records.

#### *2.6.4 Financial Advantages of EPR System*

Adler (2005) recommended in selecting an EPR system that time should be taken to consider all the implications. He gave examples from his own experience with a team of 86, saying it would be time well spent for such an important acquisition, and was indeed essential. "It could take up to 2 years, but methodical, critical and inquisitive approaches are necessary for all concerned" (Adler 2005, p.62).

He considered that EPRs provide improved communication, access to data and documentation, resulting in better efficiency. Clinical information was readily available and record keeping and access are simplified. Costs, both of purchase and use of the system need to be considered, but they can be more than equalled by the savings on previous systems. "The long time gains will more than justify short-time pain" (Adler 2005, p.46). Alder mentioned also that EPR in the long term benefits justify the initial costs.

#### *Cost Saving*

Koeller (2002) saw the possibility for considerable cost saving because paper based records did not assist clinicians and healthcare staff as effectively as EPR. Tierney

et al (1987) & Stair (1998) & Bates et al (1999) reduced the number of tests taken by patients and expensive investigations, resulting in cost savings and patients time.

Nicholas observed in 2002 a decrease of 48.9% in chemical tests, were analysis by 41.6% and microbiology by 40.6%. The use of EPR has reduced the number and hence the cost of laboratory and radiology tests by 9-14% (Bates et al , 1999). A 2% reduction in hospital admissions saving on average \$16.000 each and reduction of excess medication by 11% (Teich, 2000) was also noted. Young (2000) noted that the use of EPR reduced the medication and other costs, because it was more accurate than a manual record system.

The EPR system can improve the quality of patient care, because of using innovative approaches and improved healthcare information management. The EPR advocates modernisation in practice and care models, otherwise not readily available. (Englebardt & Nelson 2002). Cascardo (2003) sees the importance of reducing effort by using EPR and the ease of printing patient data from a computer. Use of EPR saves time for physicians and all staff using patient records.

## ***2.7 Difficulties & Disadvantages of EPR System***

### ***2.7.1 Difficulties in Introducing an EPR System***

Many authors have considered how the introduction of EPR can cause problems as well as solve them. Atkinson (1997), whilst seeing the benefits of EPR systems, also noted that they could change clinical practice, and that there could be problems of controlling access to them. His research also reported anxieties that were expressed

regarding the possibility of computer failure. The argument shows that the electronic patient record system has a “back up” scheme for computer failure which automatically prevents information from being lost. In addition, even if the benefits of EPR are recognised, Miller and Sim (2004) found that the time taken to learn the procedures was an obstacle to their use.

There was a reported reluctance to change which needs to be overcome by a good training programme, and some people under-estimate their capabilities to cope with new and different systems ( Loomis & Ries 2002). As Huston (2004) noted, to implement such a change would require an agreed standard procedure and provision for the transition period. Faber (2003) draws attention to the fact that several authors argue that the implementation of EPR can fail if the assumed nature of the medical work being considered does not match the real aspects of that work. As a result it is necessary for the approach to introduce a new EPR system to avoid mismatches between EPR and existing record systems. During four months, 150 health care professionals were interviewed to provide opinions about the possible development of EPR and of any advantages or disadvantages of the system that were revealed.

Hayrinen et al (2004) evaluated patient care by the quality of information available to all appropriate medical staff in relevant departments. Manual records were used for 30 years in Finland and EPR systems have been available especially in primary care for several years but manual records are still used for many hospitals. The existing EPR systems are poorly structured although the basic elements have been determined. The problems include inflexibility, and insufficient support for patient care which were identified in many countries, including Australia, England and



Finland where on going projects aim to develop a national health care infrastructure based on EPR.

The advantages of EPR drew attention to disadvantages, as Glaser (2005) noted whilst considering the expense and difficulties in implementation which should not be underestimated. During the installation period it was important to discover any problems and discuss with staff how they can be resolved. Progress needs to be reviewed and not be taken for granted, and staff need to be aware that, when problems arise, they will be dealt with.

### ***2.7.2 Confidentiality***

Anxiety about confidentiality was one of the greatest barriers to overcome in persuading professionals and patients of the benefits provided by electronic patient records. Strasberg & Tudiver (1998) noted that there was some reluctance by doctors under the present system to disclose records to hospitals.

Griew et al (1999) considered the problem of confidentiality and the need for access to patient records by a wide range of medical staff and administrators. Decision making is discussed and how to control access whilst ensuring that all relevant details would be available for authorised use. In the UK the use of EPR had increased rapidly, but there was not yet a clear standard of accessibility for all professionals, though some barriers have been introduced and encryption protects certain information. Also they draw attention to the fact that the legal aspects of electronic patient records have not yet been clarified. UK hospitals have been slower to adopt the system than GPs. Countries where hospitals are dominant have more readily adopted EPR systems. In some areas both GPs, and hospitals, patient records

were computerised making very comprehensive information readily available. This can cause problems of confidentiality but reduce those of bad handwriting. Special procedures can ensure confidentiality when necessary.

Several authors emphasised the need to show the benefits of computerising the record system, but some doctors were reluctant to use computerised systems, requiring a well designed training programme for all. Because information is obtained from multiple sources there was a need for appropriate rules for confidentiality (Rogerson 2000; Schuman 2004).

Education and training about confidentiality were essential for staff involved, with revision several times a year, as Htt (2000) stated, in addition to penalties and rewards. It was essential that everyone, including patients, should be aware of a similar degree of confidentiality in the new system. EPR provided easy access, no duplication of data and more integration of different record components. The argument by Htt (2000) was further supported by Cowan (2000) who explained and drew attention to the rapid use of electronic patient records (EPR) and the necessity for risk management; various organisations were concerned with guidelines appropriate for confidentiality. She emphasised the opportunity to improve the quality of patient records and to reduce errors, but that this may not be 100% successful; consistency and high standards are seen as essential.

NHS Executive (2000) noted that to establish a care record service needed encouragement as well as agreed procedures and there was a need for mandatory clinical recording standards. Where the EPR system has been in use for some years it

has taken a while for the benefits of the system to be apparent and acceptance of the system seems to take quite some time. Eventually the respondents generally agreed that the benefits outweigh the difficulties of the changeover period.

Modern technology could be used for access to patient records using the internet and other networks, as Anderson (2000) mentioned, but security was a major problem and encryption would need to be investigated. EPR increased by 70% per year with a similar increase in their use. Also the possible use of the Internet for comprehensive health records was allied to great concern about confidentiality, which differs from country to country. There was confusion about patient rights and how to enforce them, and standards of protection of privacy were needed.

Manndle et al (2001), Shaw & Gillies (2001) emphasised that patients need to be reassured, and informed about the new system. There was a requirement to retain existing records for a specified period until all training in the new system was complete and confidence in the new system was high. In the early stages of introducing the new system it was recommended that all patients should receive written information of how the records will assist them and those who care for them. This would reduce some anxieties about confidentiality and security and encouraged patients to provide additional information which could be helpful.

The final report to the Dept of Health (DOH) (NHS 2003) noted that better records do not necessarily mean better care. Part of the NHS is computerised e.g. primary care, but there was no mandatory clinical recording system to implement such a

change, and it would require an agreed standard procedure and provision for the transition period, to outweigh the difficulties of the changeover period.

The disadvantages included increased risk of confidentiality breaches, and difficulty in obtaining a copy of existing records when on ward rounds mentioned by Svenningsen (2003) in addition to the complex procedures of recording observations of patients, which could delay other activities.

The confidentiality problems and how to reduce the procedures required for limiting access to patient medical records and to assist medical research were studied by Oatway (2004). In addition to the systems already existing which meet these requirements and enable very rapid access for authorised users; voice recognition developments and authentication increase the acceptance of electronic records. Previously there was reluctance on the part of many medical professionals to use these methods. He concluded that Information Technology (IT) systems will provide helpful assistance for those using medical records, and professionals, patients and society as a whole will benefit. Overcoming scepticism about the use of new technology will be the largest problem in some areas.

Whereas the above authors emphasised the importance of confidentiality and how it is seen as a problem of EPR used for the purpose of recommending proper documentation, as Grzybowski (2005) considered confidentiality and how a GP was able to solve this with manual records. For EPR systems the author considered the problem of privacy to be an inevitable disadvantage of an otherwise beneficial

change. He mentioned the need for guidelines to protect patients' privacy, and discussion with those who have ensured it with paper record keeping. Also the aim must be to provide a system which reassures patients that their privacy can be preserved.

### ***2.7.3 Financial Problems***

Dick & Steen (1991) found that new systems were be expensive but cited evidence that clerical costs decrease, and the system may in time decrease costs of care.

The initial costs were seen as a barrier to the implementation of EPR nationwide in the USA and it has been a factor in delaying its development, forecasting \$ 1.4 billion in 2008, as Rutherford (2005) commented. Lack of support by medical staff, difficulty of conversion and lack of standardisation were other factors. However the present system was expensive in time, and there was a need to improve efficiency. This would strengthen the case for an immediate EPR system. Future healthcare involving patients, families and practitioners, needed the assistance of EPR quickly and economically.

Of all the countries which have introduced EPR systems, none appear to regret having made the change, but in some countries finance was a problem as Evans & Kalra (2005) stated that the two essentials for a nationwide EPR system were that clinical information must flow in two directions in a compatible format, and also that there must be a standardised training system. The NHS plan estimated initially at £ 6.2 billion and now forecast to rise considerably aimed to create an integrated EPR system. An international system would require, in addition, agreed procedures.

Consultation with medical staff was essential for any system to work effectively as the authors recommended.

## **2.8. Systems Thinking**

To analyse and to gain understanding of complex problems or systems it is necessary to use an appropriate theoretical framework and methodology. From consideration of a variety of approaches, it became clear that 'systems thinking' offered a powerful tool. This involves the central concept and a range of elements which constitute the system as a whole, rather than its individual parts. (Checkland, 2001; Waldman 2007).

System thinking is useful in understanding an existing structure and how it could be improved by holistic, systematic research methods. After an examination of several approaches, Checkland's Soft System Methodology (Checkland, 1981) was selected as an appropriate technique to use in this study because of its emphasis on identifying appropriate actions to improve problem situations.

### **2.8.1 Applications of Soft System Methodology (SSM)**

In various countries SSM has been successfully applied to various aspects of healthcare provision but there are only limited publications on how the SSM system has been used in a wide variety of health-related research. Checkland & Scholes (1990, p.89-114) used the SSM method for community data within the NHS in UK.

Le Fevre & Pattison (1986) in Western Australia emphasised the importance of introducing information systems into hospitals and general health care. SSM was the principal method adopted. It was used as the main element of the planning process, including all factors affecting the problem. In addition they noted the importance of users' views about the information systems to achieve the best results. There was a lack of a rich picture (RP) because of the size of the organisation and need for a simplified system to identify a wide variety of potential users.

Fennessy (2001) studied the problems which occurred in evidence based practice and how SSM can be applied to action research. Clinical information for practitioners can be made readily available by introduction of EPR and can improve clinical effectiveness.

Mathiassen & Nielson (2000) describes how SSM was adopted after exploring several alternative systems to provide an efficient community service including surgery which was reorganised into one unit. Preserving and developing nursing skills was an important consideration and obtaining resources for all sections as well as co-ordination and communication between all sectors were encouraged. Additionally root definitions for the new system and its management were introduced together with conceptual models for their use.

The researcher stated that SSM requires a different kind of systems concept is not just one system to enable it to be used effectively in the development of information systems.

## ***2.9 Gaps in the Literature***

Throughout the literature, there is very little evidence that countries in the Gulf Region have adopted EPR systems. So far, only in Kuwait a Point and Click (PAC) System was thought to have been implemented (in one of the hospitals). However, there is no evidence in the published literature whether this has happened. Furthermore, authors in several countries in this region, such as in Egypt (Al-Shorbaji 2001) only gave an analysis of the benefits of computerised patient records, especially accessibility, legibility and format but no mention of whether such a system has been implemented in this region. The same is the case with the same literature that focuses on this region.

## ***2.10 Summary***

This chapter reviews the history and development of medical records in general, and the development of manual patient records in particular. In addition it explores the possibilities offered by electronic patient records systems. It examines the impact of the introduction of EPR in several countries which have adopted this system and the benefits and costs which have resulted.

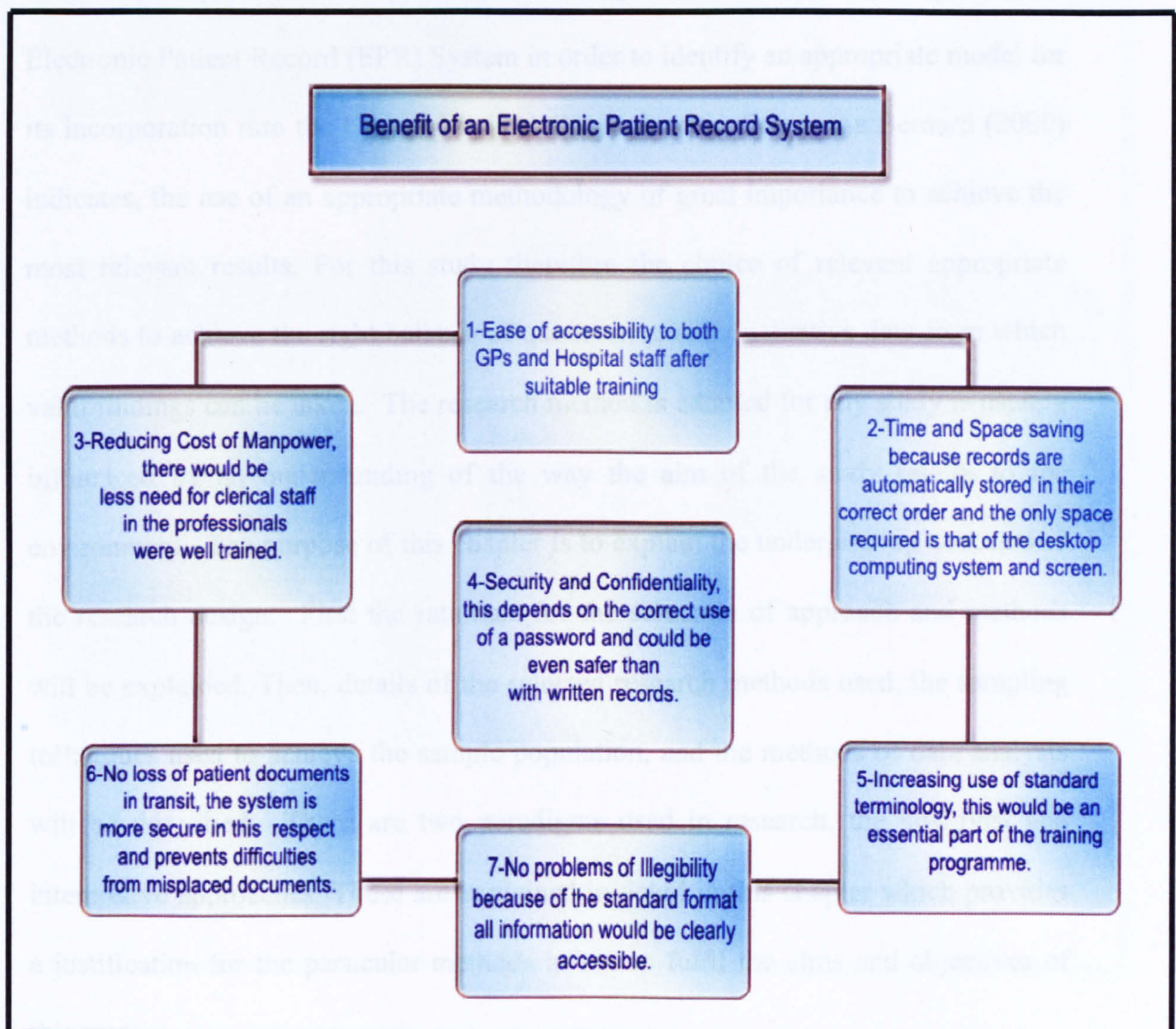
The benefits of EPR from reviewed literature include improved legibility, and systematic order. (Fatchamps et al, 1991, Young, 2002 & Hippisley et al 2003). Security of information is better protected in comparison with manual records. (Stein 1997, Hagland 2004 & Friedman 2005). In addition to other benefits Pabst et al (1996) notes greater efficiency in time and use of resources. EPR reduces errors and improves quality of care. (Nicholas, 2001).



There is a clear message in the literature that the successful introduction of electronic patient records can be very beneficial to all concerned, patients and practitioners. Observation of computerised systems and the relevant literature in UK and USA strongly support the introduction of electronic patient records. In making the switch to an EPR system, however, it is equally clear that there are difficulties and disadvantages to address associated with managing change, especially provision of good training programme for all concerned, and the need to protect confidentiality. To do this successfully requires major investment of time, skill and resources. It is evident from the literature that the implementation of EPR is a long-term undertaking with the expectation of the significant benefit in the long term from easy access, low cost, space and time saving, in addition to security and no problems of illegibility. To gain these benefits there is strong support for computerised methods. The advantages of electronic patient records are illustrated in Figure 2.3. It would seem advisable to retain for a limited time paper records as a parallel system until all are familiar with the new procedures, as has been the practice in other countries.

There appear to be in the literature review few references to EPR research in the Gulf Region or Middle East. On a particular note, the literature review conducted by the researcher did not find any references to research having taken place in Qatar on the possible introduction of Electronic Patient Records (EPR). This appeared to be a valuable opportunity to raise awareness of the benefits of EPR systems, their suitability for use in this area, and recommendations on how to achieve successful implementation. This study endeavours to contribute to filling this gap.

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**Figure 2.3** Benefit of an Electronic Patient Record System

## **Chapter 3**

### **Research Methods**

#### **3.1 Introduction**

This chapter provides to explore the advantages and disadvantages of using an Electronic Patient Record (EPR) System in order to identify an appropriate model for its incorporation into the Hamad Medical Corporation in Qatar. As Bernard (2000) indicates, the use of an appropriate methodology of great importance to achieve the most relevant results. For this study therefore the choice of relevant appropriate methods to achieve the right balance of quantitative and qualitative data from which valid findings can be taken. The research method is adopted for any study is usually influenced by an understanding of the way the aim of the study relates to the environment. The purpose of this chapter is to explain the underpinning concepts of the research design. First the rationale for the selection of approach and methods will be explained. Then, details of the selected research methods used, the sampling techniques used to achieve the sample population, and the methods of data analysis will be described. There are two paradigms used in research, the positivist and interpretive approaches. These are explained in detail in this chapter which provides a justification for the particular methods in use to fulfil the aims and objectives of this study.

As Figure 3-1 indicates, SSM is dependent on the richness of the data gathered that describes the 'problem situation unstructured'. To create these data for Stage 1,

a literature review and the data collection were undertaken both add to the study findings that allows for an understanding of the issues surrounding the impact and value of EPR adoption within HMR.

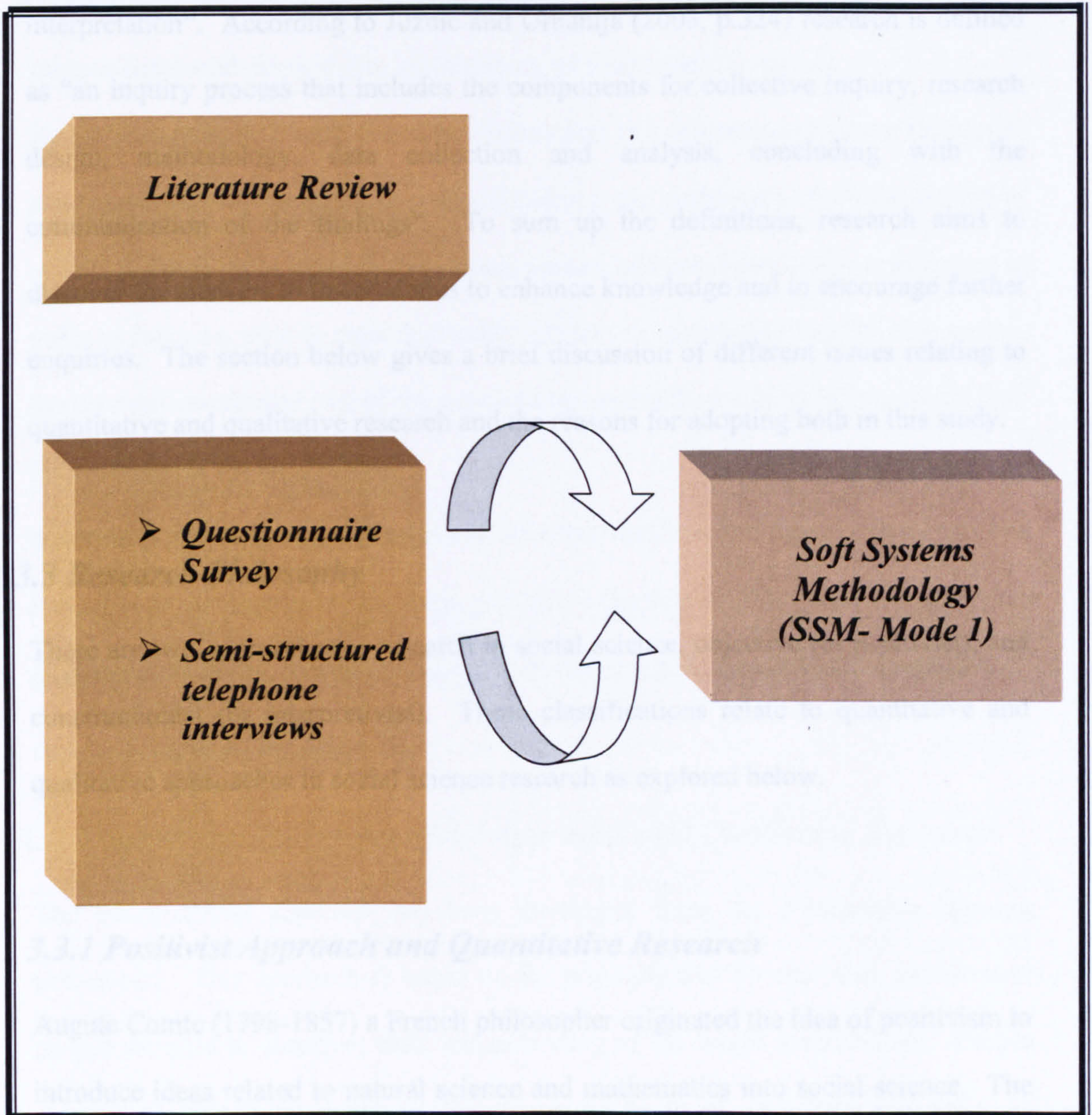


Figure 3.1 Research Methods

### ***3.2 Definition of Research***

Wilkinson (2000, 1-11) defined research as “the process of arriving at dependable solutions to problems through planned and systematic collection, analysis and interpretation”. According to Juznic and Urbanija (2003, p.324) research is defined as “an inquiry process that includes the components for collective inquiry, research design, methodology, data collection and analysis, concluding with the communication of the findings”. To sum up the definitions, research aims to discover the answers to uncertainties to enhance knowledge and to encourage further enquiries. The section below gives a brief discussion of different issues relating to quantitative and qualitative research and the reasons for adopting both in this study.

### ***3.3 Research Philosophy***

There are two approaches to research in social science, objective (or positivist), and constructionist (or interpretivist). These classifications relate to quantitative and qualitative approaches in social science research as explored below.

#### ***3.3.1 Positivist Approach and Quantitative Research***

Auguste Comte (1798-1857) a French philosopher originated the idea of positivism to introduce ideas related to natural science and mathematics into social science. The definition of positivist refers to something that is given, scientifically observed as verified factual knowledge (Evered & Louis, 1981). Crotty (1998) explains that positivists are concerned with facts, which they check in relation to the world around them. According to the philosophers, if a discipline stated that certain claims about

the world could be seen in physical actions, they could be verified and could be designated scientific. They propose that attempts should be made to describe the regularities of cause and effect in order to explain the world. Positivism as described by Bryman (1988, p.11-44) includes as its main feature a belief that both natural science and social science can use the same methods and procedures.

By gathering verified facts, they can be classified in a theoretical structure to support a particular field of knowledge. Consequently, the positivist perception and belief of data depends upon deleting the unique aspects of the subject being investigated in order to focus on what is most applicable. Positivist approaches may miss some key features not considered part of the quantitative approach, resulting in less useful data (Wainwright & Forbes 2000).

Neuman (1994) argues that people are not mere numbers and that abstract laws and formulae do not represent real lives. Similarly Gorman (1997) points out that mere figures do not go far enough in dealing with issues which are not easily quantifiable.

### ***3.3.2 Constructivist/Interpretivist Approach and Qualitative Research***

The constructivist approach has been developed from the constructive learning philosophy. This approach is based on the principle that by analysing experiences people are able to construct their understanding of the world around them. People create their own ways in which they can make sense of what they experience as Brooks noted in 1993 learners construct knowledge for themselves; each learner individually and socially constructs meaning as he or she learns. Neuman (1994) considered the constructivist approach by systemically observing how people use socially meaningful actions to achieve their objectives in creating and maintaining

their social worlds. As Butts & Brown (1989) noted, the constructivist approach towards qualitative research generates explanations of various social phenomena and helps to explain and understand the world in which people live and how there is a pattern in the way developments happen. Similarly, Myers (1997) stated that interpretivism assumes a connection between reality and the social world and that reality is measurable by subjective methods. He considered that interpretivism should study phenomena by using the meanings people attribute to them. Studying people's meanings and experiences were considered of greater importance than seeking "external causes and fundamental laws" to explain phenomena (Esterby-smith, et al. 1991, p.24).

### *3.4 Research Approaches*

From the above discussion it will be clear that there are two predominant approaches to research, that is, quantitative and qualitative. Quantitative research uses statistics to explain data whereas qualitative methods involve attitudes rather than statistics. Bryman (1988, p.12) concluded that quantitative research "investigates the natural order variables, control, measurement and experiment". He also considered that there is no single best method for social science research, and he described a variety of approaches.

Oppenheim (1992) refers to the strategy and logic of a research plan ensuring the possibility of making general conclusions from the findings. The choice of methods that would be most appropriate to answer the research question is essential; this often involves both qualitative and quantitative methods.

Quantitative research is concerned with the gathering of detail and the exploration of the relationship between one set of details and the other. Quantitative method should present reliable and valid ways of collecting data; the research design is logical in the natural world, as it attempts to decide reason and have an outcome on relationships; this achieved by adopting methods such as questionnaires ( Bell 1993).

The notion of using quantitative approaches in this case was in line with suggestions by Strauss and Corbin (1998), who observed that in order to gather data on behaviours and attitudes, quantitative approaches were one of the appropriate methods.

As Pope and Mays (2000) advocate, researchers may use several methods of data collection to obtain a valid impression of the available material. This can be used to provide a clear systematic picture, which will validate the research.

Strauss & Corbin (1990) define qualitative research, as any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification. Gorman (1997, 23) defines qualitative research as “a process of enquiry that draws data from the context in which events occur, in an attempt to describe these occurrences, as a means of determining the process in which events are embedded and prospective of those participating in the events, using induction to derive possible explanations based on observed phenomena”.

To sum up the above, Silverman (2001, p25) argues that “qualitative research covers a wide range of different, even conflicting, activities”. The choice between qualitative and quantitative depends on the aspect to be analysed, and both are



relevant to this study. The methods used by qualitative researchers illustrate a common faith that they can offer a deeper understanding of social phenomena than would be obtained from merely qualitative data (Marsh, 1982).

Comparatively, qualitative research is more language based whereas research with quantitative approaches deals mostly with numerical data. Furthermore, frequency counts are usually used in quantitative studies with larger samples, whereas qualitative studies generally have smaller sample sizes, and they often relate to the questions “how, when or why?” (Green & Thorogood, 2004, p.5). Bowling (2002) sees qualitative research as less obtrusive than quantitative, studying people in their usual environment and collecting data. The questions relate to the subjects surroundings and reactions to them. Often tape recording is used with unstructured interviews and transcribed before analysis.

Qualitative research currently involves a range of methods, subjects and disciplines. It has become important in most social sciences by representing the opinions of participants and recognising social realities. Qualitative research, as encompassing various philosophical and theoretical aspects, includes grounded theory, phenomenology, ethnography and a range of other approaches; all involve a search for meaning and understanding, from the collected data and analysis to describe the total phenomenon (Merriam, 2002). The researcher must be flexible to change direction if necessary as a result of research findings as they emerge. Lincoln (2005, p.165) considers that “qualitative research has established a small stronghold in education and the social and clinical sciences” and he notes that the number of

conferences has greatly increased and the variety of methods also, in a democratic way. Qualitative analysis does not involve measurable elements of amount frequency. Instead it analyses how reality relates to social structure and becomes meaningful (May, 2001).

Qualitative research makes use of 'unusual or the deviant and unexpected' to stimulate analysis and research. Qualitative and quantitative research may take place simultaneously. In quantitative research, the observer's independence is essential, and there is standardisation of data collection, but qualitative research involves subjective perception as part of the process. Qualitative interviews are also more flexible to benefit from individual contributions. The more subjective information obtained from them can provide explanations to assist analysis of statistical information. Since the 1960s, the qualitative approach has resulted in a range of independent research and more recently consolidated the use of methods (Flick et al, 2004).

Silverman (2005) has noted that qualitative research might appear to replace quantitative methods and that validity and reliability are relevant to both qualitative and quantitative research. However methods are not pre-determined; they depend on immediate relevance, and he maintains that the choice should be governed by the circumstances, no method is better than another in all circumstances. Quantitative surveys can be on a larger scale than qualitative interviews. Generally qualitative research involves a few cases but researchers tend to feel that these provide a better understanding than that obtained from quantitative data.

### ***3.5 Research Design for Study in Qatar***

#### ***3.5.1 Quantitative and Qualitative Research Methods***

Best and Khan (1989) noted there is the need for both types of information to give a full picture. Quantitative analysis were one of the main methods of approach in this study. Some qualitative data and analysis was also necessary to provide adequate information and explanation for details that quantitative methods are not designed to provide. Selecting the most appropriate design and methods for research depends on the research questions, the information needed to answer these questions, the resources (both financial and human) that are available, and the extent to which people in the field are accessible (Patton 2002).

This study uses questionnaires and interviews to achieve its objectives by providing opportunities for the expression of detailed opinions for analysis, both quantitative and qualitative as appreciated by Krueger 1994 and Ragsdell and Willy (2001) who recognised the importance of benefits of combining quantitative and qualitative procedures strengthening the research design. However, Wilson (1996) considered there is no specific best way of obtaining data but valid and reliable methods are the most important aspects to consider.

##### ***3.5.1.1 Quantitative Research Methods***

A quantitative approach was used to gather data on attitudes and behaviour of introducing an EPR system in Qatar. The questionnaires were used to solicit

information from a vast population, which would not be possible by using interviews or other qualitative methods. Questionnaires helped to gather information about the respondents' experiences with regard to the use of the current manual system and the extent to which the new EPR system would remedy the ongoing record keeping difficulties. The findings from the questionnaires responded to the main research questions by providing information about advantages and disadvantages of using an EPR system for medical records. In addition, questionnaires gathered information about medical and administrative staff perceptions of ways by which an EPR system could be developed more efficiently.

### ***3.5.1.2 Qualitative Research Methods***

This research used a qualitative approach to gather data on medical and administrative staff's experiences with the existing (manual) patient record system and the difficulties they faced when using this system. This approach also helped to solicit respondents' opinions of what the EPR system could best do based on their experiences and knowledge gathered from their use in different countries. This approach assisted the collection of information that responded to the main research questions on the advantages and disadvantages of introducing and using an EPR system in HMC.

Based on the above description of the two methods, the sections below provide the details of how each of the methods facilitated the collection of data for this study.

### ***3.6 Data Collection Tools***

#### ***3.6.1 Questionnaires***

Questionnaires are commonly used in quantitative research to obtain data, to gain numerical information, and to gain opinions in a structured way (Ajetunmobi 2002).

The findings can then be applied to the situations under review. However, Hall and Hall (1996) considered that the most important function of questionnaires is to provide information in a systematic way, which makes analysis easier and results more reliable. Walliman (2001) noted the usefulness of questionnaires as a data source, including low cost, wide geographical description, high response rate, bias reduction because of standardised questions, and also anonymity if necessary.

The disadvantages, as Bernard (2000) considered, included providing unambiguous questions and inability to seek additional information or to explain responses. Balnaves and Caputi (2001) mentioned different methods of obtaining information via questionnaires distributed and collected later, or handed out to a group.

Bell (1993, p.10) argues that the aim of a questionnaire is “to obtain information which can be analysed” and this could include an analysis of patterns and possible comparisons. In addition it is pointed out that a large sample is necessary to avoid the risk of being unrepresentative and also an experimental survey could ensure that the correct type of ample could be determined and would ensure statistically significant results.

Bell (1993) referred to the use of questionnaires and the analysis of data to reveal patterns and make comparisons using objective methods. Considerable sample size is

necessary to achieve representative results and questions such as, why, often lead to complex answers.

The literature states the value of a wide range of opinions obtainable from questionnaires, which provided useful information from a wide range of respondents. Sanders and Pinhey (1983) emphasised the importance of the order in which questions are asked. It is advisable to begin by asking the easy questions about the respondent's personal data and also in logical order.

As Greenfield (2002) advised, answers to questions were designed to facilitate grouping for subsequent analysis. His guidance was also followed in the wording of questions to avoid ambiguity, using simple grammar, avoiding 'nested' questions using simple language, not asking two questions in one, and making response easy by use of tick boxes. Instructions on completion and return of the questionnaire must be simple. In addition to being clearly printed, easy to understand and with confidentiality stressed, questions were closed and numbered. Bowling (1997) emphasised the importance of clear lay out, printing, and ensuring that the wording was unambiguous.

### ***Advantages and Disadvantages of Questionnaires***

Questionnaires are cheaper to use than personal interviews and require only printing and postage or e-mail costs. They can cover a large area, avoid bias, preserve anonymity, and enable both contemplative and spontaneous answers.

Other advantages of questionnaires are that responses can be quickly obtained by 'tick box' design which is appreciated by respondents. However, an important disadvantage of this method is that not all relevant questions are always included and respondents feel frustrated because they are unable to express important opinions.

This may result in inadequate responses. Ambiguity in questions can adversely affect responses also.

However, disadvantages include limiting the nature of the questions so they are straightforward, simple to understand, and, the written answers are clear to interpret, but there could be cheating that the researcher may not recognise. Furthermore, questionnaires may provide very low response rates.

### ***Likert Scales***

According to Bowling (1997), Likert Scales are frequently used for health related questionnaires, for measuring responses on categorical scales especially for health status and health related surveys. Bowling (2002, p.289) stated that “they contain a series of option statements, usually on a 5 point scale which denote the possible range of responses”.

As Oppenheim (2001) explained, Likert Scales express a continuum for each statement; there are five responses, which range from ‘strongly agree’ to ‘strongly disagree’. However, researchers have different views about how the scale should be applied between the extremes of ‘well’ and ‘ill’.

### ***Questionnaire Design***

A structured questionnaire for study in Qatar was used to enable the investigation to focus respondents on specific issues relevant to the investigation and to assist analysis of the responses. The questionnaires need to be completed by a pilot sample group to enable analysis of any problems before the main distribution and to ensure significant results.

When designing the questionnaires key issues included how EPR could improve patient care. Structured questions were designed to obtain relevant information from the respondents to meet the aims and objectives of the research. Questions were also checked to avoid any ambiguity and bias. The length of the questionnaire was important because it had to provide the required data yet not be tedious for the respondents.

### *Population Sample*

The choice of sample is a most important aspect of research especially when small samples are used in order to focus in depth (Murphy et al, 1998). Burgess (1982) considers that the selection of the sample, rather than its size, is the important factor in its overall validity. Also Padgett (1998) considered site, people, time and events were of greatest importance when choosing a sample, as they affect the kind of information which can be obtained. As Blaxter et al (2001) stated, sampling is used in research to provide typical examples of the items being studied from which accurate generalisations can be made. Such sampling is essential when the funding of an examination is limited. They concluded that the random sample is the most appropriate for the type of investigation needed in the research discussed in this thesis. To decide an appropriate size for the sample was, as Bryman (2001, p.93) noted, not easy because there are many aspects to be considered and no immediately obvious "best choice".

As suggested by Whitten et al (1986), a random sample should represent opinions if total numbers were large. Questions should be written, should avoid



misinterpretation and be tested using a small sample, amending questions if they appear to be ambiguous.

Sampling involves choosing a small number of respondents from a large population to represent a general viewpoint from a large bias. In this way the eventual findings are accurate because the sample affects the reliability of conclusions made from it, as Walliman (2005, p.276-277) emphasised in choosing a sample to be random, the researcher needs to consider the different groups in the population and which are most appropriate for purpose. Yates (2004) also defined the types of random sample and they are:

Simple random sampling used for populations which are uniform and all have an equal chance of being chosen; whereas simple stratified sampling is used when there are distinctly different groups to be included and each category needs to be represented.

The results are combined to give the overall outcome and can be used separately or combined for analysis. To achieve this, cases are proportionally selected at random from the various sub-divisions (Yates 2004, p.28).

Similarly (Greenfield 2002, p.190) noted that stratified sampling is used to obtain a sample which represents the population accurately. It can be included in the design of the sample. The population has to be divided into 'strata' and a random sample selected from each is used to create the required sample. It is most useful in situations where the stratifying variables are simple, and easily observed and related to the subject of the research. Cluster sampling refers to situations when the population concerned shares any characteristics. It is used to select at random

a small number for investigation from a much larger population. Systematic sampling appropriate for very large populations, which have no specific characteristics, and it is used for the choice of respondents e.g. selecting every 10<sup>th</sup> name on a list, the first being other than the first on the list concerned (Walliman 2005, p.277).

### *Pilot Study for Questionnaires*

As Oppenheim noted in 2001, the value of a pilot study is its ability to reveal ambiguities, which can be corrected. The above study revealed the need to be unambiguous, as brief as possible and easy to complete. Mason (2002) supported Oppenheim's (2001) findings and the importance of pre-testing to discover the time required for completing the questionnaire. From those pilot study questionnaires it was possible to discover where alterations to them were required to avoid ambiguity.

Feedback from the pilot study was used when making improvements to the questionnaire in design and structure, eliminating any problems of ambiguity. The questionnaire was then redesigned to incorporate these amendments, and a Likert scale for responses was introduced, so that they could be easily categorised in order of importance.

By organising a trial run of a questionnaire using a small group of respondents it is possible to detect any misunderstandings and correct them for the final draft. Most authors recommend pilot studies. A small group used for testing in this way should be as similar as possible to the main research group, e.g. in age and gender.

Their comments assist in revising the questionnaire to remove any ambiguities. They were designed to obtain the maximum relevant information and tested in a pilot study.

### ***3.7 Interviews***

#### ***Introduction***

Interviews can be effective research methods that investigate motives and feeling. Interviews can also be time consuming as Blaxter et al (1996) expressed. However, Moser and Kaiton (1985) described how to conduct an interview to obtain specific information, depends upon a structured approach. They emphasised the importance of preparing questions to obtain specific information rather than generalisations, and the necessary analytical techniques. Cohen (1976) mentioned that the researcher should prepare carefully for the interview and that it require a lot of patience. Interviews are a useful way of developing questionnaires and testing a variety of aspects of research. Interviews may be structured, semi-structured or unstructured as Robson (2002) and Nardi (2003) described.

#### ***3.7.1 Semi-Structured Interviews***

As noted by Pole and Lampard (2002), verbal exchange of information takes place between two or more people with one gathering information from the other, and Bryman (1998) notes that discussion can provide insight into a situation. The benefits of interviews include being able to confirm interpretations of written

information, obtaining additional information, extending the area of research, studying phenomena and practical issues.

Semi structured interviews include both questions, particular topics and general discussion, in what Have (1999) describes as the most typical interviews. The purpose of the interview must explain at the beginning by the interviewer. In order to decide the types of questions to be asked, preliminary investigations are necessary because time and timing were important to achieve co-operation. As Gillham (2000) noted, it was sometimes necessary to prompt respondents, or ask additional questions to achieve all the information required. Also, when interviewees had problems in communication, efforts were made to clarify the situation without compromising the reliability of the research; equivalent samples were used to validate the interviews (Darlington, 2002). These are useful for obtaining information in a more informal way which might not otherwise have been discovered. Patton (2002) pointed out the need for the interviewer to achieve maximum co-operation and information by identifying the reason for the study, relating the questions clearly to the subject and recording responses accurately. By combining all this information the researcher gains knowledge of the respondent's attitudes and aspirations. Sekran (1992) considered both face-to-face and telephone interviews, and the benefits of the latter when respondents are widely scattered. They are also beneficial for brief interviews.

### ***Strengths and Weaknesses of Semi-Structured Interviews***

An important advantage of an interview is its flexibility, in that explanations can be made if the interviewee does not understand some aspects. Also the interviewer can,

if necessary, request a more detailed response to avoid ambiguity. The high response rate is an advantage in comparison with postal questionnaires. In addition it is possible to obtain some background information during an interview that would not have been discovered in other circumstances. Other benefits of semi-structured interviews include the opportunity to clarify responses so there is no ambiguity. According to Nachmias & Nachmias (1992) one of the benefits is providing flexibility in questioning and to obtain more detailed information. If calls are recorded they may provide additional useful information at the data analysis stage. The researcher tape-recorded all conversations for analysis and the recordings were checked for clarity.

However the disadvantages include considerably higher costs and the time involved. The possibility of bias could be a problem in oral interviews. In addition, telephone interviews proved beneficial and informative. All these considerations were addressed by Nachmias & Nachmias (1989), Bryman (2001), Robson (2002), and Bell (1995). To overcome the above shortcomings, the samples were necessarily selected randomly in order to obtain information from wide range of respondents, some of whom were not known to the researcher.

### ***3.7.2 Telephone Interviews***

Bowling (2002, p.262) considered telephone interviews to be as effective and accurate as face-to-face ones, for collecting data, whilst saving time and resources. However, their use is limited to brief enquiries that require specific answers, mainly due to cost if longer conversations are entertained. Bowling (2002) studied the

problems of selecting interviewees by telephone to obtain information from respondents in clearly defined categories. Random selection proved to be time consuming and expensive; often the person answering the call was not the one required and the author had to use just random samples.

Tony Greenfield (2002), referring to telephone interviewing, noted that if the respondents were geographically scattered costs tended to be less by using telephone rather than face to face interviewing. However, even if living within a country, travel costs can be greater than phone costs. However, Kidder and Judd (1986) note the increase in telephone interviews for social research now that phones are more generally available and the high response rate which was only 5% less than that of face-to-face interviews and was not less reliable or valid.

### *Advantages of Telephone Interviews*

There are many aspects in favour of telephone interviews for both caller and respondent. One of the most important, as mentioned by Bernard (2000, p.234) is its comparatively low cost and also its convenience. In addition, although there may be as many as 40% refusals, it is not difficult to find others willing to participate and there could be almost 100% completion. He also mentions the need to keep details of the refusal rate to avoid a biased sample and to see if the respondents have any characteristics in common.

Another advantages noted by Bernard (2000) is that the interviewer is safe, and respondents can be selected in areas where researchers might hesitate to go.

However, Gilbert (2001) examined the benefits of telephone interviewing which is now easier because of the use of mobile phones and phones in general and has become an important aspect of many research projects. Generally the costs are reduced and time saved while respondents concentrate on the topic and useful information is gained quickly.

Bryman (2001) noted various examples of telephone interviews being more effective than face to face meetings such as in relation to costs. It is easier to check whether interviewers asked the questions correctly. Another benefit is the absence of bias because of reactions to the interviewer's presence.

### *Disadvantages of Telephone Interviews*

Bernard (2000, p.236) mentioned that disadvantages include limitation of time, though once having agreed to participate respondents tend to co-operate for as long as is necessary. A 20 minute session should be adequate for most research projects.

In some instances telephone interviews can be very costly, but in this study the cost was less than that which travel would have involved.

As Gilbert (2001) noted, the disadvantages included the need for special recording equipment and interviewers who can guide the information in the required direction.

To overcome the problem associated with recording equipment, the researcher obtained the necessary equipment using their own resources. There is of course no means of interpreting 'body language' of respondents due to a lack of eye contact.

Factual information is obtained more easily than attitudes and feelings. Holley (1996) supported Gilbert (2001) and emphasised that the first contact with a possible respondent is of crucial importance. To some extent, lack of physical contact was not

a major problem since the interviewee's expressions were noted through the voice tones they made while making arguments. Similarly, Kidder and Judd (1986) noted the disadvantages of telephone interviews include some difficulty in not being able to use visual aids, and the complexity of some questions. To overcome this, the researchers clarified all aspects which seemed ambiguous or unclear, wherever possible. Furthermore, questions were made as simple as possible for respondents to understand them clearly. However, Wengraf (2001) noted that you can not see the interviewer to gauge their response in addition to the tension that you never know when an interviewer might call to interview you, especially with a busy people.

Bryman (2001) agreed with the referred to above authors that there could be a loss of information by being unable to see the reaction of the respondent to particular questions. Also a telephone interview gives no details of the environment of the respondent which could be relevant. Another drawback is that the interviewer is unable to use visual aids which might assist responses. Also should also be emphasised that body language will be missed in this kind of interview, in addition to the fact that they can seem to go very quickly without giving interviewees much time to think about the answers, so it mean be well prepared.

### ***3.8 Soft System Methodology (SSM)***

As described in the literature review, soft system methodology has proved to be advantageous for a variety of applications. Both industrial and health care management have benefited from its use. It was first applied by the Systems Engineering Department at Lancaster University in the UK during the 1960s. Because of the failure of traditional Systems Engineering for use with complex



situations that involve an agreement of the required objective to be achieved, it became necessary to find alternative and effective approaches. Many objectives are not clearly defined, for example “to achieve better health” or to “provide quality healthcare”.

This SSM system has been used for organisational analysis. Bustard et al (1999) applied the modelling in business to evaluate its advantages.

For use in healthcare, SSM has become the most important technique for description, as noted by LeFevre and Pattison (1986). They also draw attention to the value of SSM in other forms of information planning, in particular for detailed analysis of environmental factors related to a problem, both internal and external. Smallwood (1990) applied SSM to improve the problems of transferring patient information for medical staff. Macias-Chapula (1995) examined information problems of health care in Mexico using SSM to identify the value, effect and problems of access to patient information and its impact on patient care. Fennessy (2001) used SSM to resolve problems in organisations where health information used only evidence based practice and explored how better information could be provided to improve patient care. Weston (1999) noted that SSM provided a better understanding of the issues concerned in the development and introduction of standards for electronic medical records (EMRs) to record the treatment of patients in New Zealand. This understanding was then used to guide the development of a questionnaire which was then subsequently used to obtain additional information from the stakeholders.

As this study uses Checkland's Soft Systems Methodology (SSM), some key concepts will be considered which will assist in understanding SSM. They include the definitions of systems, system thinking and soft and hard approaches.

### ▪ *Definition of System*

A system is a set of components, which together are able to achieve a particular objective, where components can be people or objects. Maier & Rechtin (2000, p.8) define a system as "a collection of different things which together produce results unachievable by elements alone". Checkland, (1991, pp. 317-318) expressed a system as

"A model of a whole entity when applied to human activity; the model is characterised fundamentally in terms of hierarchical structure, emergent properties, communication and control. When applied to natural or man-made entities, the crucial characteristic is the emergent properties of the whole".

### ▪ *Systems Thinking*

The systems thinking approach involves considering a problem as a series of components, each of which is dealt with separately so that final conclusions can be made (O'Connor & McDermott, 1997, p.255).

Systems thinking is holistic, it enables analysis and practical applications to be developed, thoughts, and ideas can be applied to complex problems to assist in finding appropriate solutions. It can help to provide rules that assist in predicting developments and rules to control them. Checkland looked at a system holistically

in relation to the problem as a whole rather than of its component parts; however, O'Connor & McDermott break the problem down into its component parts.

Aronson (1996) described systems thinking as expanding views in order to concentrate on the links between all components in the system, so that complex social phenomena can be explained.

▪ ***Hard and Soft Approaches to Problem Solving***

It is necessary to distinguish between “hard” and “soft” problems when selecting a methodology to solve a problem. Checkland (1991) considered that the ability to distinguish between hard and soft systems thinking was essential in understanding Soft System Methodology. The methodology involves creating a conceptual model which can be compared with the real world or the current situation. SSM has been successfully applied to a variety of situations including industry, management and health care. A hard system has a set of objectives, aiming towards a defined end-point and solves problems. However, a soft system has a ‘mess’ from which objectives are difficult to discern, does not have an end-point, as it is the objectives that are formulated as part of the process and improves the problem situation.

***The Seven Stages of Soft System Methodology***

***Stage One: The Problem Situation Unstructured.***

This explores basic research in the problem area, and identifies the participants, how the system works, and gives a general description of the problem and the organisational processes.

### ***Stage Two: The Problem Situation Expressed***

This helps in structuring and expressing data collected in Stage One and four analyses are involved, including

- Analysis based on the client, the problem solver, and the problem owner.
- Analysis of norm and values related to social and cultural considerations.
- Political analysis of the organisation, its politics, power structure and the characteristics of those who are powerful.
- Diagrams communicate information effectively by rich pictures (Checkland, 1981, p.165).

### ***Stage Three: Root Definition (RD)***

A basic description of the proposed system based on root definitions is an essential part of the methodology. The main aim is to examine the situation from different viewpoints which are appropriate to the problem situation. To be certain whether the root definition relating to the situation under discussion is complete requires the use of six criteria identified mnemonically as CATWOE.

- **C** represents the customer i.e. all who benefit from the system. If there are some who are disadvantaged by the system they must be included as customers.
- **A** represents an actor who participate in the system.
- **T** represents the transformation process i.e. from input to output.
- **W** represents Weltanschauung, the German for worldviews, and identifies the underlying assumptions of the system.

- **O** represents the owner of the system and ultimate control.
- **E** represents environmental constraints including legal and ethical concerns.

An example of a root definition could be:

“A HMC owned patient records system to improve organization and communication of patient data by means of an EPR in order to achieve a decrease in morbidity and mortality while increasing patient care”.

Here, it is easy to identify the different components of the generic root definition statement, “A system to do **X** by means of **Y** in order to achieve **Z**”.

#### ***Stage Four: Conceptual Models***

At this stage the root definition is converted to a conceptual model which defines the function of the system and the ways in which its objectives are achieved. Interlinked activities can be illustrated by a pictorial model or flowchart for clarification. According to Avison & Fitzgerald (1995, p. 248) a model should illustrate some relevant aspect of the problem situation. When considering conceptual models or what the system must do for each root definition, Checkland (1981, p. 313) commented that “a system account of a human activity system is built on the basis of the system’s root definition, usually in the form of a structured set of verbs in the imperative mood”. Davies & Ledington (1991) stated that the creation of conceptual models relates to the root definition only and formal systems logic so that references to the real world are excluded in relation to the problem situation.

Carson & Cobelli (2001) noted that there are numerous types of model, for example, conceptual, mental, statistical or mathematical which can be used to explain interpret or describe. The essential requirements include recognising the extent to which the model is an approximation of the factors being studied. It should be sufficiently relevant for any particular purpose, and therefore valid in that particular context.

A model is an essential part of any creative process used to assist in defining the final product whether material or imaginative. Subsequently, ideas can be modified during the design process so that the final object meets the necessary requirements which the model requires. A model is successful if it enables the designer to achieve his or her objectives, and this does not depend upon its size (Merriam, 2002; Wilson, 2001).

As Punch (2005) states “Conceptual clarity involves the precise and consistent use of terms, internal consistency within an argument and logical links between concepts especially across different levels of abstraction” (Punch 2005, p.21).

In graphic or narrative form a conceptual framework should include the main concepts and their relationships. It is helpful to identify prior knowledge and how it can fit into the research programme (Punch 2005, p.53). Lofland et al (2006) recommended concept charts to illustrate the relationships between various data which used to be displayed in a variety of areas before computer data basing was available. They rarely feature in the final versions unless their complexity makes this necessary. Sheppard (2004) considered the importance of conceptual understanding using ‘partnership’ as an example. He mentioned that generally ideas about it are vague, sometimes cynical and often concern conflict. He examined three

aspects, assumptions, practical concerns, and how to make these work in practice. In addition he considered how partnership quality could be assessed.

A conceptual model is a kind of mental map for the logical use of information. It shows how information can be fitted together so that both designers and users understand it clearly. How people constantly receive information and their mental reaction is to wonder how this relates to their activities. What is their conception about the information they have received i.e. what is their conceptual model?

Jarvelin & Wilson (2003) divide conceptual models into those which summarise and others which are analytic. They investigated in detail models which assist research projects. Models can highlight gaps in research without suggesting which hypothesis should be tested (Wilson 1999,p.251).

A conceptual model helps in the analysis of concepts and how these relate to one another, leading to the development of appropriate research questions (Bunge 1967 & Wanger 1993). As supported by Vakkari (1998), it could be helpful before beginning research to consider the various conceptual models and their usefulness. This requires consideration of a wide range of information, not only academic but by other professionals and laymen. There is value in seeking the experiences of those who have to put theory in to practice and make it work.

### ***Stage Five: Comparison of the Conceptual Models with the Real World***

The conceptual model stage 4 is compared with the real world stage 2 to discover if it reflects accurately the real situation and if the systems currently in use are satisfactory. Results from stages 4 and 2 are examined to discover in what respects they are similar or different. Additionally, constructive action can be taken and the model can be modified if necessary (Checkland 1981, p.177).

### ***Stage Six: Identification of Necessary Changes***

With costs and benefits in mind, the previous stages can be analysed to see where changes could be beneficial. Checkland (1981, p.181) noted that desirability is related to insight provided by the choice of root definitions and the creation of a suitable conceptual model. Feasibility depends upon cultural aspects of the problem situation, the people involved, and their mutual experiences and their prejudices.

### ***Stage Seven: Action to Improve the Problem Situation***

This final stage requires action to improve the problem situation outlined in stage 6, but it may also result in new and different problems (Checkland 1981, p.180), indicating the iterative nature of the methodology.

### ***Advantages and Disadvantages of the SSM***

Any new system will have both benefits and difficulties; the choice of this particular system is because it provides understanding of problem situations and several



authors draw attention to these advantages. SSM combines both theory and practice, uses special terminology and acts in several stages to solve unstructured problems. Cultural factors in soft system methodology can be included clearly to apply where necessary.

The SSM provides flexibility and is able to be used in a variety of study topics. It is also linked to activities and this enables it to be used in describing the actual human activities through root definition. SSM can assist in understanding these activities and is useful in classifying information. SSM allows the quality of information and co-operation to be examined (Checkland, 1981; Checkland & Scholes, 1990; and Macias-Chapula, 1995).

However SSM has some disadvantages which include the fact that problems are not structured. Problem situations, however, can be improved by discussion and give and take. With open-ended methodology, any changes to one problem might result in creating another, and in this aspect, the difficulties could be never ending.

SSM produces informal models of various activities, which could result in misinterpretation and fail to add to data necessary to solve the problem (Davies & Ledington, 1991; Checkland & Scholes, 1999).

This study will apply the first four stages of Checkland's Soft System Methodology (SSM) because this approach represents the problem under investigation at the Medical Record Department. The problem situation unstructured can be analysed from the questionnaires and telephone interviews of the participants. The outcome of the SSM intervention in this study will be a conceptual model of the issues associated with the introduction of an EPR system within HMC in Qatar.

***Reasons for the Adoption of SSM for this Study***

The choice of SSM as a framework for this study can be explained as follows

- SSM assists in highlighting any problems, which could enable appropriate modifications to be made and to achieve an acceptable solution, by designing the ideal system framework for patient records. This will enable appropriate action to improve the problem situation. All of these considerations both theoretical and practical make SSM the principal approach in creating an efficient, practical and effective system.
- The SSM approach to the analysis of problems involves an overall view of the ideas under consideration and enables a more detailed development of them. This method is flexible enabling the analysis of the problem to be investigated thoroughly to enable the overall analysis to be valid and accurate. It also makes possible the consideration of different stages of the analysis whilst avoiding any omissions.
- The methodology, as chosen to include both theory and practice, has its own terminology and deals with current problems aimed at improving them.
- SSM is the most appropriate system for analysing and resolving the problems involved in this study. These include investigating all aspects of transferring patient records in the Medical Record Department at Hamad Medical Corporation from a manual to an electronic system. The needs of SSM influence relationships between hospital staff, computers and information technology (IT).
- SSM has been implemented successfully in a variety of organisations including issues related to health services, government services, industry, information systems, education and library services.

- Every aspect of SSM has been described in detail to provide logical guidance through to the investigator. The benefit of this approach is that it provides increased confidence and better overall organisation of the investigation.
- Despite the fact that SSM was developed in the West, where it is assumed it was required to enable managements to resolve problems amongst staff, it appeared to be used in many countries elsewhere. In addition, this approach is appropriate because any system of information must represent the realities of the situations described and this is especially critical for any successful system of electronic patient records (EPR).

### ***3.9 Data Analysis***

The Statistical Package for the Social Science (SPSS) was used for analysis of the questionnaires and the accuracy of the data used was verified. By using frequencies, descriptive statistics and percentage cross tabulation as in the case of Pallant (2001), and Guillian (1988), it becomes obvious that the data could best be analysed in ways in addition to using chi-square tests. Significant findings from the chi-square test are highlighted in the chapter concerned with the analysis of findings. These analyses will be discussed in chapter 5.

The Statistical Package for the Social Sciences (SPSS) programme (Version 14) was used for questionnaires analysis. Descriptive analysis was required. ( Kinnear& Gray , 2000).

Bell (1993) noted that it is not sufficient just to collect facts. They need to be analysed by using the appropriate analytical methods.

The results were displayed as a summary which was used to see if there were any obvious patterns and a frequency table revealed the percentage of each question.

Cross tabulation was then used to illustrate and compare variable responses with one another and to examine if there was a positive or negative relationship between them and if it was statistically significant.

A qualitative approach is derived from the analysis of data and it enables new ideas to be developed (Creswell, 1998). Therefore, it was used in this research as this area is new in Qatar (Strauss and Corbin, 1998). Recorded telephone interviews needed to be analysed and summarised to discover key themes. Such qualitative and descriptive approaches result in semi-structured data which the researcher can analyse and categorise to match the aims of research (Padgett (1998), Scott, 1990). Transcription must be carried out immediately after each telephone interview. Gillham (2000) suggests that researchers should follow this practice in case the recording is faulty in any way, any missing information can then be recalled.

To assist analysis the data were coded as Bryman (1998) suggested. This is a key process in qualitative analysis in general. Bryman (2001) emphasised that coding is considered to be an important part of qualitative tools, after obtaining initial data. Analysis of the data is assisted by creating categories (Coffey and Atkinson, 1996). To use a coding system it is necessary to put the interview details into categories, determined by the responses. The analysis would aim to determine the main themes and to see if any appeared to oppose one another. All the themes must be checked to identify their interrelationships, then organised hierarchically (Byrne, 2002). From the analysis of the results it was possible to draw conclusions which answered

the research questions related to the literature review and reflected the contribution of the research (D'cruz and Jones, 2004).

The QSR (Qualitative Software) Nvivo programme was used for analysis of the data, and Lewins (2001) stated that this is often used in the grounded theory methods. Fielding (2001) recommended that codes should be brief and their names should be related to the data. Coffee and Atkinson (1996) encouraged Ford et al (2000) to see the benefits of reducing the time required for analysis of data by using software.

However, Lewins (2001) noted some disadvantages that software may have some limitations, such as the fact that data can not be freely easily edited or annotated. Consequently, choosing the right package is important because of the possibility of a lack of recourses, money and time to learn to use the system. Therefore Nvivo software would be used as the most familiar and appropriate. Language and the way questions are asked are very important factors in communicating (Beresford 2000).

### *Coding*

Coding is one of the processes by which the researcher can organise and manage the data in qualitative research. It enables the data to be analysed by creating categories and thus can be part of the analysis process (Coffey and Atkinson, 1996). Analysing data by coding can be achieved by putting the contents of interviews into categories, some of which can be identified before coding commences, given the nature of the questions used in the semi-structured telephone interviews and analysed using the coding by which to type them. Gibbs (2002) emphasises the importance of coding

because it is essential for all qualitative analysis from the very beginning of the research. He describes coding as a means of identifying data, parts of a text, or ideas by the use of nodes which connect concepts or ideas with relevant parts of the text. The Nvivo code used in this research connects passages of the text to nodes which are named. Nodes are not merely names; they connect a theoretical idea with any part of the text exemplifying that idea. Nodes can be linked to one another in a text directly, or by using a node tree, and linked to documents.

To analyse data, the NVivo software program as Computer Assisted Qualitative Data Analysis (CAQDAS) has become an accepted means of managing qualitative data. The purpose of the software is to ease the attachment of codes to particular data and it allows the retrieval of all examples in the data sharing a code. These approaches are represented in programs (Coffey & Atkinson 1996). Consequently, coherent codes are related to each other, as Miles and Huberman (1984) emphasised. Furthermore they noted that chosen names for codes should be short and close to the concept. Also, the quotations alongside each code are very useful in carrying out analysis and in checking availability and reliability.

The software has advantage over manually coding that using more than one code word simultaneously. The software is able to deal with very large numbers of coding.

Therefore, NVivo software if chosen to use it in any research could be resulted a greater degree of confidence in terms of coding and analysing (Lewins, 2001).

Yates (2004) considers coding as essential for good research work so that relevant references can be quickly identified in complex documents.

### ***3.10 Triangulation***

Triangulation can be used as a form of validation. By using a combination of methods there is a better understanding of the subject and also additional rigour, richness and depth can be achieved (Denzin, 2005). Also using a variety of research strategies may help in analysing a subject more thoroughly, and this is the purpose of triangulation (Denzin, 1970). Using evidence from several different sources, where investigations have included different methods, can result in greater credibility of the resultant conclusions (Hall, 1996). This led to a comprehensive picture being obtained for triangulation which increased both the validity and reliability of the research. Pop and May (1999) suggested that researchers often employ more than one method to collect data in order to obtain a valid, holistic and systematic picture when using an interpretative approach. The main benefit of triangulation for researchers is that it strengthens their arguments in favour of a particular viewpoint, and adds to their confidence in the results. Also it assists the development of innovative approaches and new ways of examining problems. In addition triangulation can sometimes reveal deviations which might not otherwise have been noticed e.g. some viewpoints which are different from those of the theory or model being examined. Triangulation is not suitable to use in all situations for all types of research. However, it is a vital component in enhancing important research (Bryman, 2006).

In this study triangulation was achieved by combining the perspectives obtained from the questionnaire survey and telephone interviews with the conceptual model developed through application of SSM. By doing this, it is also possible to combine

breadth of study (questionnaire), depth of study (telephone interview) with a representation of the findings of the study.

### ***3.11 Validity and Reliability***

Validity and reliability must be addressed by the researcher throughout the whole process since these are central elements in judging the research's quality and rigour (Bryman 2001). The credibility of the data gathered in this study was assisted by the researcher's understanding of the social world under investigation. Additionally, using a variety of quantitative and qualitative methods supports the validity of the findings through triangulation. (Burgess (1982), Bryman (2001), Silverman (2005), Blaxter et al (2006).

The validity of using questionnaires and their reliability are important to give a comprehensive view and increase the validity of the information and reliability of the sample (Pope & Mays, 1999). As Bryman (2001) stated, the quality of research depends on the validity and reliability of the data. This was emphasised by several authors as an estimate of the accuracy and value of any research.

It can be argued that the validity of data lies in its ability to make conditions apparent and to assist an understanding of facts and relations which emerge from the setting being studied (Bryman, 2004). However, Punch (2005) stated that reliability is concerned with the design and development of the research and what should be included.



In this study, using different methods with different samples and requesting information about different periods of time offered both internal reliability and complementary outcomes.

Bogdan and Biklen (2007) argued that the accuracy and credibility of data in qualitative research are more important than being able to repeat their research. Since data are analysed according to the knowledge and experience of the researcher, a defining feature of such research is the role of the researcher that being involved in the whole process, especially during the collection of the data.

Litwin (1995) noted that all research intrinsically depends on the reliability and validity of the data. He also emphasised that the lower the measurement error, the closer the data are to the truth whilst recognising that random error can occur in all research. He recommends increasing the sample to be more representative. Golafshani (2003) in contrast argues that reliability is concerned with measurement not quality and is therefore irrelevant for qualitative analysis. However, this takes the view that validity of research depends upon the truthfulness of the results or whether the research really measures the attributes intended.

### *3.12 Ethical Considerations and Access*

Blaxter et al (1996) considered confidentiality, anonymity, legality and professionalism. Participants were assured that third parties would not be involved and anonymity would be preserved. To ensure legality the questionnaire did not

include items relating to morality, ethics or general probity. Respondents were encouraged to complete the questionnaires.

The purpose of any research needs to be explained to the participants before their interviews as suggested by Burgess (1982). He considered that such information could be of advantage especially if there is a subsequent discussion, which could be considered as feedback, and it is time saving. Padget (1998) also thought this would ensure validity, relevance and viability. The interviewees consent was obtained by the researcher and they were informed about why the study was necessary. This will enable them to respond more effectively. It is also necessary for the researcher to clarify her identity and aims. As Filstead (1970) advised, the researcher must be certain that he/she is not viewed as the representative of any particular group. The researcher must be sure always to present herself only as a researcher, and not as an employee, which could affect interviewee's responses.

There may be more than one telephone interview per individual medical staff member and administrator at the hospital. They were aware of the topic of research and what their contribution could be, also that they could change their mind and withdraw during the telephone interview. In addition they were to be informed that they did not need to answer any question they preferred to avoid. This ensured that their permission had been granted verbally and in writing. The brief letter contained all the required information; what would happen during the research, how often they would be interviewed via telephone, and how the data would be used, with a reminder that they were confidential (Baes, 2002 and Rapport, 2004).

The telephone interviews were tape recorded, permission having previously been granted. However, Murphy and Dingwall (2003) mentioned that researchers must protect participants by keeping all personal data confidential.

From an ethical point of view research must be seen to be confidential and used only for the sake of the research. Actual names were not used, abbreviations or synonyms were appropriate for confidentiality, but service providers may have had their actual names recorded if they gave permission.

### ***3.13 Research Procedure for this Study***

The choice of qualitative or quantitative methods that would be most appropriate to answer the research question is essential.

To give a comprehensive view it is necessary to draw attention to all aspects of the existing system in order to validate the proposed changes. This research used both quantitative and qualitative approaches to investigate the best system in order to introduce a patient record system, which will be readily available, accurate, up to date and retain confidentiality.

Quantitative analysis was one of the main methods of approach in this study. In August 2004, 400 questionnaires were distributed and simple stratified sampling was used to select randomly from each category, e.g. nurses, doctors and administrative staff of HMC from all grades. A covering letter was included with each questionnaire to provide an authoritative introduction to the research methods (see Appendix 1). All the questions were in English language. Through the discoveries made during the pilot

study and informal conversations with the medical and administrative staff, the Likert scales were found to be a suitable approach. This was due to the fact that most respondents were busy and therefore could not respond to questions that needed detailed explanations. Furthermore, the questions provided rich information, in which case this method was considered ideal in the situation where respondents could provide their opinion in the form of agreeing or disagreeing with various aspects they were asked to respond to.

It is important to plan the distribution and collection of questionnaire. The researcher used telephone calls to remind those who had not returned the documents as recommended by Stone (1984) and DeVaus (1996). They suggested numbering questionnaires and recording addresses to which they were sent before a closing date.

Where questionnaires were not returned, a further copy was sent.

The sample consisted of medical and administrative staff as summarised in Table 3.1.

Care was taken to ensure that the questions were clear to understand and unambiguous. The questions were categorised into three areas, which included personal data, opinions about the introduction of EPR and the main factors that affected the proposed change. A total of 22 questions were included, seven of which were personal data in section one, twelve related to opinions about EPR introduction in section two and section three referred to the main effects of the change to EPR.

See Appendix 1 for the questionnaire.

Table 3.1 The stratified sample (HMC)

Doctor of Medicine	150
Administration	50
IT Services	50
Nursing	100
Technician	50
Total	400

**Table 3.1 The Stratified Sample**

This study ensured that a reasonable sample size was used to ensure optimum representativeness. This research used a questionnaire approach to collect in depth information from all levels of medical and hospital staff about the present and proposed format of final patient records system. The Likert scales were chosen as the most appropriate for the quantitative surveys involving different categories of staff, both medical and administrative. The questionnaires were designed to obtain opinions quickly, because time was an important factor for these respondents and accuracy and legibility were essential. Reassurance was also necessary regarding the possible accidental loss of records when inexperienced staff used the system.

For all respondents, Department Heads set up an explanatory meeting to clarify the aim of the research and explain how important their contribution would be. There was general agreement that the system would be beneficial. Many had seen something similar elsewhere. The saving of time, the legibility of the standard

format, the ease with which additional information could be recorded, were of benefit to every user of the proposed system.

### *Pilot Study for Telephone Interviews*

In order to decide the most appropriate method for semi-structured telephone interviewing's a pilot study was arranged to include four Doctors and one Administrator from Hamad Medical Corporation (HMC) while they were in England. To collect maximum information's it is necessary to identify the topics, to relate questions to the subject, and record accurately the responses. Oppenheim (2001) considered pilot telephone interviews to be helpful provided they are tape recorded and can be studied subsequently. He recommended pilot studies to save both time and money. The importance of explaining the procedures and the need for uninterrupted time when making arrangements for interviews ensured that they were as efficient as possible. Stone and Harris (1984) recommended how important it is to have a pilot study to test questions to avoid possible misinterpretation and for this research a pilot study was made. The interviews were recorded and the researcher subsequently printed verbatim copies in this pilot study. Each interview lasted 20 to 30 minutes depending upon the interviewee's experiences and responses which were recorded. As Bernard (2000) noted pilot telephone interviews are inexpensive, but 30 to 40 % refusals may occur and it is easier to replace them than face to face interviewees. He recommends from the pilot study that calls should not exceed 20 minutes.

Cohen (1976) related pilot interviewing to going fishing and he emphasised that interviewing requires preparation, practice and patience to obtain the desired result.

There was similarity in the researcher's efforts to contact specific individuals and it proved more productive when an introductory letter explaining the purpose of the enquiry was sent. Financial considerations were also a problem, but the opportunity to speak directly with a particular practitioner or administrator was very worthwhile.

### ***Analysis and Importance of the Pilot Study Semi-Structured Telephone Interviews***

A list of all relevant staff was received and the researcher made a random choice of consultants, specialists and residents from a range of departments within HMC in Qatar. An e-mail in English was sent to each of the chosen group to obtain their permission to conduct an interview and discover the most convenient time for this, at a stated phone number. After one week, if no reply had been received, a reminder was e-mailed and some substitutions were made. Access to the Hospitals has been made via an approval letter from Administrative Director of Hamad Medical Corporation (HMC). Permission to undertake telephone interviews was requested for medical and administrative staff. The procedure had the approval of the Administrative Director of HMC who was most helpful.

### ***Participants in Telephone Interviews***

Interviews were conducted with 30 participants as shown in Table 3.2 in three groups. A simple stratified sample, randomly selected from different positions and

departments, firstly including 15 doctors, was chosen because they need information rapidly in emergencies and they add to the existing patient records. They make the greatest use of existing medical records and have experienced problems with the present manual system. Secondly, 10 administrators were chosen because they are the second most frequent users of patient records. They included the hospital administrator's medical records and IT staff because they are mostly involved and have daily use of the existing system. Thirdly, 5 nurses were selected representing both in-patient and out-patient contact with medical records on a daily basis. Each was the Head Nurse of a different department and had a wide experience of dealing with patient records.

Doctor of Medicine	15
Administration	10
Nursing	5
Total	30

**Table 3.2 The Participants in Telephone Interviews (HMC)**

### ***How the Telephone Interviews were Conducted***

The interviews took place from March to May 2006 and the researcher explained their purpose and their confidentiality. The information gathered would be used for this research only.



Each interview lasted between 20-30 minutes, and was recorded. It was sometimes necessary to provide additional explanation to obtain the required information. The digital recording system was necessary for these interviews to enable a complete written record of them to be compiled as Burton (2000) recommended.

### *Telephone Interview Design*

There were 3 types of respondents, 15 doctors, 10 administrators including IT staff and 5 nurses. To ensure accuracy and the best use of data, the conversations were recorded and this proved to be essential. The telephone interviews consisted of 17 questions, all but one of which related to the difficulty of dealing with manual hand-written patient records. The exception relating to the above did not concern some of the senior administrators. Their work did not deal with any of the hand written documents.

This study used semi-structured telephone interviews to obtain in-depth data from service providers, physicians and nurses.

A digital recorder was used for the questions by telephone, which was transmitted, from the UK to Qatar at a time convenient for the respondent, i.e. during the afternoon or evening. The transcripts were manually recorded verbatim, coded and then transferred to a computer. The aim was to include verbatim records of each interview to provide maximum information for analysis. This made it important to reassure those concerned that the respondents would retain their anonymity because only a single initial letter would be used to identify them. Some hand written notes were made during telephone interviews, which added to their value for analysis. In

this research telephone interviews were conducted in English. Language is also very important and the way in which questions are asked (Bryman, 2001). The recorded interviews were categorised using NVivo for analysis. In this method recorded interviews are analysed and summarised to reveal key themes. This qualitative approach produces semi-structured data, which the researcher has to interpret (Strauss and Corbin, 1997 and Creswell, 1998). In this research transcription and analysis was carried out immediately after each telephone interview. In qualitative work coding is one of the ways of analysing data (Bryman, 1998). This enables the information to be analysed by creating categories, Coffey and Atkinson, (1996), and commonly uses data coding for analysis as Pole and Lampard (2002) noted. Moreover codes will enable the development of general ideas about the research aims, that the qualitative data will be used NVivo software for analysis. In order to minimise the above shortcoming, this study used telephone interviews which helped to provide detailed and richer information that questionnaires did not.

Telephone interviews provided examples of problems resulting from the current patient record system at the Department of Medical Records in Hamad Medical Corporation in the state of Qatar. This study is focused at different levels on four stages of the patient record system, because each stage is dependent on the others. Current issues and situations were discussed to enable analysis of the data, using Soft System Methodology as will be outlined in section 3.8 and 7.2.

A combination of methods such as structured questionnaires and semi-structured telephone interviews were called for in this study. These approaches may be considered necessary to provide a clear analysis of the collected data.

### ***3.14 Limitations of the Study***

The main limitation was the number of completed questionnaires returned and the number of telephone interview respondents from both the pilot study and the final study. This was in spite of the importance of this research to those concerned, who did not reply but who would have benefited from an Electronic Patient Record (EPR) System if it were agreed. The proposed system of data collection was chosen as the most appropriate to achieve the objectives of the study. The time involved in completing questionnaires was a major concern and also that some potential respondents admitted they had lost their questionnaire.

### ***3.15 Summary***

This chapter has described the research methods and how the findings were analysed and also reviews the approaches used to achieve satisfactory information by various methods about the proposed EPR system for HMC in Qatar. For this research it became apparent that the most useful approach would be to combine both positivist and constructivist methods, for data collection and its analysis in relation to the design of an EPR system.

A combination of quantitative and qualitative research approaches was adopted. The methods selected include questionnaire survey, and semi-structured telephone

Interview. In addition an in-depth discussion of the use of Checkland's SSM was given, this being used to provide the appropriate data for this research illustrated in Figure 3.1. Questionnaires and semi-structured telephone interviews were discussed as there provided the most appropriate material for analysis. The co-operation of respondents was much appreciated. In addition the advantages and disadvantages of both methods was considered. In considering quantitative analysis, qualitative aspects also must be involved. For the design of the questionnaire care was taken to avoid ambiguity. Ethical issues especially confidentiality were considered.

The findings in Chapter Seven on the result of Systems Intervention will present the application of SSM to the problem situation at Medical Record Department.

The next chapter interprets the research findings in the context of Qatar and, in particular, the health service related to HMC.

## **Chapter 4**

### ***The State of Qatar and its Health Services***

#### ***4.1 Introduction***

This chapter provides a brief overview of the history and economy of Qatar. Additionally, a historical background of development of the health care system is given, including profiles of the hospital provision, an introduction to the Hamad Medical Corporation (HMC) and the medical records system. The Hamad Medical Records (HMR) are the focus of this study.

##### ***4.1.1 Geography and Population of Qatar***

Qatar is a small peninsula, 11,437 sq km in area, on the West of the Arabian Gulf, bordered by Saudi Arabia and the United Arab Emirates (U.A.E), (Figure 4.1). In addition to the mainland, Qatar had a number of islands near the peninsula which are the main source of the national wealth from their oil reserves. It had (in 2003) a population of 800,000 of ancient Arabic descent from nomadic tribes.

The population is mainly Arabic, sharing history, language and religion with neighbouring states. Over 50% of the population reside in Doha the capital, where most of the commercial, financial and governmental activities are concentrated (Qatar, 1999; Day, 2006).

Towns such as Wakrah, Umm Said, Dukhan, Al-Khor and Madinat Al-Shamal have sizable populations.



**QATAR**

Figure 4.1 Qatar Map

### ***4.1.2 Independence of Qatar***

The country was controlled by various powers over the centuries until 1916 when Turkish rule ended with the signing of a protection treaty with Great Britain.

The discovery of oil transformed the economy and exploration began in 1949. Qatar acquired independence from Great Britain on 3<sup>rd</sup> September, 1971 and modernisation of the country became the primary concern of the Emir (Al-Othman,1984).

A welfare state was created to provide housing grants, free education and medical services for all citizens. Foreign experts were called in to set up a large-scale development programme to modernise the country. Soon houses, schools, hospitals, power stations, government departments and many other public institutions were built. Islam, is the main religion of the state, and the Sharia (Islamic Law) applies in all areas. Arabic is the official language, although English is widely spoken (Ahmed, 1983).

Qatar is an important member of the Gulf Co-operation Council (GCC) which includes, Oman, United Arab Emirates (UAE), Bahrain, Kuwait and Saudi Arabia.(Anscombe, 1998).

### ***4.1.3 Development of Qatar's Economy***

Qatar is blessed with huge natural resources, especially natural gas and oil, and there is resultant social development especially improvement in the standards of all aspects of life. The Emir, His Highness Sheikh Hamad Bin Khalifa Al-Thani, supports strategies which aim to develop the national economy, supporting initiatives in the private sector to attract foreign investments and to pool foreign expertise and

modern technology. Investment plans include diversification of exports, and encourage a variety of sources of income and the development of new economic sectors. Projects for oil and gas developments are on a vast scale and already oil fields have increased from 4 in 1980 to 10 in 2000 (Amazon, 2004 ; Al-Naser, 1982; Crystal, 1995).

The oil revenues make Qatar a very wealthy country and there is general agreement that investments should be of benefit to all the population. To improve the standard of health care in all areas the proposed system in this thesis for introducing an Electronic Patient Record System (EPRs) could potentially bring benefits nationwide. The initial capital costs will be followed by savings in time and the running costs will be small. New technology will soon become familiar once the system is in general use. Qatar could become a leader for other countries to introduce similar systems if it is seen to be beneficial to all concerned.

#### ***4.2 The Health Services System in the State of Qatar***

The first hospital was established 50 years ago and now there are four supported by the state, as well as several others offering private services in the capital. Clinics and practices throughout the country are licensed by the Ministry of Public Health which sets the standards for practice (Qatar, 2004).

All aspects of health services have been modernised in recent years with emphasis on prevention of illness and the provision of universal primary care. This has become an important aspect of Government policy. Most areas of the country now have health services within easy reach. Until recently most services were free for all



Qatari citizens and from 2006 patients of other nationalities have paid fees which are subsidised by the government and organised by the Ministry of Public Health.

### ***4.3 Hamad Medical Corporation (HMC)***

Hamad Medical Corporation is responsible for administration of the four state hospitals and is regarded as one of the most outstanding corporations of its type in the Arabian Gulf. All hospitals have outpatient departments; the Hamad Medical Corporation constantly updates the facilities to meet the needs of staff and patients (Younis, 1993). They aim to support the highest quality of patient care and to provide the most up to date treatment. In addition Hamad General Hospital aims to collaborate with other healthcare institutions, contributing to the quality of services and health education in the Gulf Region.

Hamad Medical Corporation (HMC) was established in October 1979 and now includes four hospitals which opened in 1982 with the most modern equipment. They are Hamad General Hospital, Womens Hospital, Rumailah Hospital, and Al-Amal Hospital.

The structure of HMC is shown in Figure 4.2. These four hospitals are managed by the same Board of Directors, who are appointed by the Emir, His Highness Sheikh Hamad Bin Khalifa Al-Thani.

The Administrative and Medical Directors report to the Managing Director, and each of the four hospitals has an Assistant Hospital Director who reports to the Administrative Director. There is a policy of continuous improvement in facilities

available and the recruitment of qualified staff, in addition to new research facilities (Qatar, 2004). All HMC hospitals provide specialist care and this has reduced considerably the number of patients requiring treatment abroad. Also, there is encouragement to achieve the best results whilst keeping costs under control (Younis, 1993). Careful control has enable progress to be made in all areas without exceeding the agreed expenditures and provides health care of a high standard equalling the best services in the Gulf Region. The HMC is now one of the leading medical services in the Arabian Gulf Region.

McGivern (1996) acknowledged the influence of HMC development on the general health service in Qatar, and especially emergency medical services and ambulances.

The staff of HMC have met many demands in the past 23 years to achieve an efficient and effective standard of care using the most up to date methods and equipment (Hamad Medical Corporation, 2003).

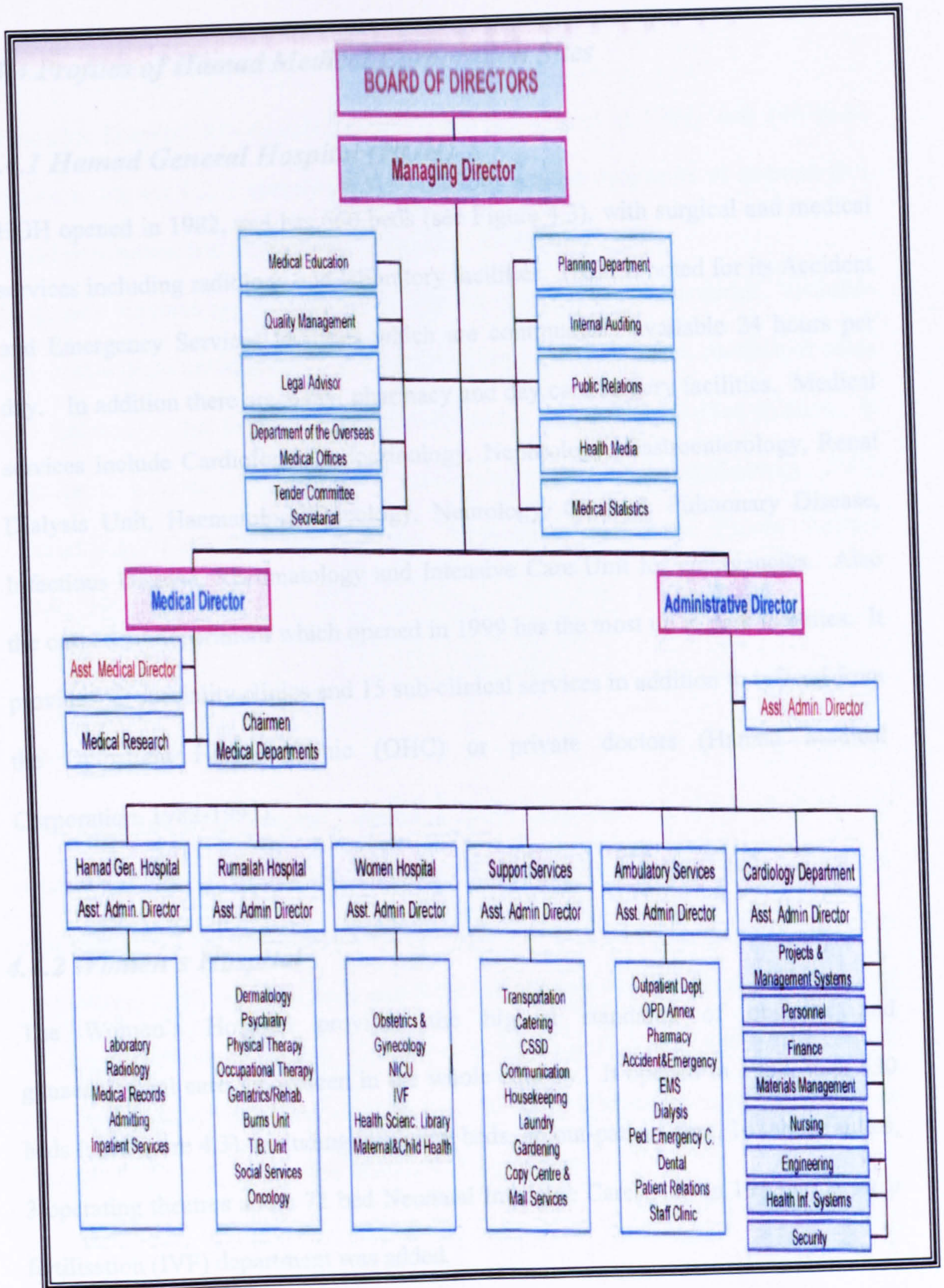


Figure 4.2 HMC Organization Chart

#### ***4.4 Profiles of Hamad Medical Corporation Sites***

##### ***4.4.1 Hamad General Hospital (HGH)***

HGH opened in 1982, and has 660 beds (see Figure 4.3), with surgical and medical services including radiology and laboratory facilities. HGH is noted for its Accident and Emergency Services facilities which are continuously available 24 hours per day. In addition there are x-ray, pharmacy and day care surgery facilities. Medical services include Cardiology, Endocrinology, Nephrology, Gastroenterology, Renal Dialysis Unit, Haematology/Oncology, Neurology, Chest & Pulmonary Disease, Infectious Disease, Rheumatology and Intensive Care Unit for emergencies. Also the outpatient department which opened in 1999 has the most up to date facilities. It provides 52 speciality clinics and 15 sub-clinical services in addition to referral from the Outpatient Hamad Clinic (OHC) or private doctors (Hamad Medical Corporation, 1982-1991).

##### ***4.4.2 Women's Hospital***

The Women's Hospital provides the highest standards of obstetric and gynaecological care for women in the whole country. It opened in 1988, with 330 beds (see Figure 4.3), including in-patient beds, an out-patient dept, 16 labour suites, 3 operating theatres and a 71 bed Neonatal Intensive Care Unit. In 1983 an *in vitro* fertilisation (IVF) department was added.

According to Gotting (1996) there is a programme of immunisation for mothers and babies before leaving the hospital and ultrasound checks are available.

***4.4.3 Rumailah Hospital***

Rumailah Hospital was founded in 1957 and refurbished in 1997, with 290 beds, shown in Figure 4.3, 3 operating theatres, and intensive care units in addition to a dental department and physiotherapy facilities (Gotting, 1996).

Diagnostic services are provided including the most up to date facilities. Geriatric care is also provided in addition to a rehabilitation centre for adults, psychiatric cases and children. Also there is physiotherapy and a school for disabled children, in addition to a burns unit. There are specialisations also in Ophthalmology, ENT, Dermatology, Dentistry, treatment for Tuberculosis (TB), and Plastic Surgery (HMC, 1991).

***4.4.4 Al-Amal Hospital***

This is the first Qatar hospital (opened in 2004) to specialise in the most up-to-date cancer treatment of all kinds, including radiotherapy. It also aims to provide education about the disease and its treatment. There is a 14 bed day care centre for chemotherapy, 50 inpatient beds and 5 for bone marrow transplantations, a total of 69 beds, as shown in Figure 4.3. There is close co-operation with the specialist cancer hospital at Heidelberg in Germany. Al-Amal hospital cares for patients over the age of 12 for diagnosis and treatment (Qatar, 2004).

4.5 The Medical Records Department

A medical record is a detailed account of every aspect of a patient's care from the moment he or she enters a hospital. It is used for verification of the care given by the facility, for the assessment of the quality of patient care, and for the assessment of the quality of professional performance. In August 1981 the Hamad Government decided to centralize and make available to staff in the departments concerned when necessary, an easy access to all relevant information. Accurate and complete records are an essential part of patient care. They need to include all relevant data and results, and to be readily accessible to authorized staff. The system originated in 1982 and includes a medical records filing system, a computer system for inpatients and a transcription facility for all kinds of patients' reports (Qatar, Ministry of Public Health, 1991).

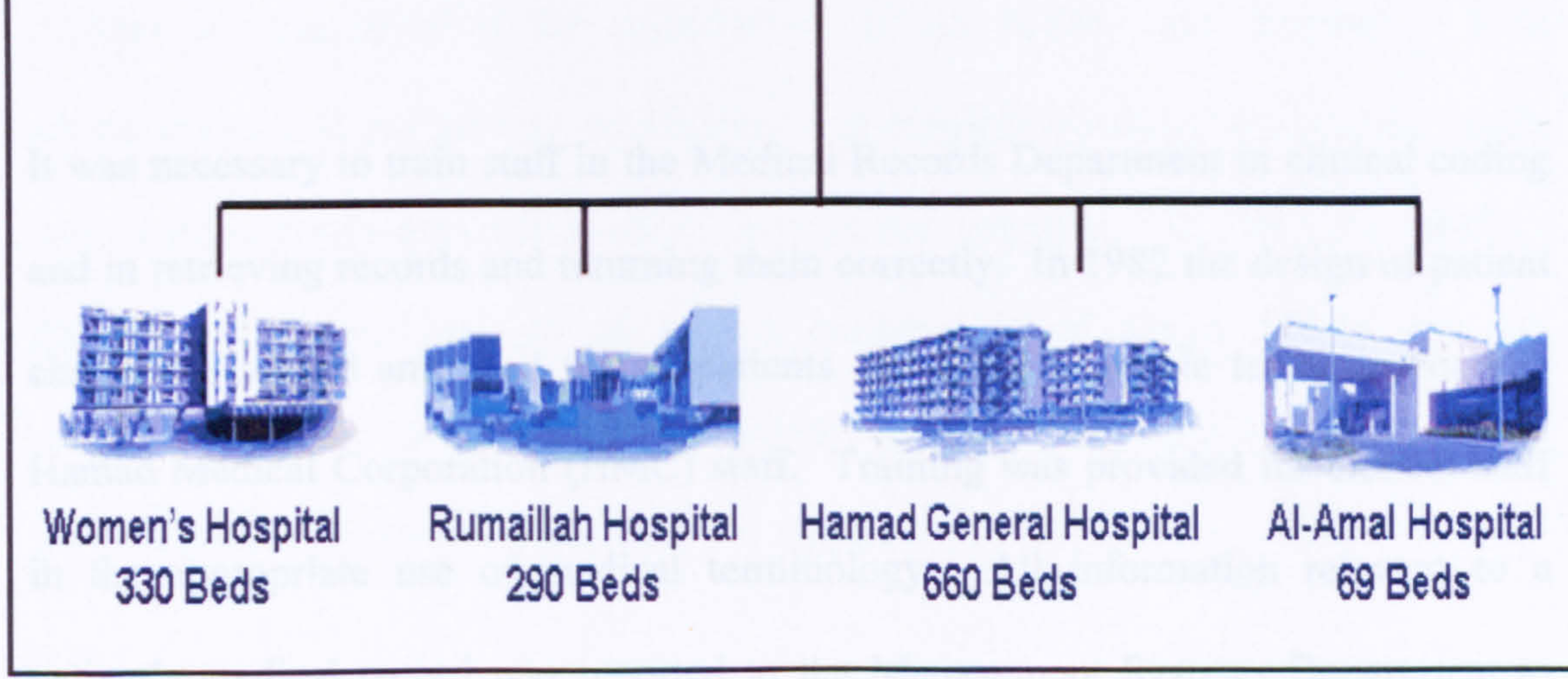


Figure 4.3 Hamad Medical Corporation

***4.5 The Medical Records Department***

A medical record is a detailed account of every aspect of a patient's care from the moment he or she enters a hospital's doors. It is used for verification of the care given by the facility, educational programmes, research activities, and the assessment of the quality of patient care.

In August 1981 the Hamad General Hospital records were first centralised and made available to staff in the departments concerned when necessary, so they had access to all relevant information. Accurate and up to date records are an essential part of patient care. They need to include all aspects of treatment and its results, and to be readily accessible to authorised staff. The current system originated in 1982 and includes a medical record filing section, a coding section for inpatients and a transcription facility for all kinds of patients' reports (Qatar, Ministry of Public Health, 1991).

It was necessary to train staff in the Medical Records Department in clinical coding and in retrieving records and returning them correctly. In 1982 the design of patient charts was agreed and used for all patients and made available to all appropriate Hamad Medical Corporation (HMC) staff. Training was provided for clerical staff in the appropriate use of medical terminology. All information relevant to a patient's medical record was reported to the Management Systems Department to monitor the accuracy of data.

In 1989 the Medical Records Department was extended to include patients at the Women's (maternity) Hospital and copies of these records were sent to the mothers' Health Centre for antenatal care.

The introduction of Master Patient Index (MPI) System in 1993 eliminated duplication of records and productivity increased. 1700 or more records were processed daily for the Outpatients Department, in addition to over 1200 laboratory, X-ray and other reports (Younis, 1993).

The Medical Record Department depends on an agreed system including well defined policies and procedures, standardised records, adequately oriented staff, centralised 'library' with colour coded files, computerised 'Master Patients Index' {MPI} "Alphabetical file of all patients who have received services from the facility, whether manual or computerised" (Abdelhak, 2001, p.794), registration, 24 hour service and a good transcription service.

A medical record contains the history of all medical treatment received by a patient from GPs, Accident and Emergency Departments and hospitals. The health care delivery system involves the organisation of all health care facilities. With advancement and complexity of medical and surgical treatment in modern health care, adequate and accurate medical records are essential. In 1982 the Medical Record Department was set up with a medical record library (filing section), processing of in-patient records (assembly/coding section) and transcription (all types of patients reports) as illustrates in Figure 4.4.

#### ***4.5.1 Filing Section***

New patients (in or outpatients) are allocated a permanent Medical or Hospital record number upon arrival, which is then used for all type-written or hand written records. Reports from Out-patient, Emergency and In-patient departments are kept



in one folder (file) with the allocated patient medical record number, are updated daily and are accessible 24 hours a day in the Medical Record Department. The files contain every record from X-rays and pathology departments etc. to provide a complete history of treatment received. When treatment is completed, the file is stored for future reference.

### ***4.5.2 Transcription Section***

The Transcription section is responsible for providing details of patients who need treatment abroad, fitness certificates for the discharge of patients, routine medical reports, discharge, death and transfer summaries in addition to operative and EEG reports.

### ***4.5.3 Coding Section***

Clinical Coding is based on the International Classification of Diseases (ICD-10-CM). The Coding Section Services act as a data bank for the hospital and provide statistics on diagnosis, procedures, mortality and nationality. Files are available for research in all departments (Qatar. Ministry of Public Health and Hamad Medical Corporation, 2001; Qatar. Ministry of Information,2004).

4.6 Staffing Implications

For an efficient medical records system a clearly defined working procedure is essential. The Director and Secretary oversee the organization which should include two assistants, one responsible for coding and transcription, and the other for the filing area.

**Medical Records Department**

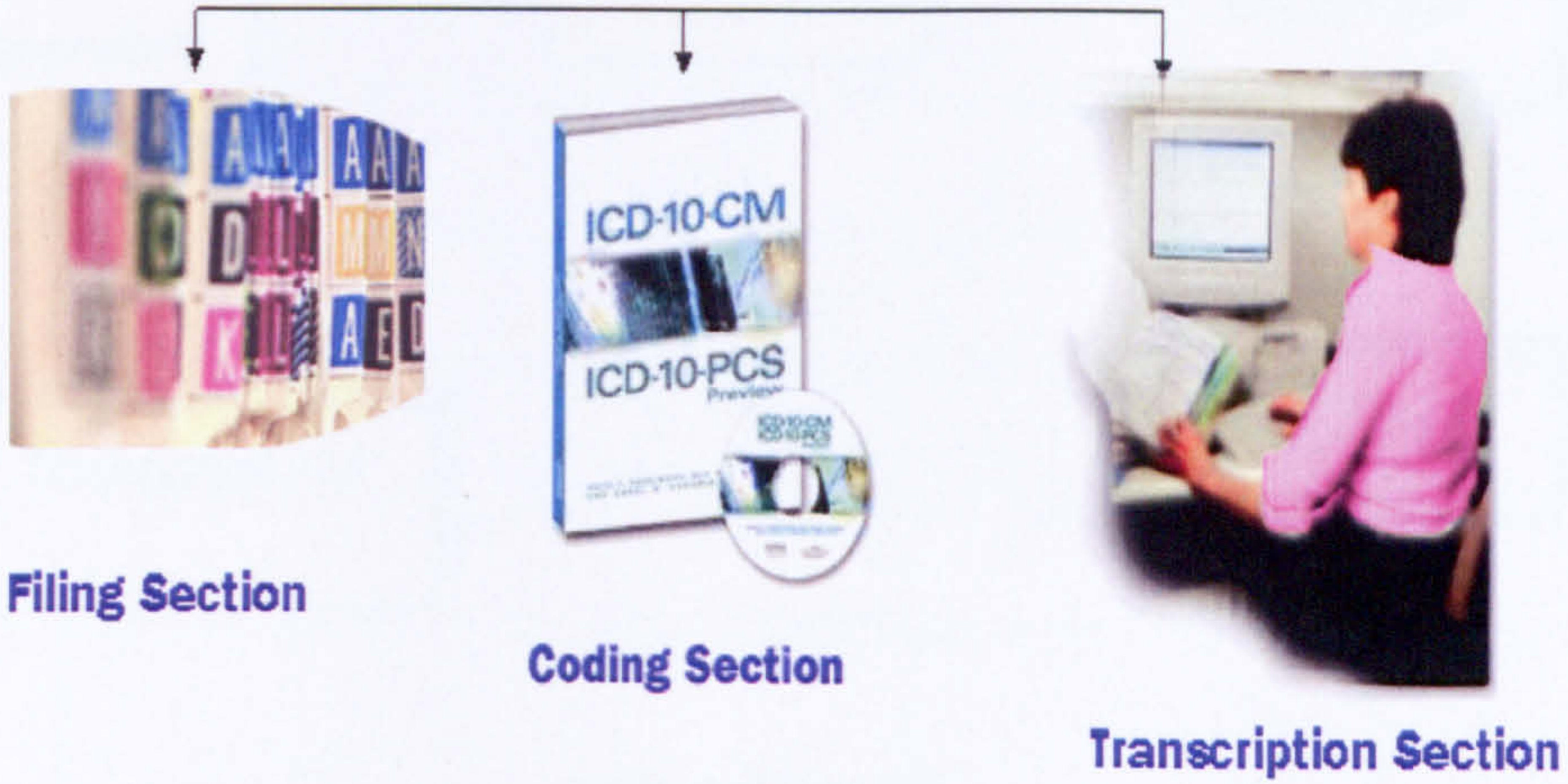
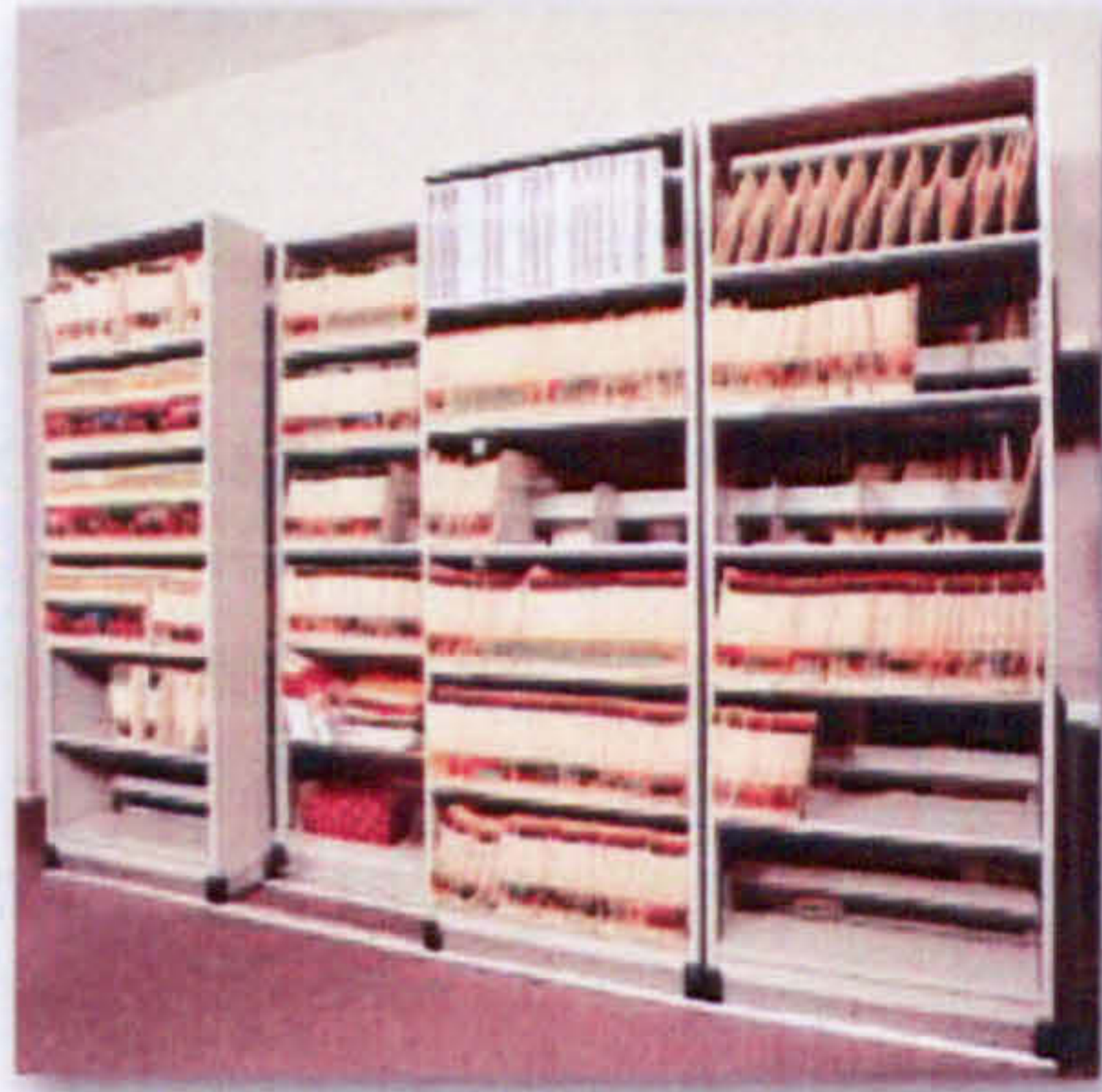


Figure 4.4 Medical Records Department

#### 4.6 Staffing Implications

For an efficient medical records system a clearly defined staffing procedure is essential. The Director and Secretary oversee the organisation which should include two assistants, one responsible for coding and transcription, and the other for the filing area.

These two areas each have a supervisor, one responsible for coding and transcription, the other for record filing. In addition a filing clerk and code transcription clerk are necessary as well as a general office aid. The organisational structure of this group is as reflected in Figure 4.5.



Figure 4.5.2009 Medical Records

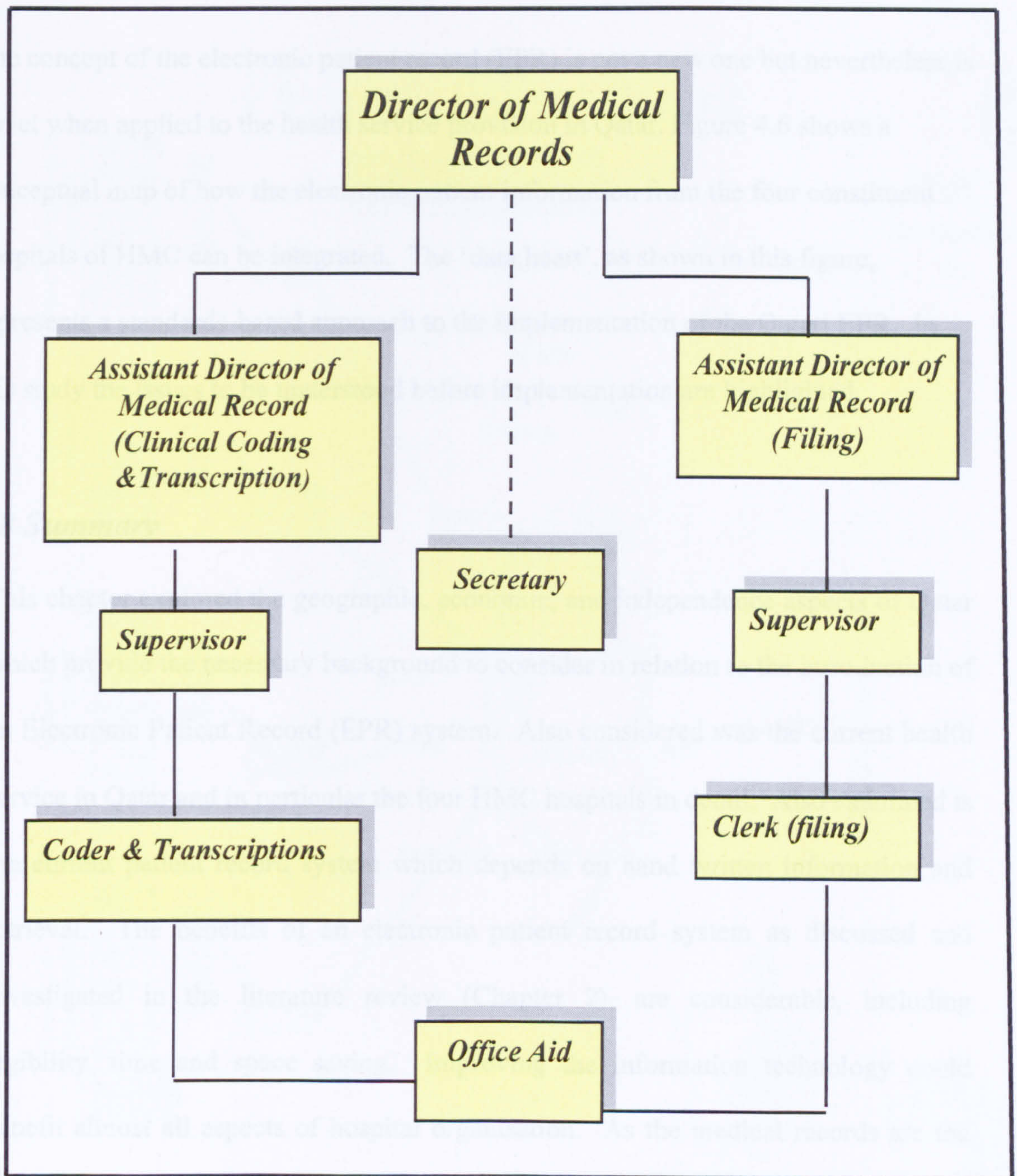


Figure 4.5 HMR Organisation Chart

### ***4.7 Electronic Patient Record***

The concept of the electronic patient record (EPR) is not a new one but nevertheless is novel when applied to the health service provision in Qatar. Figure 4.6 shows a conceptual map of how the electronic patient information from the four constituent hospitals of HMC can be integrated. The 'data heart', as shown in this figure, represents a standards-based approach to the implementation of the Qatari EPR. In this study the issues to be understood before implementation are highlighted.

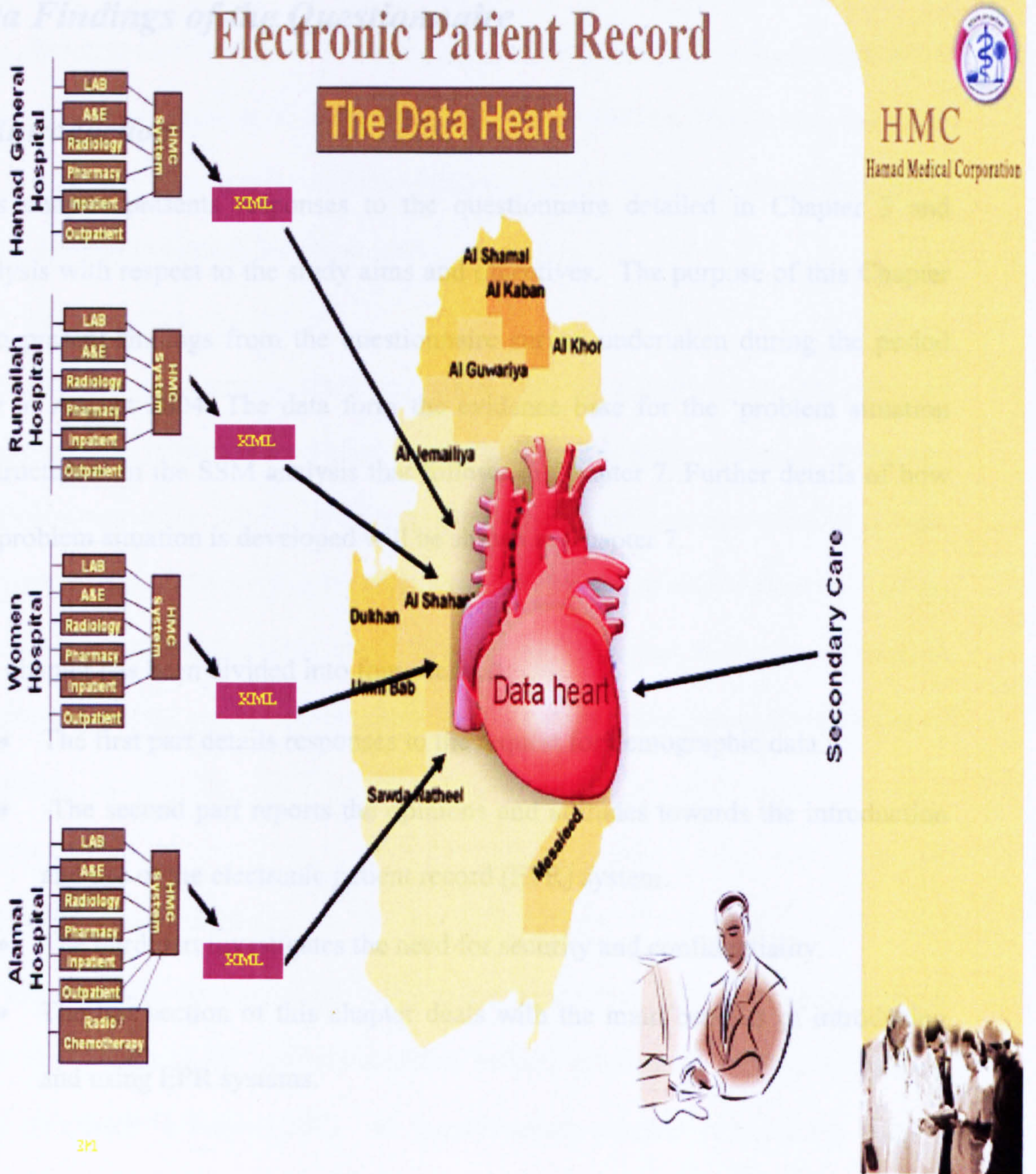
### ***4.8 Summary***

This chapter explored the geographic, economic, and independence aspects of Qatar which provide the necessary background to consider in relation to the introduction of an Electronic Patient Record (EPR) system. Also considered was the current health service in Qatar and in particular the four HMC hospitals in detail. Also examined is the current patient record system which depends on hand written information and retrieval. The benefits of an electronic patient record system as discussed and investigated in the literature review (Chapter 2), are considerable, including legibility, time and space saving. Improving the information technology could benefit almost all aspects of hospital organisation. As the medical records are the basis of all kinds of treatment their accuracy and accessibility would improve all aspects of patient medical care.

*Figure 4.6 Conceptual Map of Electronic Patient Records*

Chapter 5

Data Findings of



311

Figure 4.6 Conceptual Map of Electronic Patient Records

## *Chapter 5*

### *Data Findings of the Questionnaire*

#### *5.1 Introduction*

This chapter presents responses to the questionnaire detailed in Chapter 3 and analysis with respect to the study aims and objectives. The purpose of this Chapter is to present findings from the questionnaire survey undertaken during the period July to August 2004. The data form the evidence base for the ‘problem situation unstructured’ in the SSM analysis that follows in Chapter 7. Further details of how the problem situation is developed will be shown in Chapter 7.

The chapter has been divided into four sections:

- The first part details responses to the request for demographic data.
- The second part reports the opinions and attitudes towards the introduction and use of the electronic patient record (EPR) system.
- The third part investigates the need for security and confidentiality.
- The last section of this chapter deals with the main benefits of introducing and using EPR systems.

The questionnaires were completed in July and August 2004. To clarify the responses, telephone interviews reported in Chapter 6 took place in April 2006 to provide more detailed descriptions of problems encountered and their solutions. The followings constraints affected the data collection.

- a) The timing of the enquiry coincided with some vacation dates, and so delayed a number of responses during the anticipated data collection period.
- b) Medical staff formed the majority of the respondents and some took away their questionnaires to complete during their vacation, and several had to be reminded to return them. Others failed to return them and it was sometimes difficult to retrieve the documents.

From analysis of the structured questionnaires the great majority of respondents were in favour of the introduction of electronic patient records (EPR) system in all Hamad Medical Corporation (HMC) hospitals. The respondents' attitudes revealed a large measure of approval regarding the proposed change from manual to electronic means of collecting patient data. The small minority who were not in favour of changing the present patient record system were from a number of different departments of hospitals.

## ***5.2 Preliminary Findings***

For this research, 50 respondents participated in a pilot study to discover if there were any aspects of the questionnaire that needed amendment. The questionnaires were completed in August 2003. 41 questionnaires returned revealed the need to revise several questions. These responses enabled some of the questions to be deleted and others were modified to achieve the most useful data for the research aims and objectives.

The pilot study was helpful in revealing some problems experienced by the respondents. This enabled amendments to be made and ambiguities to be removed.



For example, the responses to question 8b, c, d, j and k relating to their knowledge and opinions about the introduction of Electronic Patient Record (EPR), revealed both lack of information about it, and that it would have been more appropriate to devise a question which those with minimal knowledge of EPR could answer productively. As a result the questions were redesigned to be more clearly understood. It became clear from the range of respondents that there was a great difference in level of knowledge of EPR systems between the varied groups of potential users. The final questionnaire was designed to provide a version which would enable all respondents to make useful contributions. In this research, care was taken to make the questions directly relevant to the respondents and the completed forms revealed the interests of recipients. As a result of the pilot study, the questionnaires were modified to provide the required data for the final analysis. Consideration was given to different ways of selecting samples, e.g. age ranges, gender, experience and function; however it was decided to select a simple stratified random sample. As was done in the main study, a structured approach was used to ease analysis. Tick boxes were used to reduce the time taken in completion. The questionnaires have been designed as far as possible to explore the concerns of the respondents and to enable the final data collection tool to meet the needs of the health service efficiently.

To eliminate possible ambiguity there were some preliminary tests of proposed questions and suitable modifications were made. As a result of the pilot study it became obvious that some questions were more relevant than others, enabling modifications to be made where necessary in the final version. The pilot study also

provided a useful opportunity to meet some of those who would contribute to the final research and its conclusions.

### ***5.3 Response Rate***

The structured questionnaire was distributed to 400 staff, comprising doctors, nurses and administrators. 330 completed questionnaires were returned, giving a response rate of 82%. This high response rate was the result of personal contact with respondents to explain the purpose and value of the study. The process was assisted by a written supporting document from the Administrative Director who emphasised the importance of this research.

Simple stratified random sampling for different categories of hospital staff was used to select respondents in all categories as shows in Table 5.1.

Categories	Distributions	Respondents
Doctor of Medicine	150	141 (94%)
Administration	50	34 (68%)
IT Staff	50	44 (88%)
Nursing	100	81 (81%)
Others		
Laboratory	25	14 (56%)
Radiology	25	16 (64%)
Total	400	330 (82.5%)

***Table 5.1 Simple Stratified Random Sampling***

**5.4 Data Analysis**

The information provided in the questionnaires was encoded using SPSS 14.0 (Statistical Package for Social Sciences), a statistical software package appropriate for statistical analysis. The descriptive analysis included:

- Frequency tables of indicated variables.
- Producing frequency histograms and tables of cross-tabulated data.
- Indication of demographic data.
- General opinions about EPR issues.
- Security of EPR system.
- Main effects of EPR and its advantages.

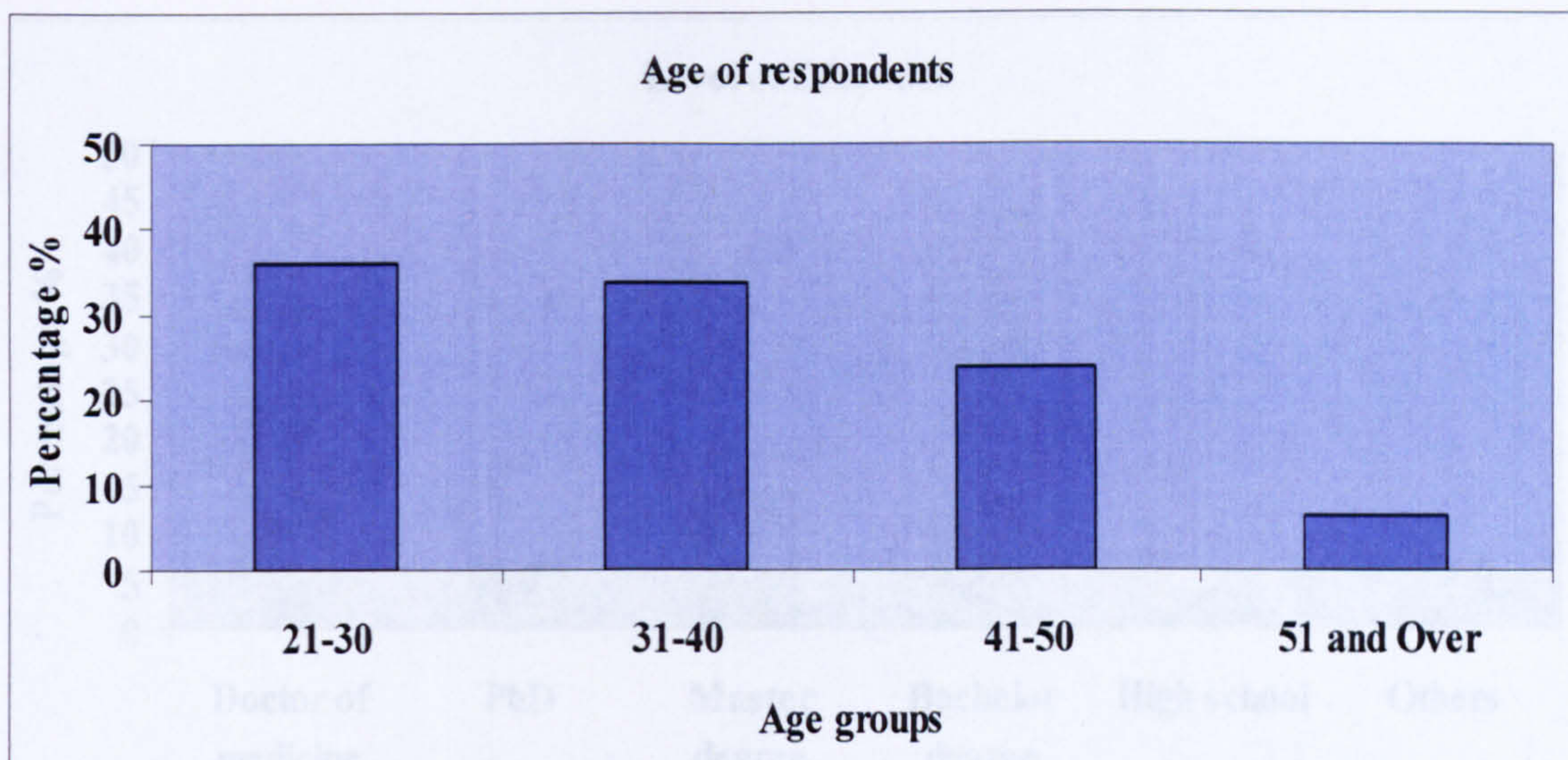
A chi-square test was used to quantify the significance of the statistical independence of the cross tabulations required to respond to the study aims and objectives.

**5.4.1 Demographic Data**

The first section of the questionnaire collected responses from participants regarding their personal details. These are sub-divided in the section below.

**5.4.1.1 Age and Gender**

Respondents were asked to state their personal data including age group. The majority were aged between 21 and 50 years, with only 21 over 51 years of age as Figure 5.1 shows. Investigation of the age profile revealed 119 (36.6%) respondents were in the age group 21 to 30; 111 (33.6%) respondents subjects belonged to the age group 31-40 years, 79 (23.9%) subjects belonged to the age group 41-50 years.



**Figure 5.1 Age of the Respondents**

Of the 330 completed questionnaires, 191 (57.9%) were female respondents.

#### 5.4.1.2 Academic Qualifications

Level of education indicated that nearly half of the respondents had a Bachelor's degree as their highest qualification (43.6%) while almost quarter (24.5%) were Doctors of Medicine. In contrast only 4.6% of respondents had no further qualifications after high school as Figure 5.2 shows.

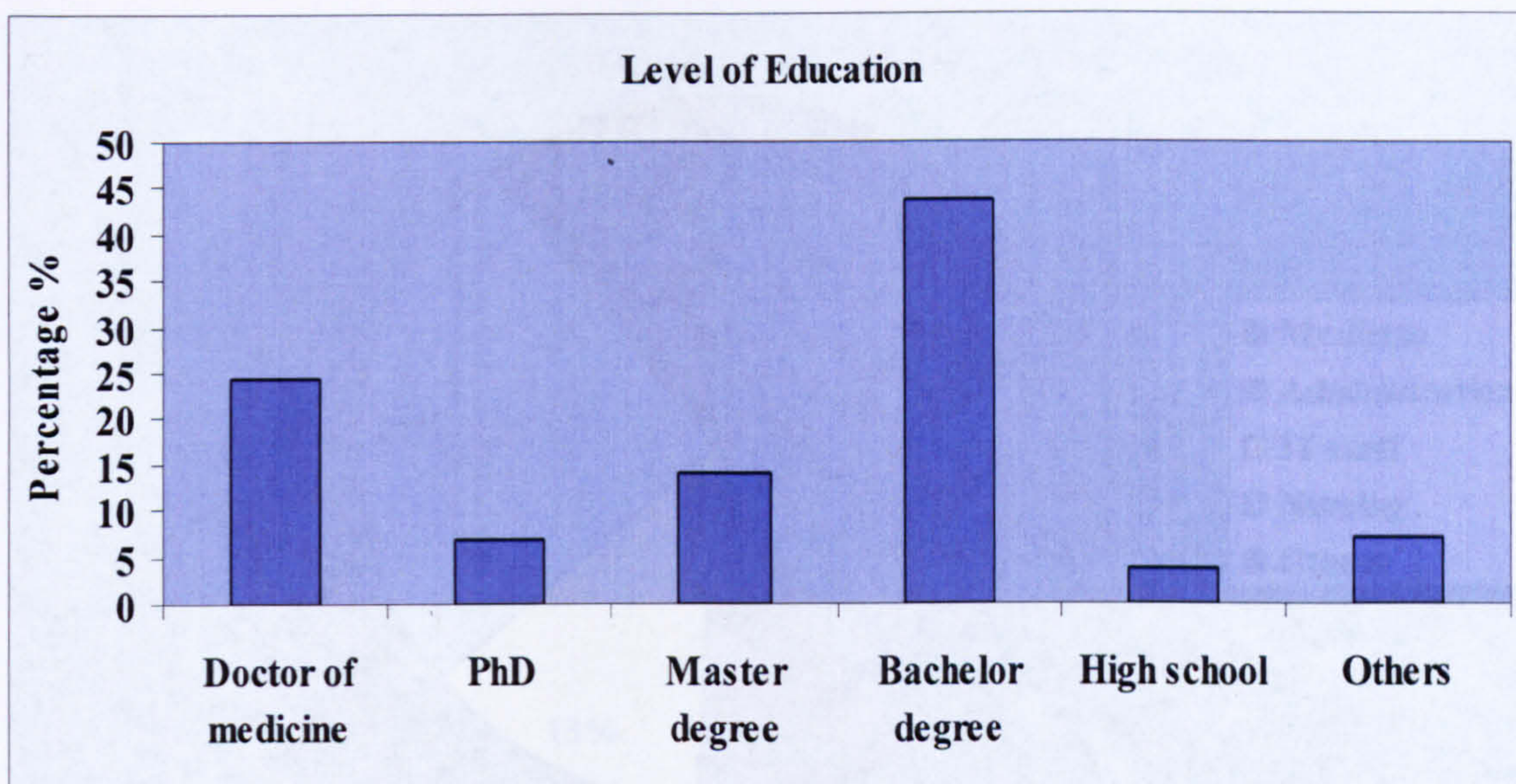


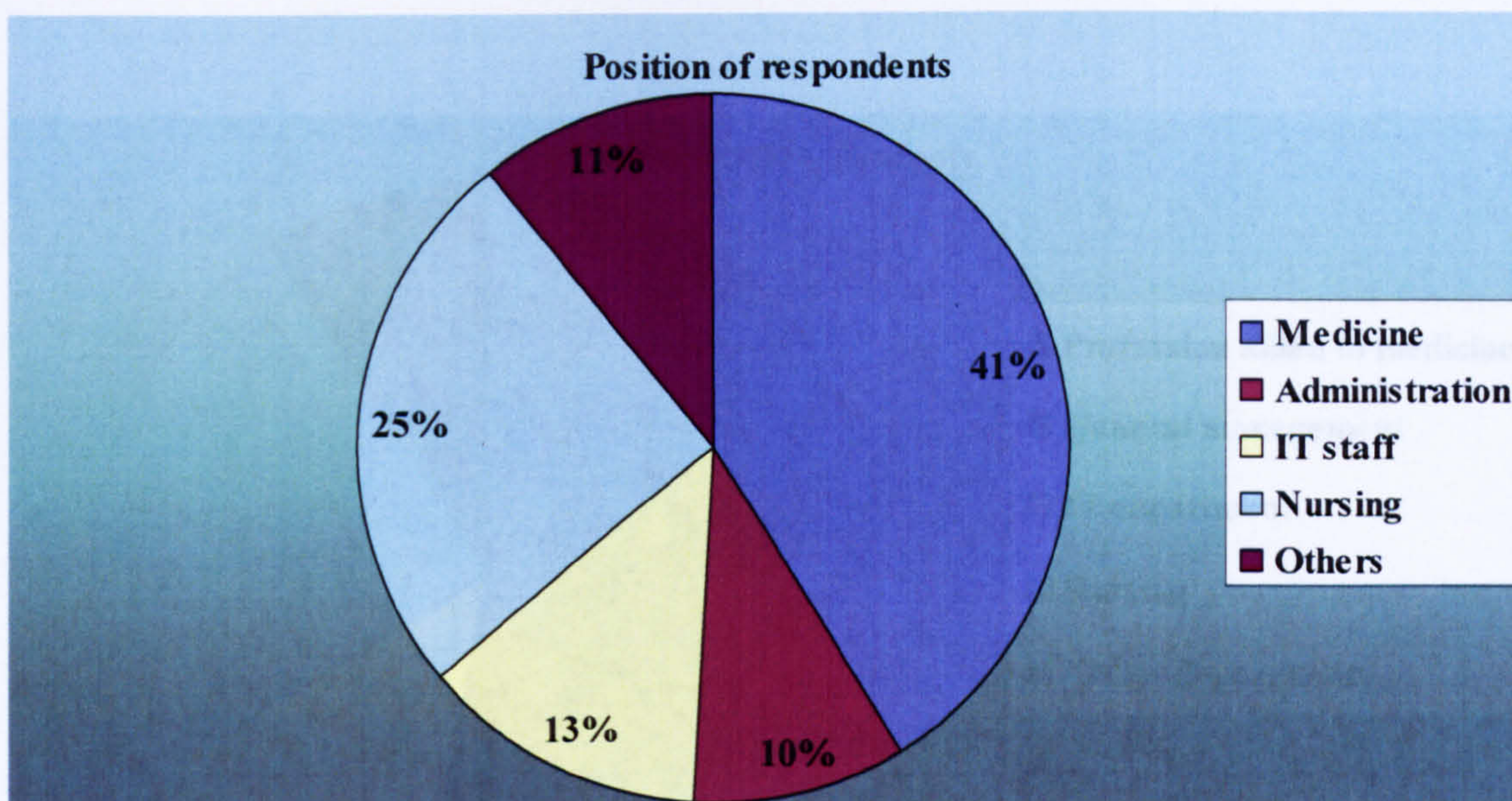
Figure 5.2 Qualifications of Respondents

#### 5.4.1.3 Nationality

Analysis was made of ethnicity, revealing that only 56 (16.9%) of respondents were Qatari, the remaining 83.3% of respondents were non Qatari.

#### 5.4.1.4 Position

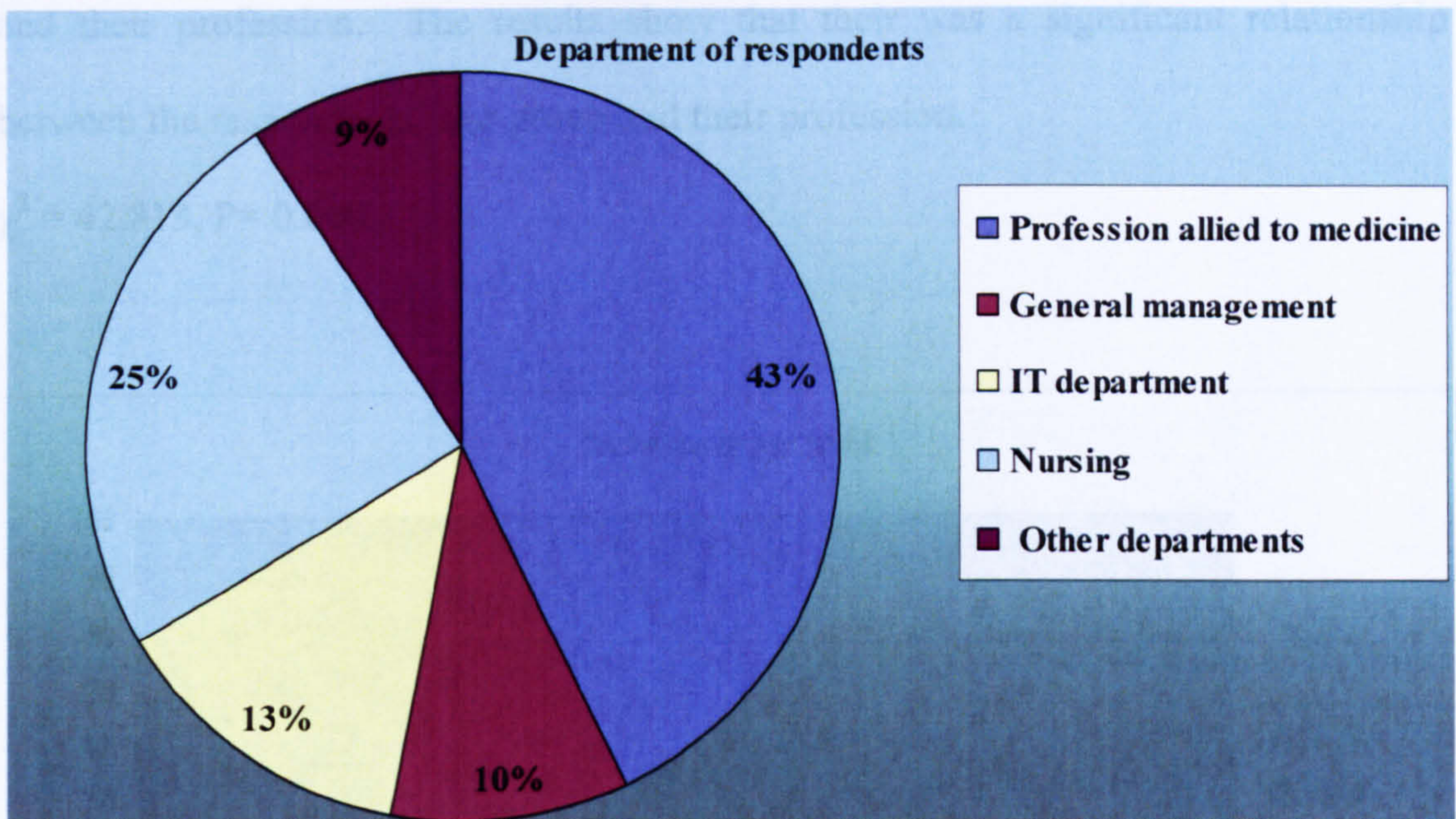
Respondents were asked to specify their occupation and Figure 5.3 indicates that 41.2% were involved with Medical department, 25.1% of respondents were nursing staff and almost 10% from administration.



**Figure 5.3 Current Position of Respondents**

#### 5.4.1.5 Departments

The areas in which respondents spent the majority of their time are analysed in Figure 5.4 which indicates that 42.7% came from Departments whose professional responsibilities are allied to medicine including 13.3% in Information Technology (IT) department, 24.5% of nursing staff.



*Figure 5.4 Working Place Respondents*

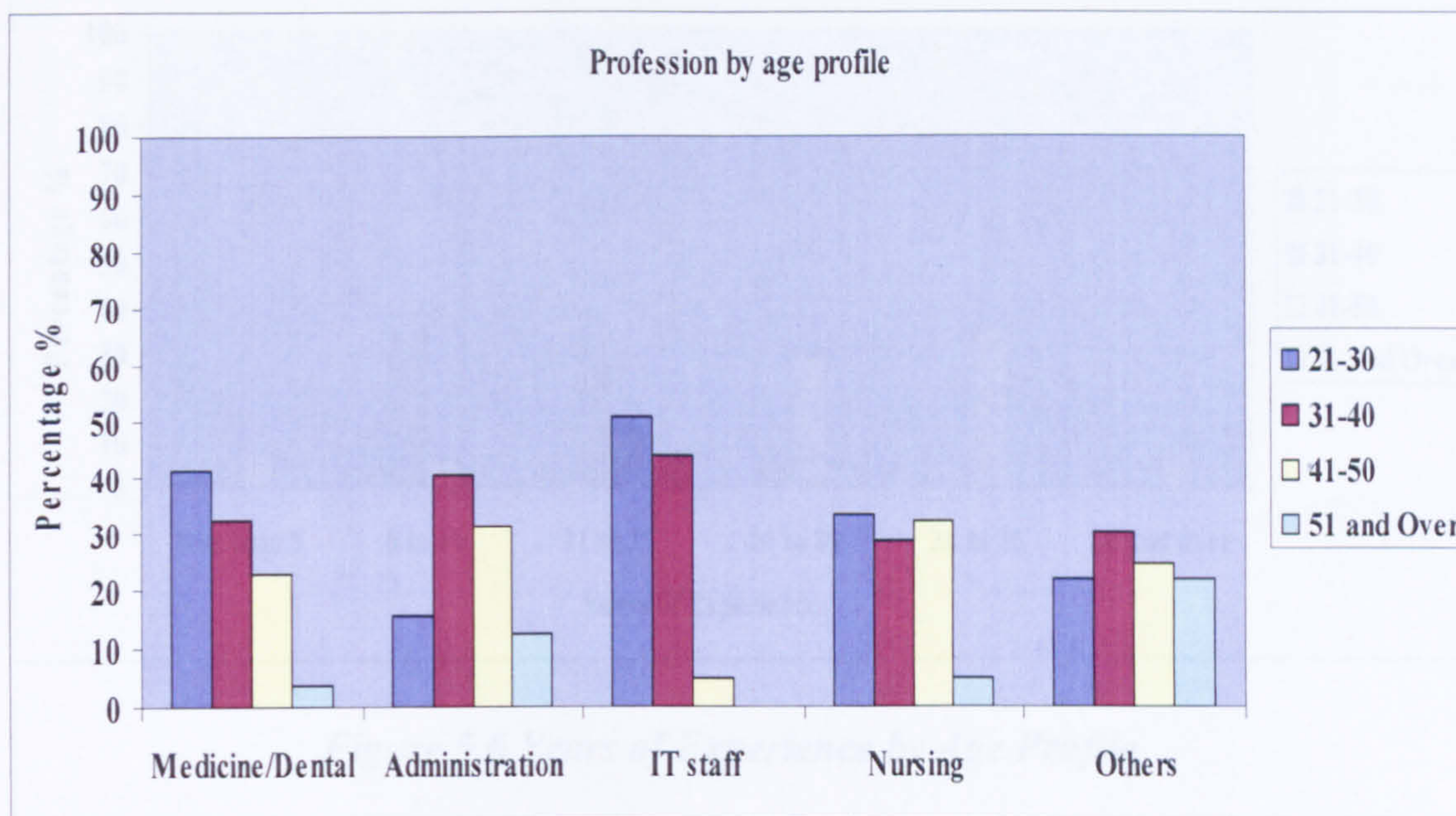
#### **5.4.1.6 Profession by Age Profile**

A cross-tabulation of the age profile with professional affiliation reveals the following data.

For an analysis of the ages of members of different professions they were grouped in 10 year intervals. Figure 5.5 indicates that the majority of doctors were in the 21-30 years range 56 (76.1%) and the minority were 5 (6.8%) represented in the 51 and over age range. For the administrators the age range distribution appears to be the opposite with 5 who were 21-30 (approximately 16%) while the 51 and over age range included just 4 (12.5%) administrator. A total of 83 nurses, 28 (23.2%) of whom were in the 21-30 age group, and 4 (3.3%) in the over 51 age range.

A  $\chi^2$  test was used to indicate the significance of the age group of the respondents and their profession. The results show that there was a significant relationship between the respondents' age group and their profession.

$$\chi^2 = 42.813, P = 0.000$$



*Figure 5.5 Profession by Age Profile*

#### 5.4.1.7 Years of Experience by Age Profile

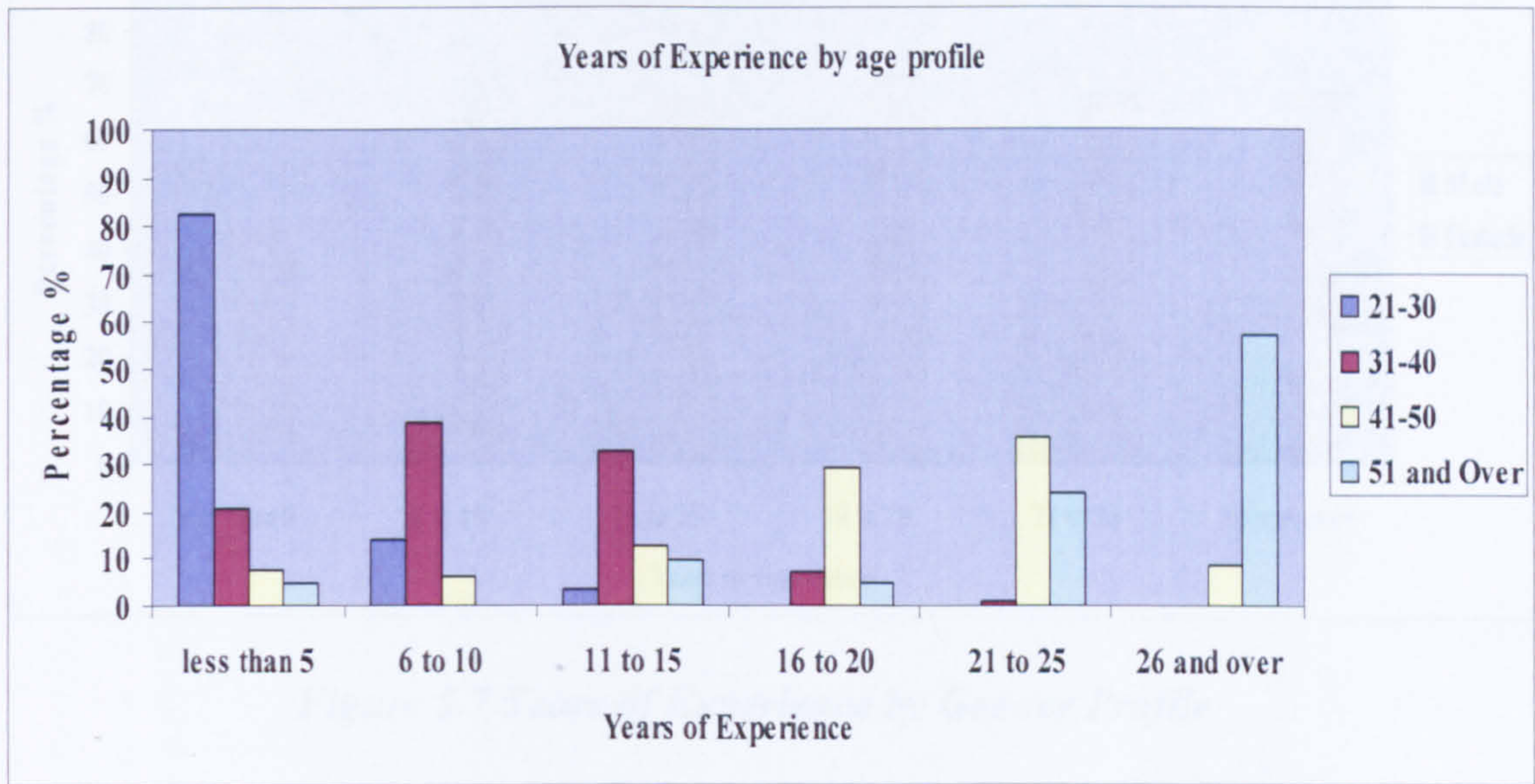
#### 5.4.1.7 Years of Experience by Age Profile

In considering the years of experience in hospitals, all respondents were grouped by age to identify the importance of the relationship between the age group and their experience. Figure 5.6 shows that in the 21-30 age range a large majority 98 of 119 (82.3%) had less than 5 years' experience; of those who were 41-50 only 6 of 79 (7.5%) had less than 5 years' experience. A chi-square test was used to indicate whether there was a difference between the years of hospital experience within the



different age groups. The statistical result revealed that there is a significant link between age group and experience.

$$\chi^2 = 387.67, P = 0.000$$



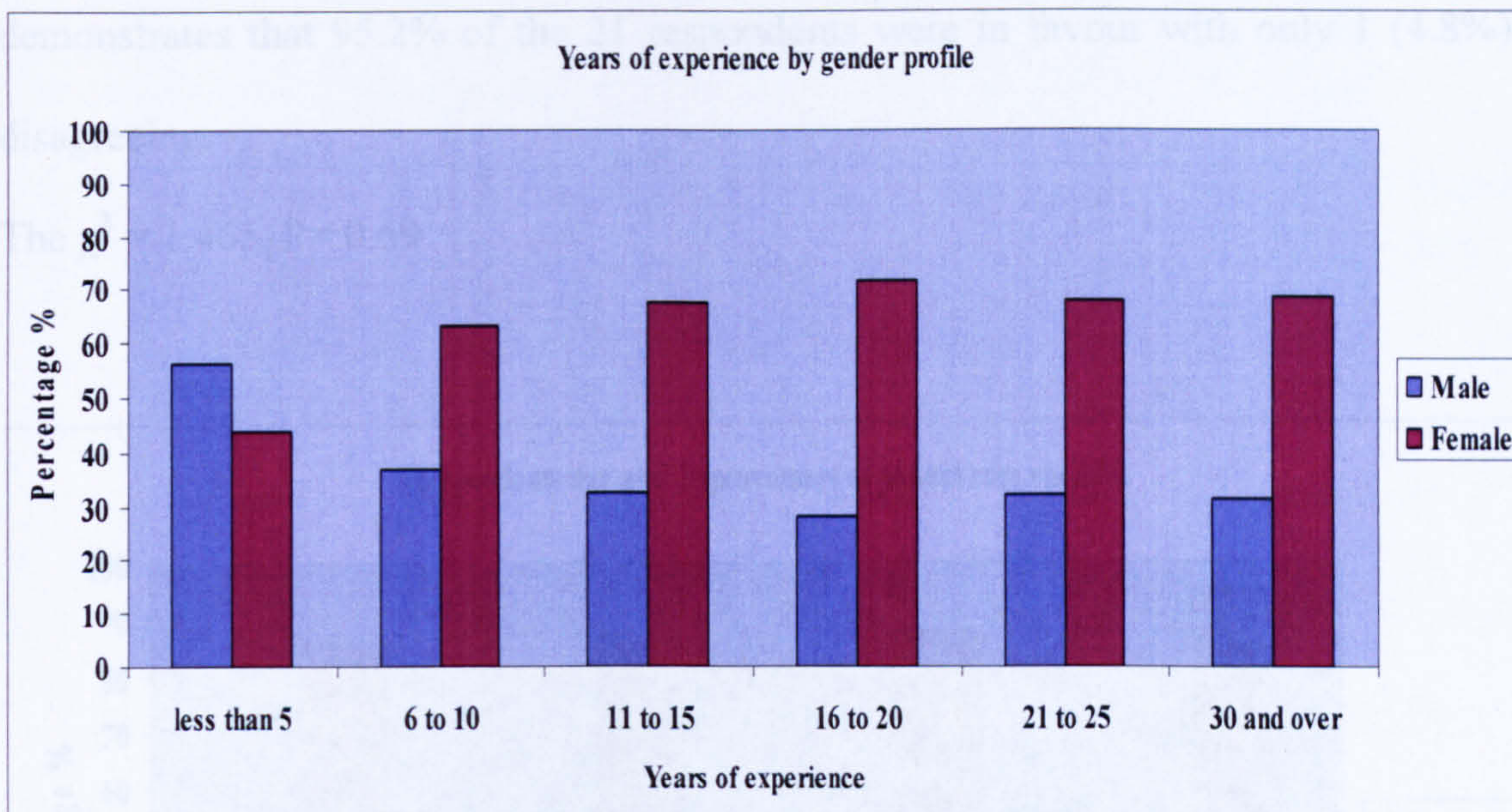
*Figure 5.6 Years of Experience by Age Profile*

#### 5.4.1.9 Years of Experience by Gender Profile

Comparing years of experience with gender resulted in a total of 139 male responses, of whom 72 (51.7%) had less than 5 years experience. Only 9 (6.4%) of them had 16-20 years experience in comparison with the 191 females of whom 56 (29.3%) had less than 5 years experience and 23(12%) had 16-20 years experience as Figure 5.7 indicates.

A chi-square test was used to reveal the significance of any association between the years of experience and gender. The result showed that there was a significant relation between gender and years of hospital experience.

$\chi^2 = 17.866, P = 0.003.$



*Figure 5.7 Years of Experience by Gender Profile*

### **5.4.2 Opinions and Attitudes towards the EPR**

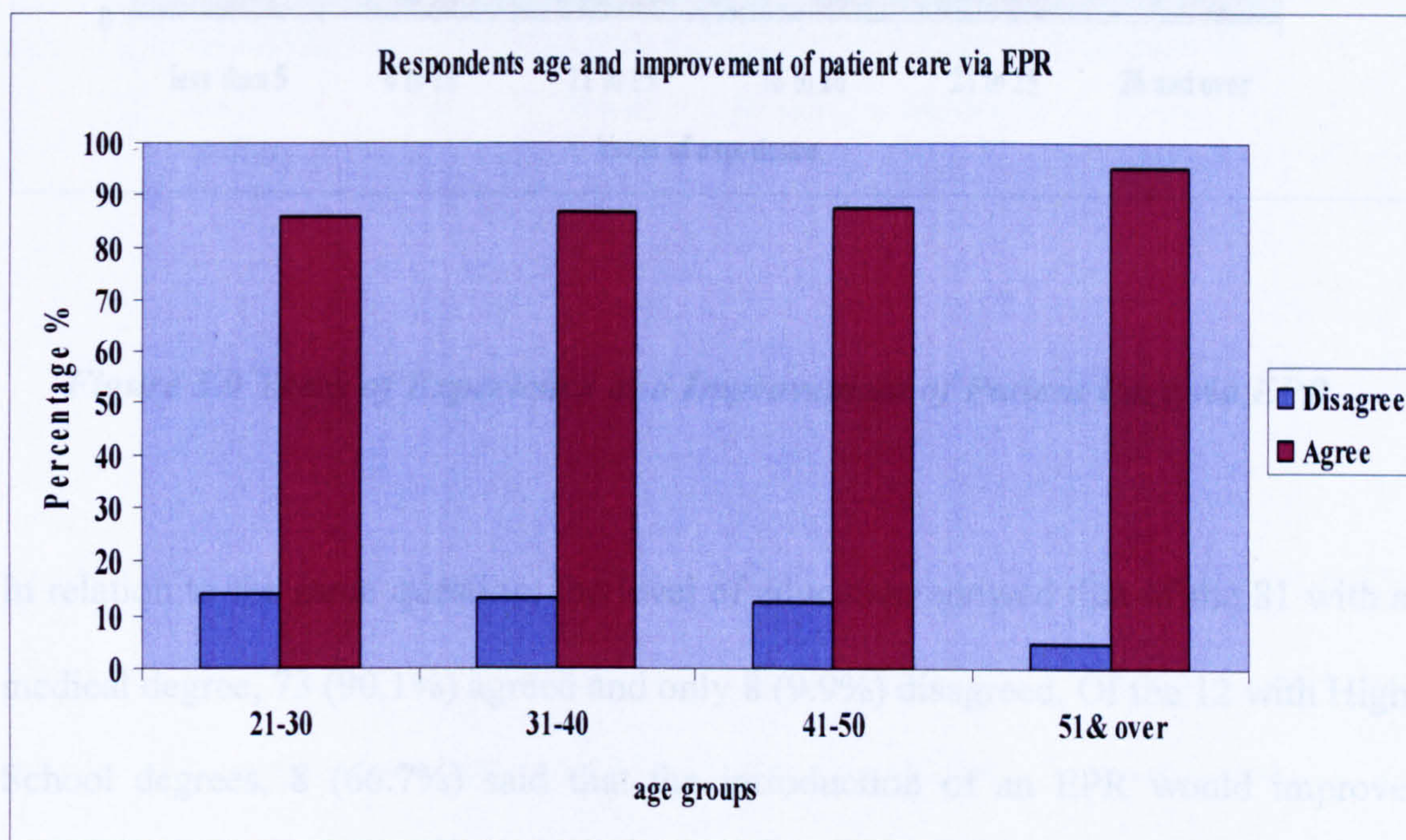
The opinions and attitudes towards the introduction of EPR to Qatari hospitals addresses study objectives 3, 4 and 5. Cross tabulations were used to uncover opinions and attitudes include the content of the sub-sections below.

#### **5.4.2.1 Improving Patient Care**

There was almost unanimous agreement amongst all categories of respondents that use of an electronic patient record (EPR) system would improve patient care. No significant differences were indicated in the responses in that the p.value was more

than  $<0.05$ . For example, in the case of 119 from age 21-30 years olds, 102 (85.75%) agreed and only 17 (14.3%) disagreed. For the 51 and over age range, Figure 5.8 demonstrates that 95.2% of the 21 respondents were in favour with only 1 (4.8%) disagreeing.

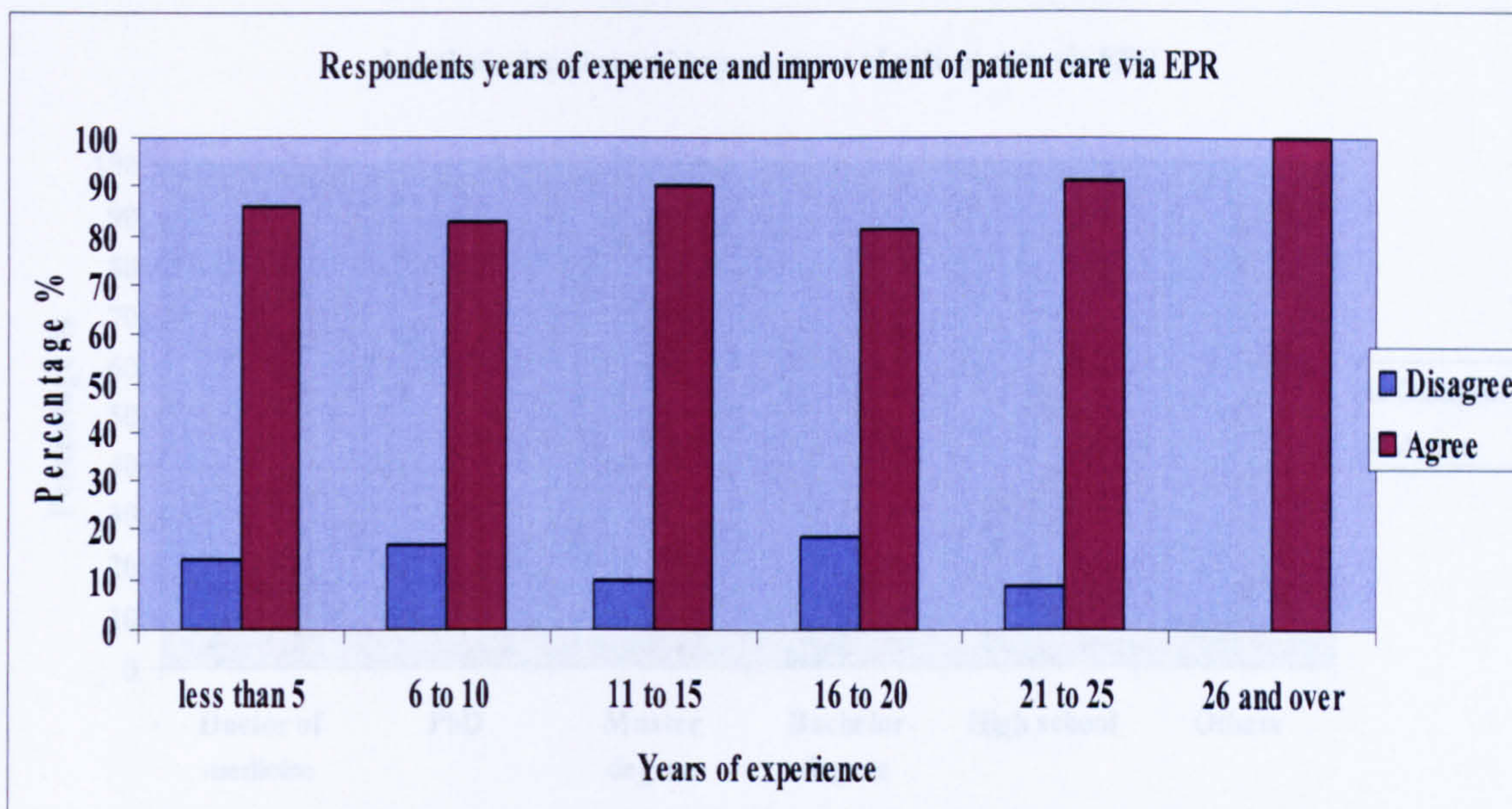
The  $\chi^2 = 1.465$ ,  $P = 0.69$



**Figure 5.8 Respondents Age and Improvement of Patient Care via EPR**

The respondents' years of experience and their reflection of how an EPR would improve patient care showed that 128 with less than 5 years experience in the hospital were 85.9% in favour of the electronic system and 14.1% disagreed, compared with those of 26 years and over, illustrate 19 i.e. 100% agreement as indicated in Figure 5.9 below.

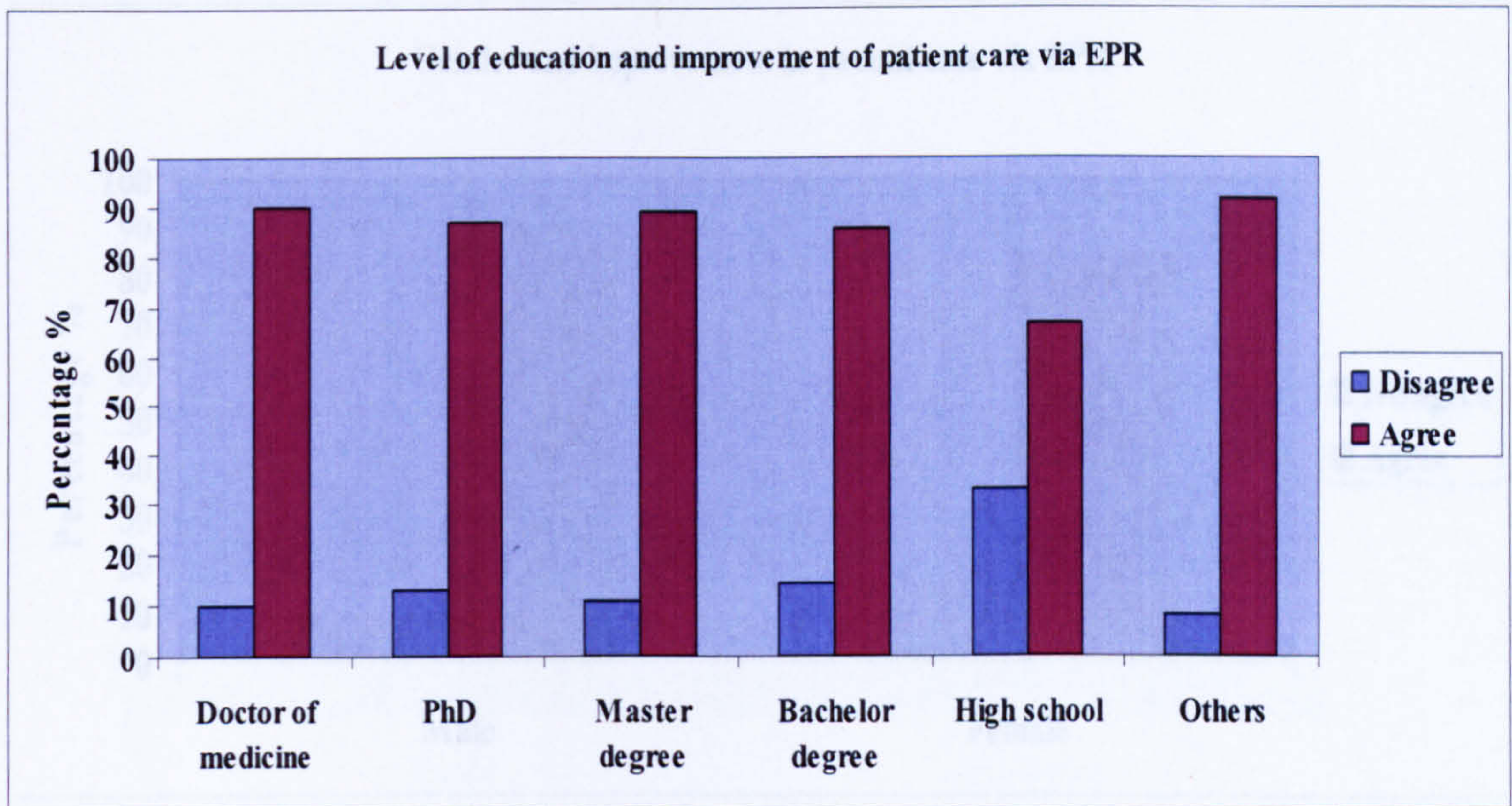
The  $\chi^2 = 5.826$ ,  $P = 0.324$



**Figure 5.9 Years of Experience and Improvement of Patient Care via EPR**

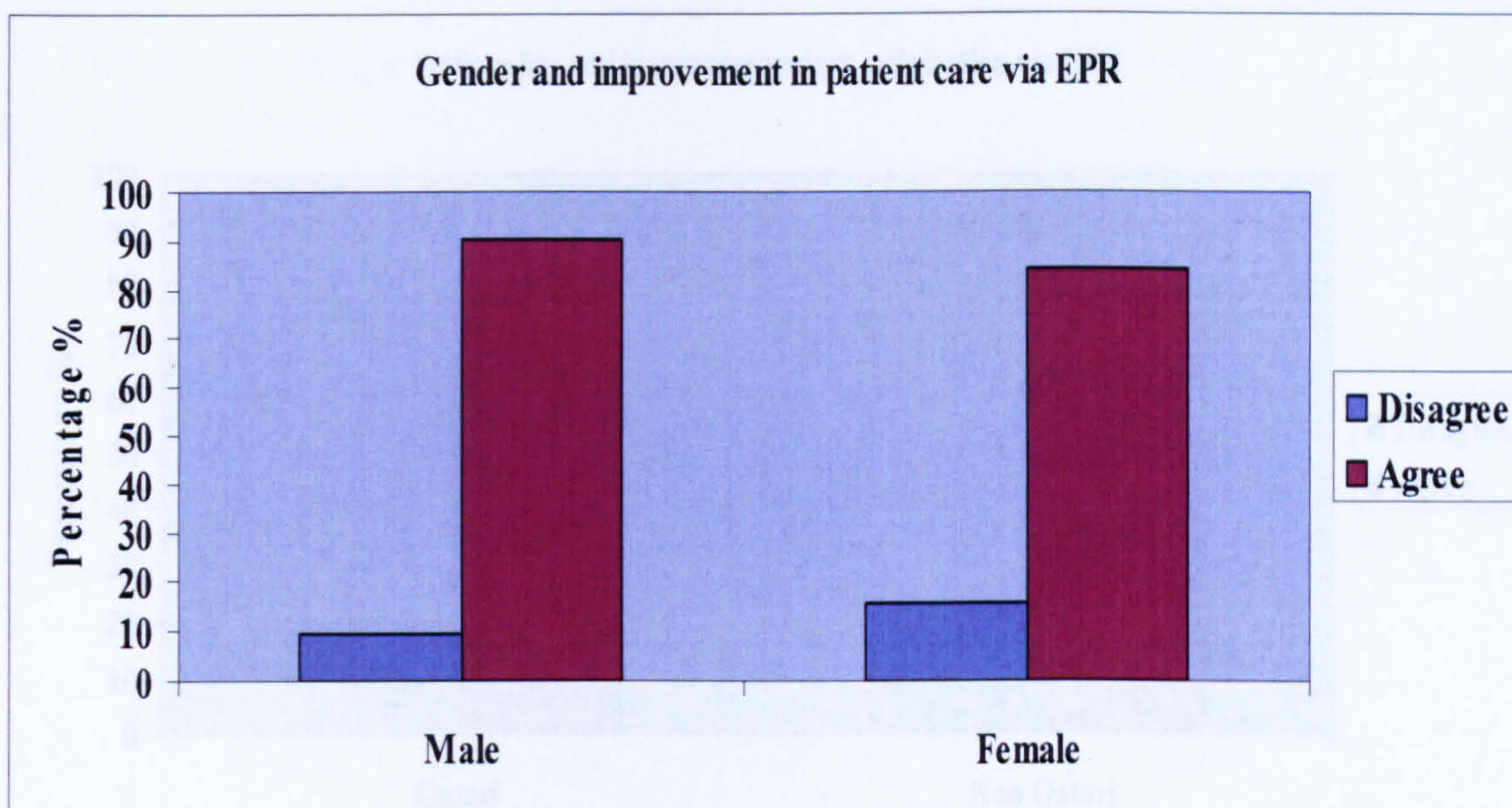
In relation to the same question, the level of education showed that of the 81 with a medical degree, 73 (90.1%) agreed and only 8 (9.9%) disagreed. Of the 12 with High School degrees, 8 (66.7%) said that the introduction of an EPR would improve patient care, while 4 (33.3%), said that there would be no improvement as shown in Figure 5.10.

The  $\chi^2 = 6.036$ ,  $P = 0.302$



**Figure 5.10 Level of Education and Improvement of Patient Care via EPR**

The P Value for the agreement difference between male and female is 0.062 ( $>0.05$ ) which means that there is no statistically significant difference between male and female with regard to the agreement level with the question (Do you agree that an EPR will improve patient care?). Looking at the percentages of agreement we can see that 126 (90.6%) male subjects agreed with the question and 161 (84.3%) female also agreed. Therefore most subjects agree with the question as indicated in Figure 5.11.

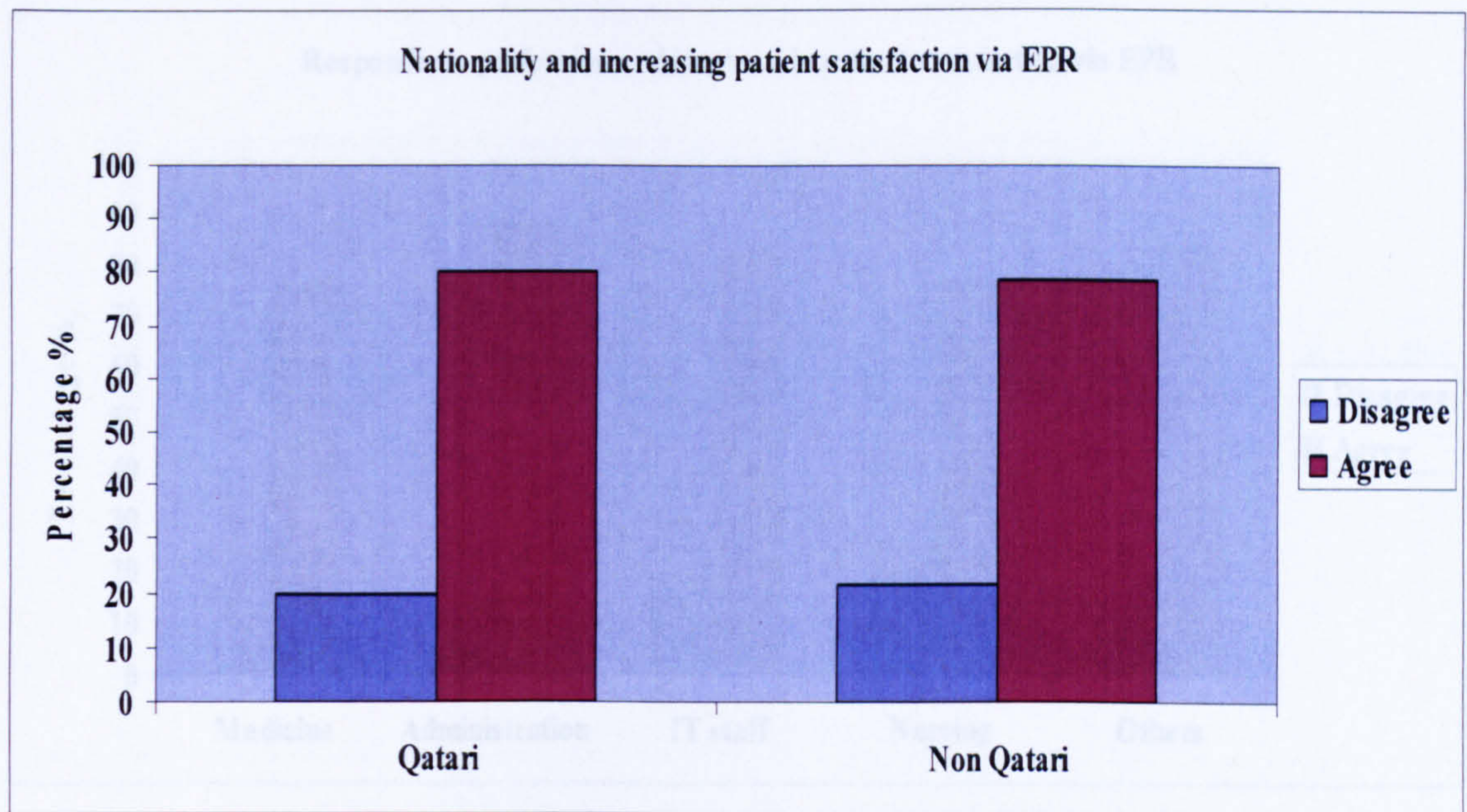


*Figure 5.11 Gender and Improvement of Patient Care via EPR*

#### 5.4.2.2 Patient Satisfaction

To introduce a system which improves any aspect of the service provided for patients is beneficial. The respondents' nationality was included in the importance of patient's satisfaction when introducing an electronic patient record (EPR) system. The survey illustrated that of 56 of the Qatari staff 45 (80.4%) agreed and 11 (19.6%) disagreed as shown in Figure 5.12. By comparison, of the 274 non Qatari hospital staff 215 (78.5%) said that the introduction of EPR will improve patient satisfaction and 59 (21.5%) disagreed.

$$\chi^2 = 0.099, P = 0.753$$

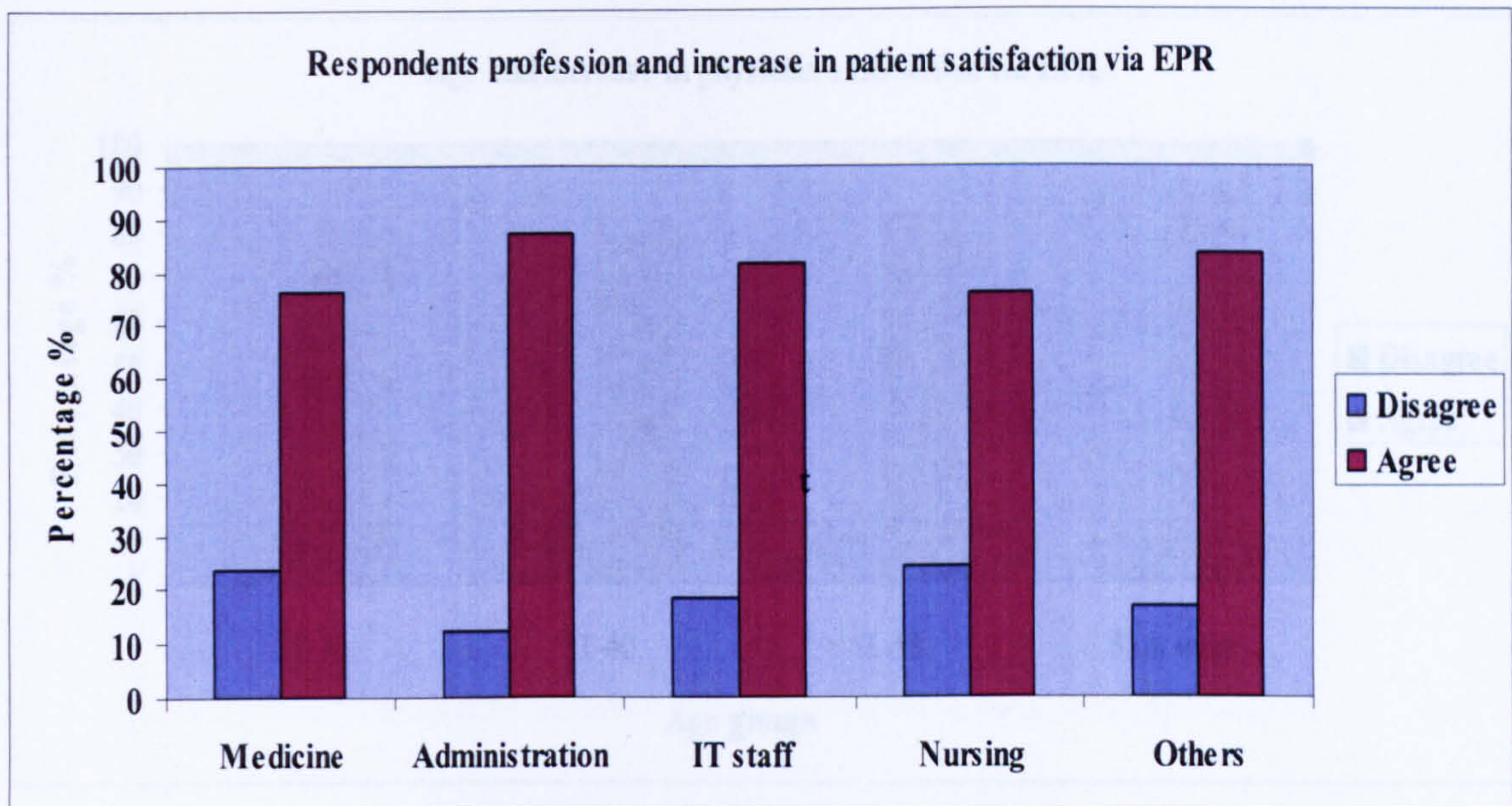


**Figure 5.12 Nationality and Increasing Patient Satisfaction via EPR**

Because of the agreement of the large majority of hospital staff, no significant differences were revealed. The improvement of patient satisfaction was examined in relation to their professions. This showed in Figure 5.13 that of 136 medical specialists, 104 (76.5%) agreed that an EPR would improve patient satisfaction whereas 32 (23.5%) disagreed.

By comparison, of the 83 nurses, 63 (75.9%) indicated that patient satisfaction would be improved, and 20 (24.1%) disagreed.

$$\chi^2 = 2.923, P = 0.571$$

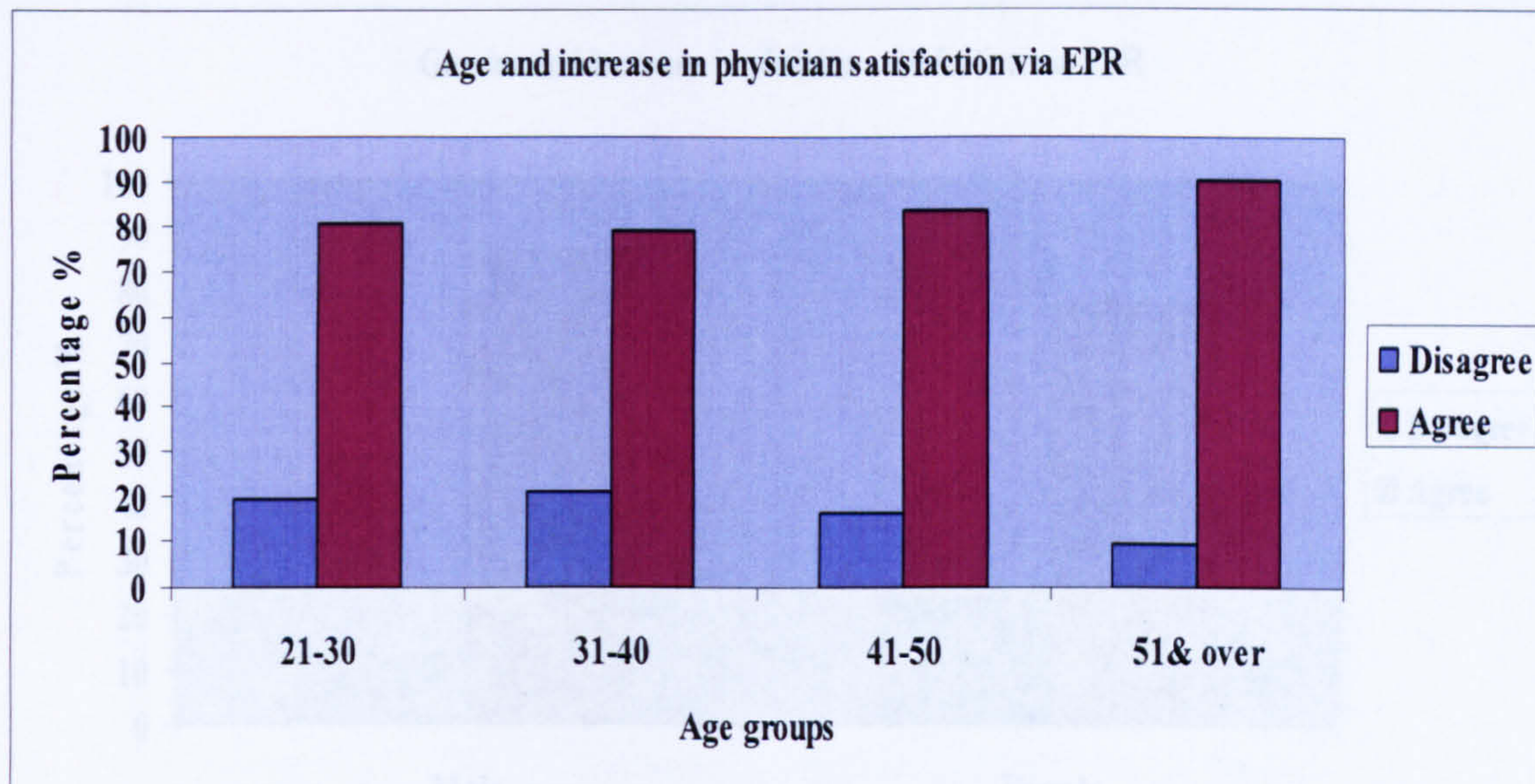


**Figure 5.13 Respondents' Profession and Increase in Patient Satisfaction via EPR**

#### **5.4.2.3 Physician Satisfaction**

Physicians' satisfaction is very important to the success or failure of the proposed EPR system. Investigation of attitudes of the sample to expectation of physician satisfaction, broken down by age range, is shown in Figure 5.14. Of the 61 respondents who responded that physician satisfaction would not increase, the largest percentage (19.3%) was found in the 21-30 age range.





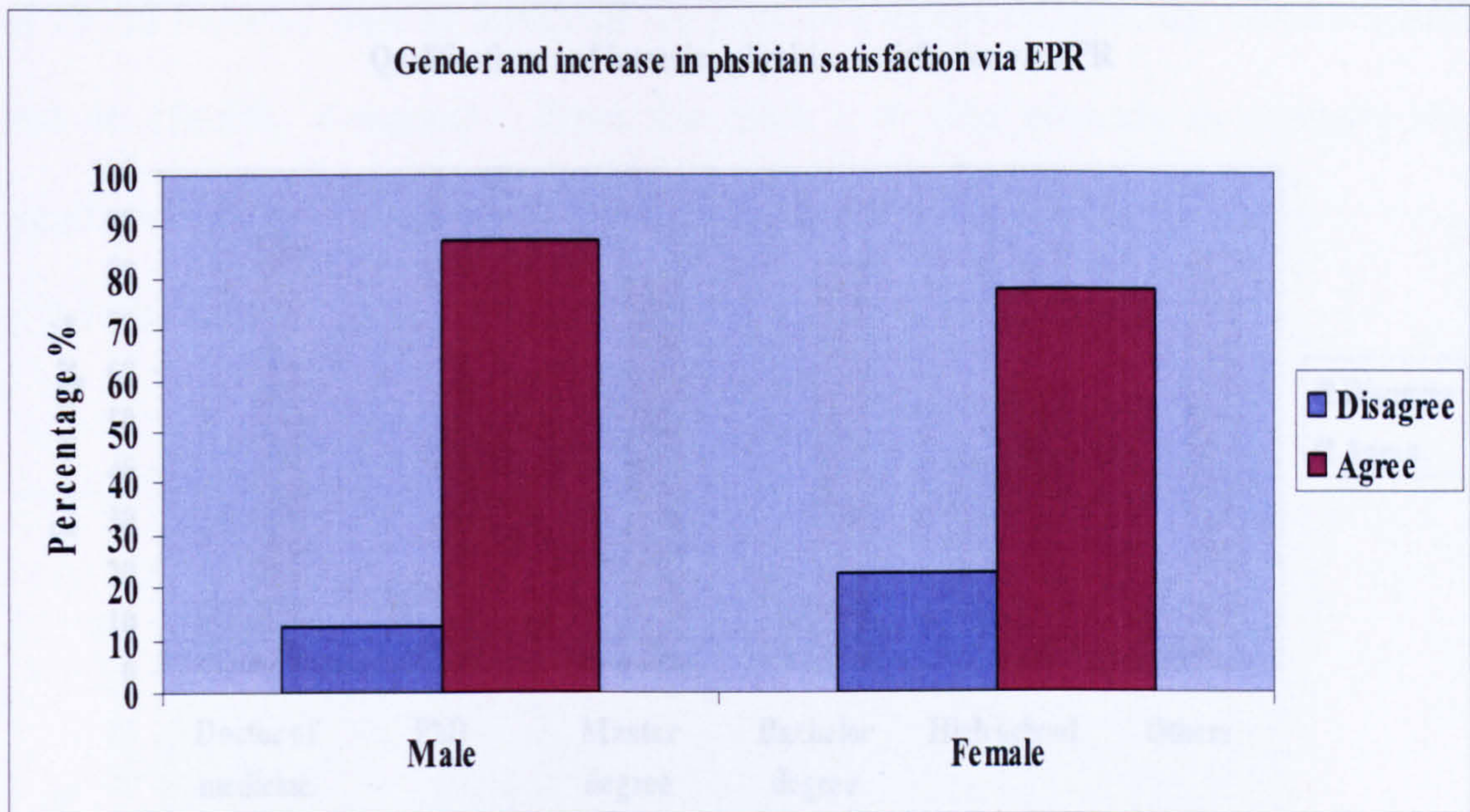
**Figure 5.14 Age and Increase in Physician Satisfaction via EPR**

*Figure 5.13 Gender and Increase in Physician Satisfaction via EPR*

The impact of gender in relation to the improvement of physicians' satisfaction as revealed in the 139 male respondents indicated that 121 (87.1%) agreed that EPR will improve physicians' satisfaction, whilst 18 (12.9%) disagreed.

In comparison of the 191 female respondents, 148 (77.5%) agreed that EPR would increase physician satisfaction and 43 (22.5%) would not be satisfied by the introduction of EPR as indicated in Figure 5.15.

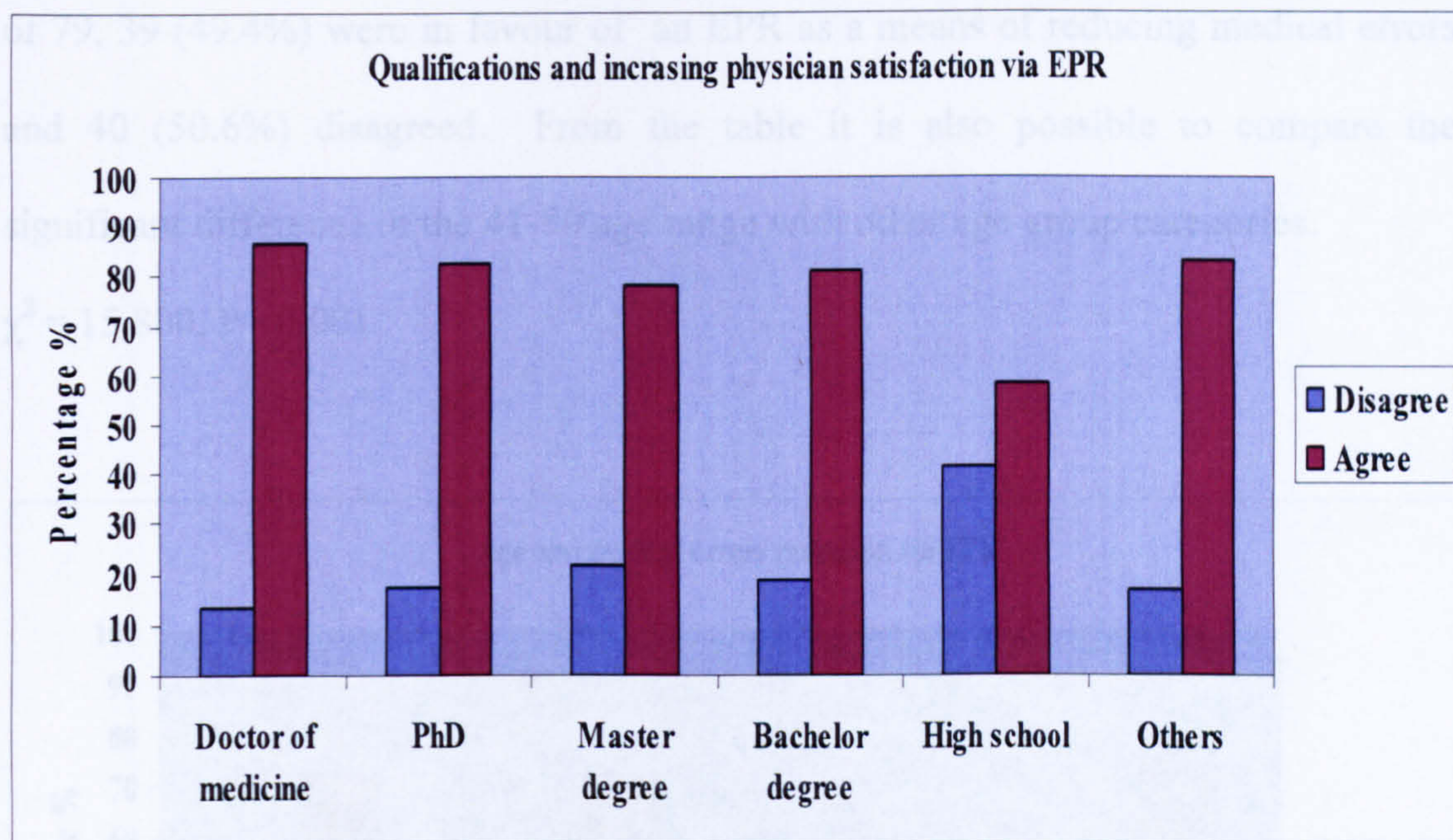
$$\chi^2 = 4.883, P = 0.027$$



**Figure 5.15 Gender and Increase in Physician Satisfaction via EPR**

With regard to their level of education and how an EPR satisfies physicians, Figure 5.16 demonstrates that a large majority were in favour, especially of 81 doctors. 70 (86.4%) agreed and 11 (13.6%) disagreed. Of the total 14 had bachelor degrees, 117 (81.3%) emphasised the importance of EPR to increase physicians' satisfaction. Some 27 respondents (18.8%) with bachelor degrees disagreed.

$$\chi^2 = 5.174, P = 0.309$$



**Figure 5.16 Qualifications and Increasing Physician Satisfaction via EPR**

From the evidence of the responses to the questionnaire, the proportion of the respondents in favour of EPR from all areas of medical staff was overwhelming. There were no significant differences between the various grades of hospital staff.

*Figure 5.17 Age and Medical Errors Reduction via EPR*

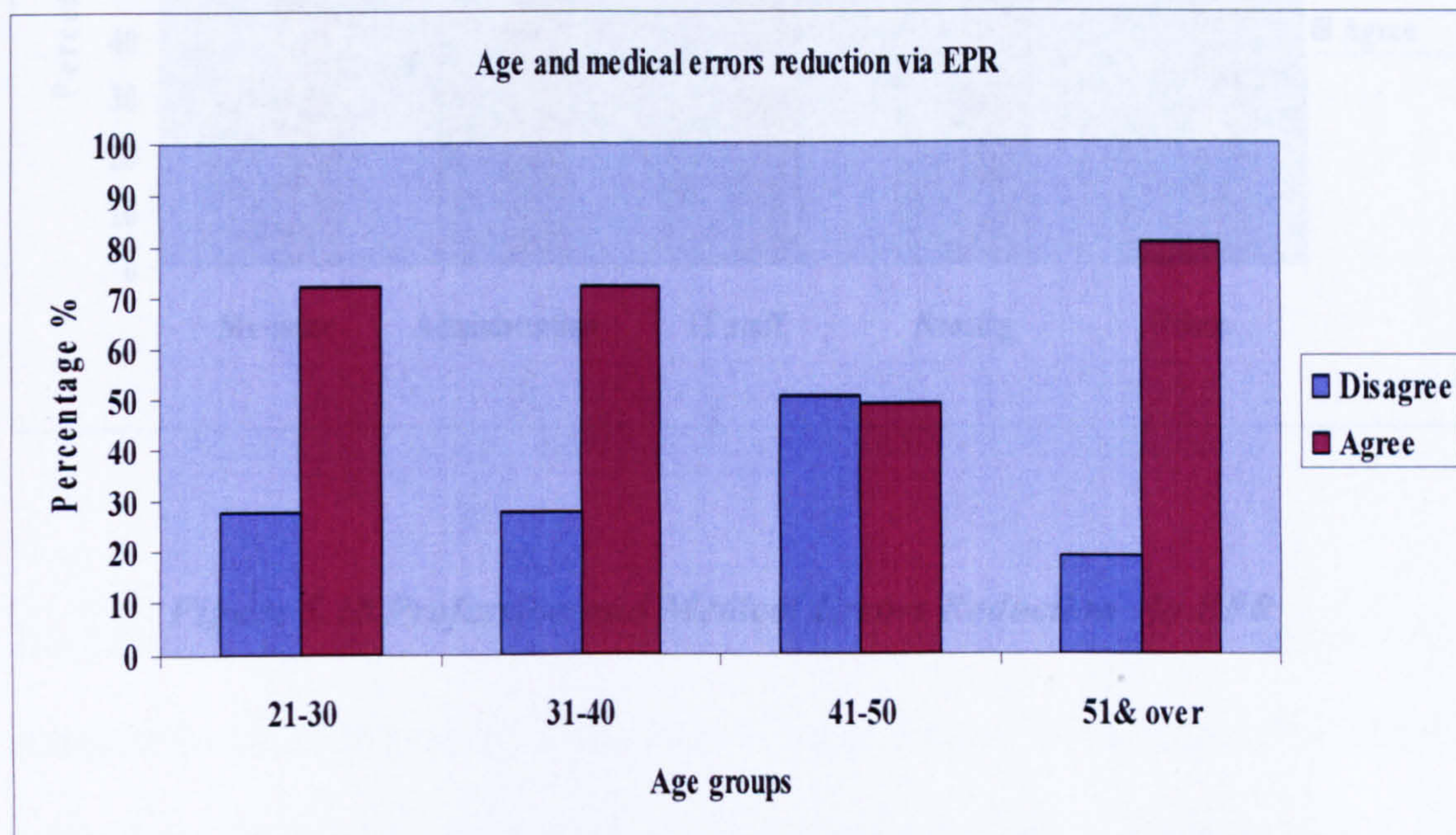
#### **5.4.2.4 Medical Error Reduction**

The importance of accurate medical records is vital and it is also important that they should be available quickly in emergencies. The introduction of an EPR should meet both these requirements.

Figure 5.17 shows the respondents' attitude to how an EPR system can reduce medical errors in relation to the respondents' age group in different categories. The results show that there are significant differences in the 41-50 age groups, in the total

of 79, 39 (49.4%) were in favour of an EPR as a means of reducing medical errors and 40 (50.6%) disagreed. From the table it is also possible to compare the significant difference in the 41-50 age range with other age group categories.

$$\chi^2 = 15.800, P = 0.001$$



**Figure 5.17 Age and Medical Errors Reduction via EPR**

Responses to the same question indicated that of 136 doctors 91 (66.9%) agreed that introducing electronic patient records would reduce medical errors and improve patient safety but 45 (33.1%) disagreed. From a total of 83 nurses, 53 (63.9%) considered that medical errors would be reduced by an EPR system, and 30 (36.1%) disagreed as shown in Figure 5.18.

$$\chi^2 = 1.483, P = 0.830$$

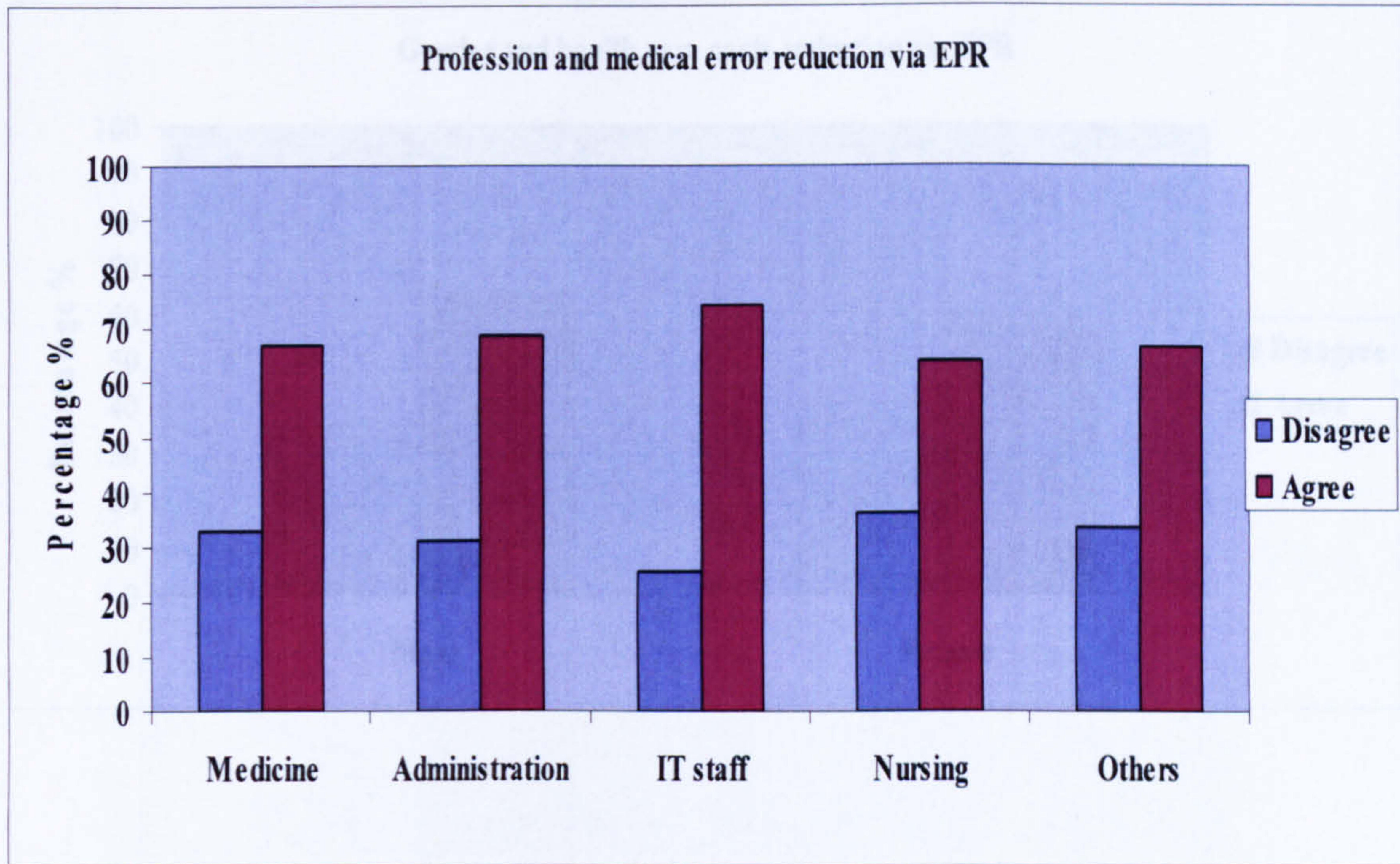


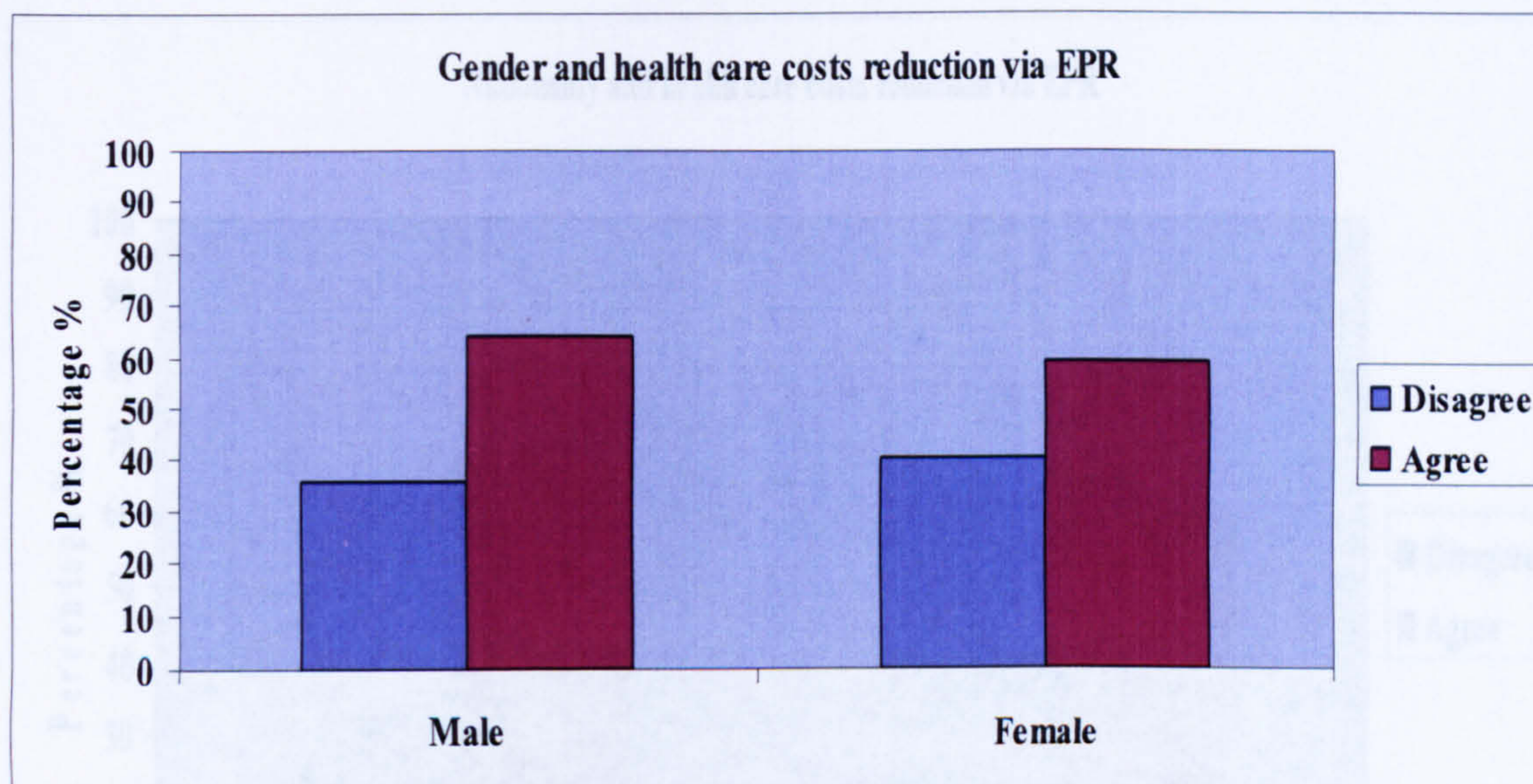
Figure 5.18 Profession and Medical Errors Reduction via EPR

5.4.2.5 Cost Reduction for EPR System in the Long Term

To install an EPR system involves expenditure, but if it proves to be more efficient than other methods of patient record keeping, it should be capable of reducing long term costs by saving the time of the users.

Of 139 male respondents 89 (64%) considered that an EPR system in the long term would reduce the cost of patient record keeping and 50 (36%) disagreed. However, of 191 females 113 (59.2%) agreed that an EPR could reduce the cost in the long term and 78 (40.8%) disagreed that an EPR would reduce the cost in the long term as shown in Figure 5.19.

$\chi^2 = 0.802, P = 0.370$



**Figure 5.19 Gender and Healthcare Costs Reduction via EPR**

The financial situation in Qatar is that of a wealthy country and this would make the introduction of EPR system easier than in other areas. For a total of 56 Qatari respondents 38 (67.9%) did not see any difficulty in the cost and agreed that in the long term costs would be reduced. Only 18 (32.1%) disagreed, compared with 274 non Qatari of whom 164 (59.9%) agreed, and 110 (40.1%) disagreed that it would not reduce costs in the long term as shown in Figure 5.20.

$$\chi^2 = 1.254, P = 0.263$$

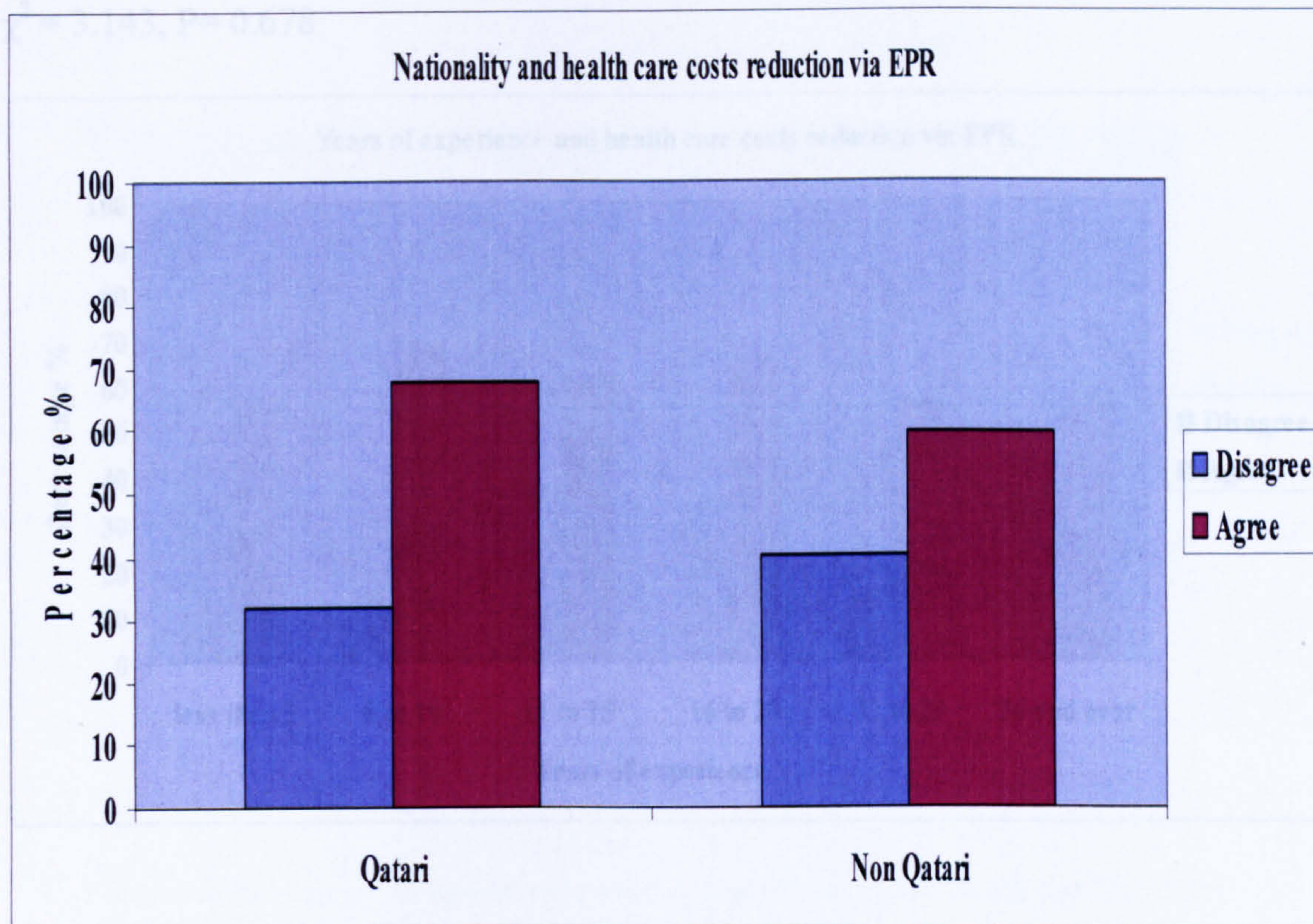


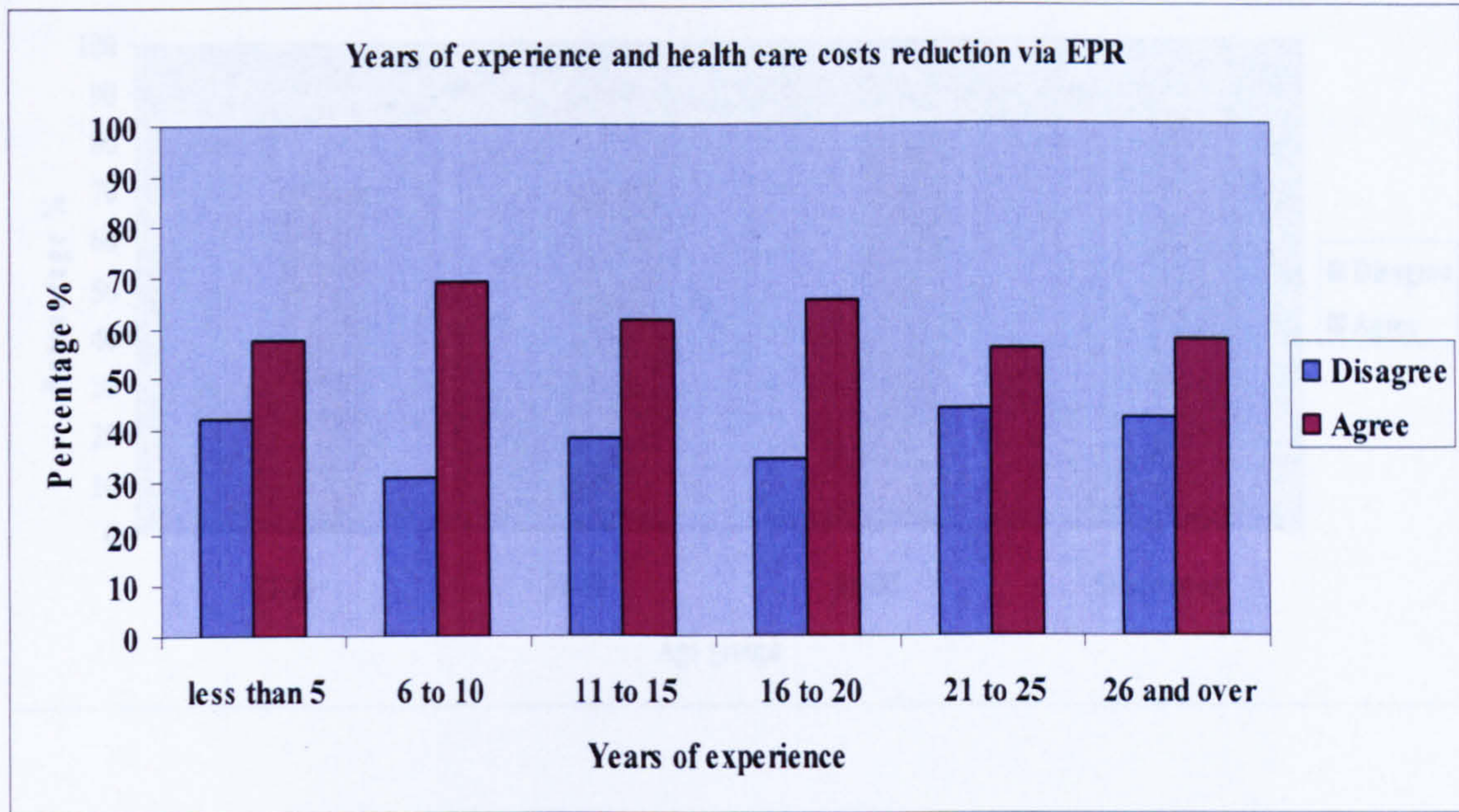
Figure 5.21 Years of Experience and Healthcare Costs Reduction via EPR

**Figure 5.20 Nationality and Healthcare Costs Reduction via EPR**

#### 5.4.2.5 Education and Training

The length of experience of respondents was considered as a factor in their views about the benefit of EPR. Cross tabulation was used to analyse the responses in relation to chi-square values which revealed no significant differences regarding this question. In relation to the question as to whether EPR would reduce health care costs in the long term, Figure 5.21 indicates that of the 65 with 6-10 years hospital experience, 45 (69.2%) agreed and 20 (30.8%) disagreed. However, of the 34 with 21-25 years experience, 19 (55.9%) of them supported the proposed EPR as a method of reducing costs in the long term. Nevertheless 15 (44.1%) considered that the EPR system would not result in cost reduction in the long term.

$$\chi^2 = 3.143, P = 0.678$$



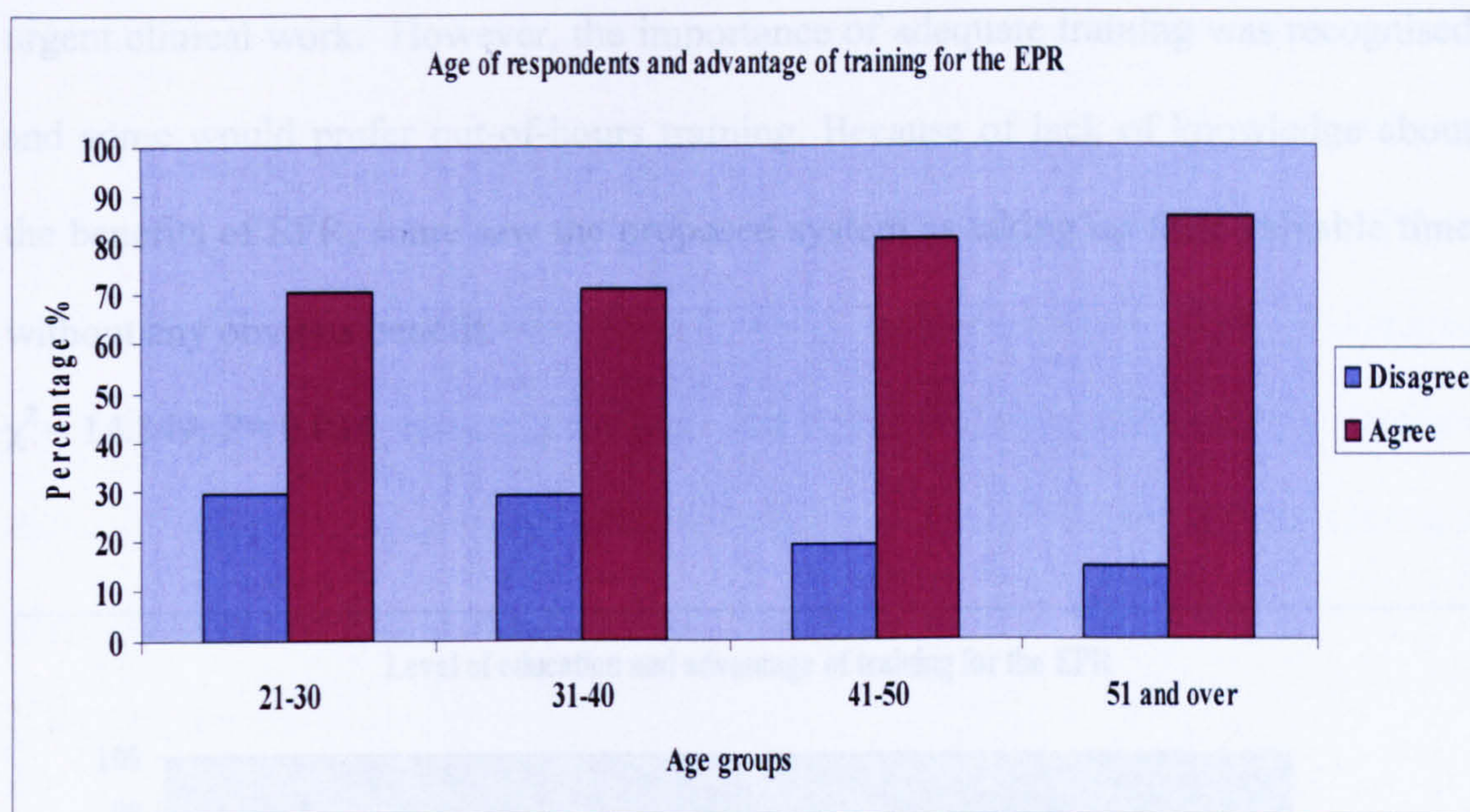
**Figure 5.21 Years of Experience and Healthcare Costs Reduction via EPR**

#### 5.4.2.6 Education and Training

Respondents were asked their opinion about the training programme and its advantages, which would be required before the introduction of an EPR system. To introduce any new system requires a carefully planned education and training system for all who will be involved. The analysis of the respondents' answers (Figure 5.22) shows that of the 119 in the 21-30 age range, 84 (70.6%) strongly agreed that lack of training would be a crucial disadvantage for the introduction of the system, but 35 (29.4%) disagreed. Of the 79 in the 41-50 age group, 64 (81%) supported the importance of training for the introduction of EPR compared with the 15 (19%) who said that training was not important.

$$\chi^2 = 4.717, P = 0.194$$





**Figure 5.22 Age of Respondents and Advantage of Training for the EPR**

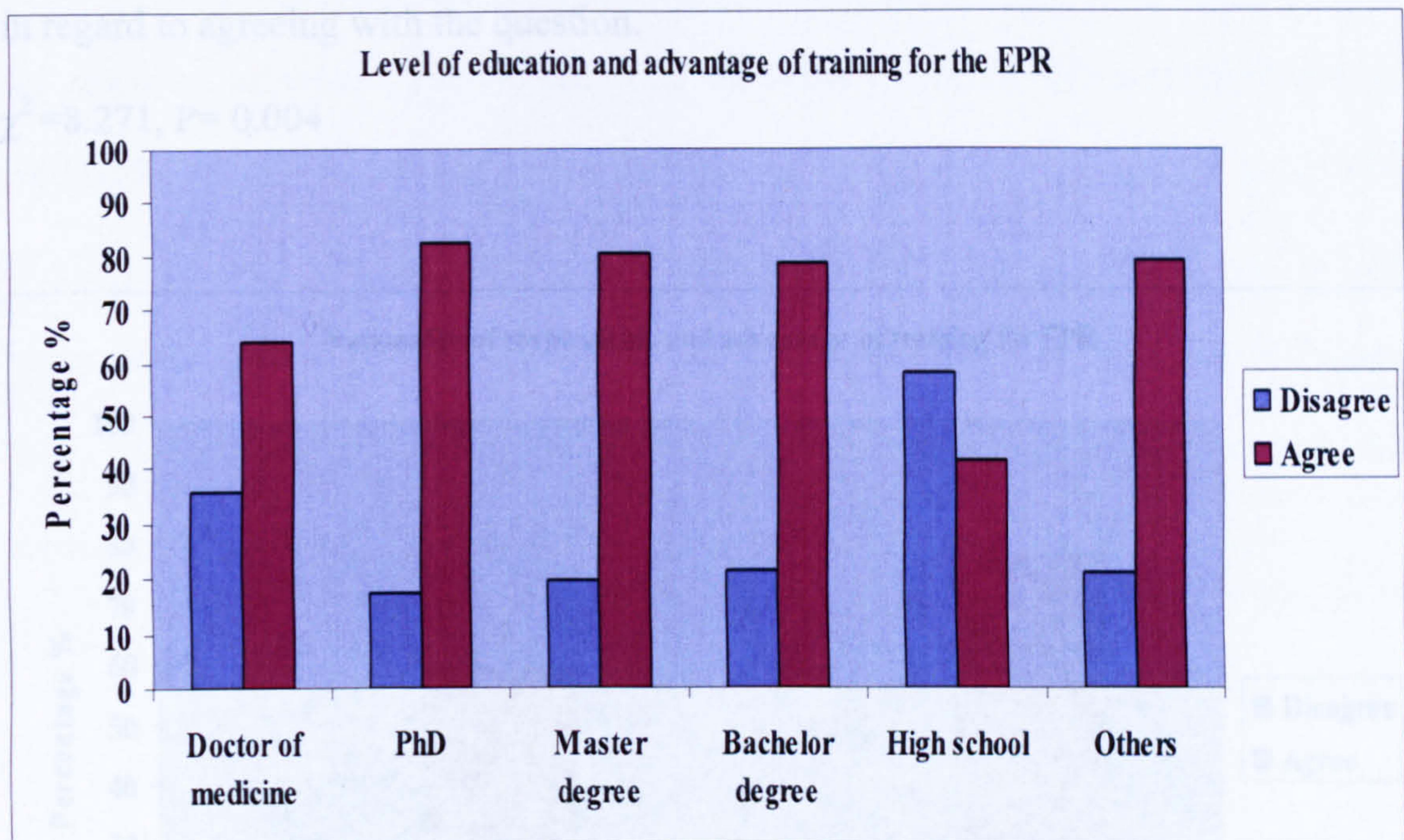
Those in all professional categories anticipated that training would be essential to ensure the success of the proposed EPR system. There was the need for all involved to be aware how the new system would affect their particular activities and how to avoid mistakes.

Those with different levels of education were asked whether the training programme would be an advantage. The responses of 81 doctors indicated that 52 (64.2%) of them supported the advantage of the training because they would be constantly using the system which would be difficult without adequate training; 29 (35.8%) doctors disagreed because they had already gained skills with EPR use elsewhere.

In contrast, of the 12 respondents with high school education 5 (41.7%) agreed as to the importance of training with the use of EPR, whilst 7 (58.3%) disagreed as shown in Figure 5.23. Concerns were expressed that spending time training would interrupt

urgent clinical work. However, the importance of adequate training was recognised and some would prefer out-of-hours training. Because of lack of knowledge about the benefits of EPR, some saw the proposed system as taking up their valuable time without any obvious benefit.

$$\chi^2 = 14.349, P = 0.014$$

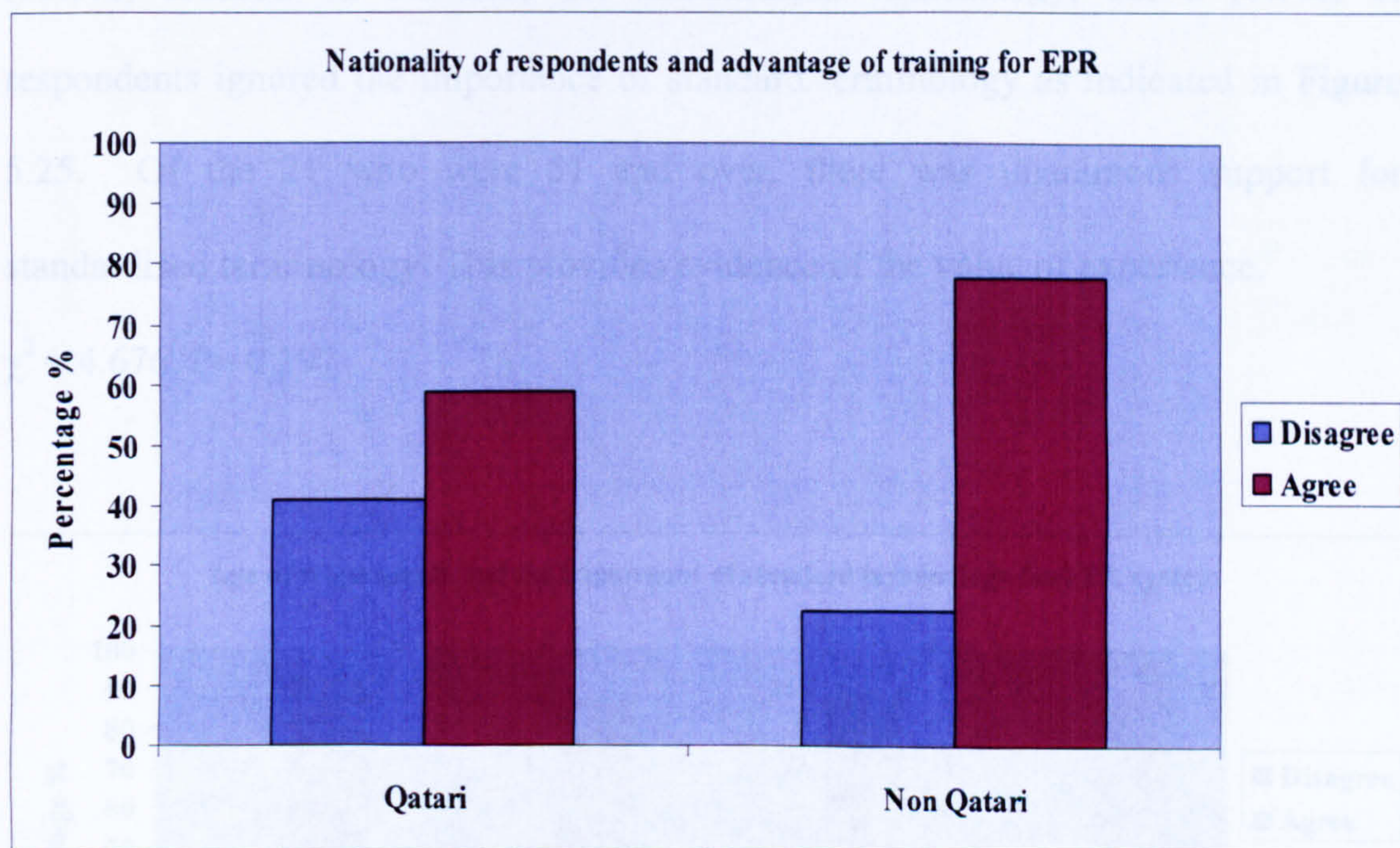


**Figure 5.23 Qualification and Advantage of Training for the EPR**

Result of chi-square testing revealed significant differences in the relationship between ethnicity and the importance of training for the use of an EPR with regard to its advantages. Differences are clearly visible between Qatari and non-Qatari respondents. Figure 5.24 shows that of 56 Qatari respondents, 33 (58.9%) were in agreement and 23 (41.1%) disagreed, compared with the 274 non-Qatari of whom

212 (77.4%) agreed and 62 (22.6%) disagreed. The difference between the agreement of Qatari and non-Qatari nationals in considering that lack of training would be a disadvantage is obvious from the 58.9% Qatari and 77.4% non-Qatari responses. Perhaps the considerable difference in sample size accounts for some of the difference in the percentage results. The P Value for the difference is 0.004, so there is a statistically significant difference between Qatari and non-Qatari nationals in regard to agreeing with the question.

$$\chi^2 = 8.271, P = 0.004$$



**Figure 5.24 Nationality of Respondents and Advantage of Training for the EPR**

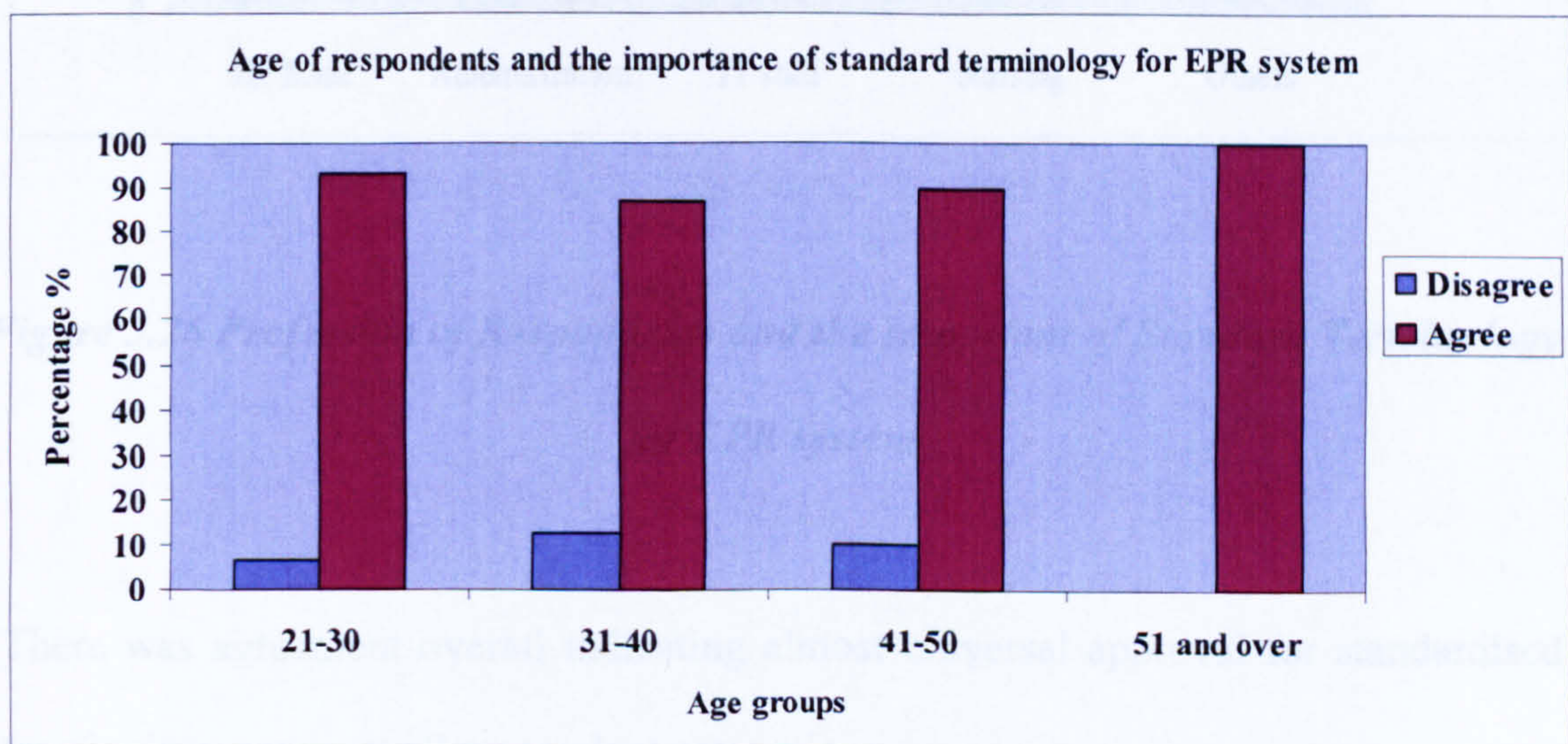
The response to the enquiry into aspects of training was very varied. There was, in general, agreement that it was necessary and effective to introduce an EPR system.

However, there was a minority of responses from those with High School qualifications because they are focussed on paper work more than patients, with whom they were not directly involved, in comparison with the Doctors, who see the result of training being of benefit to patient care in general.

#### 5.4.2.7 Standard Terminology

In introducing a new patient record system it is essential that all users are aware of the standard terminology to be used and the order in which information should be recorded. In the 21-30 age group there were 119 respondents and of these 111 (93.3%) focused on the need for standardised terminology, but 8 (6.7%) of respondents ignored the importance of standard terminology as indicated in Figure 5.25. Of the 21 who were 51 and over, there was unanimous support for standardised terminology. This provides evidence of the value of experience.

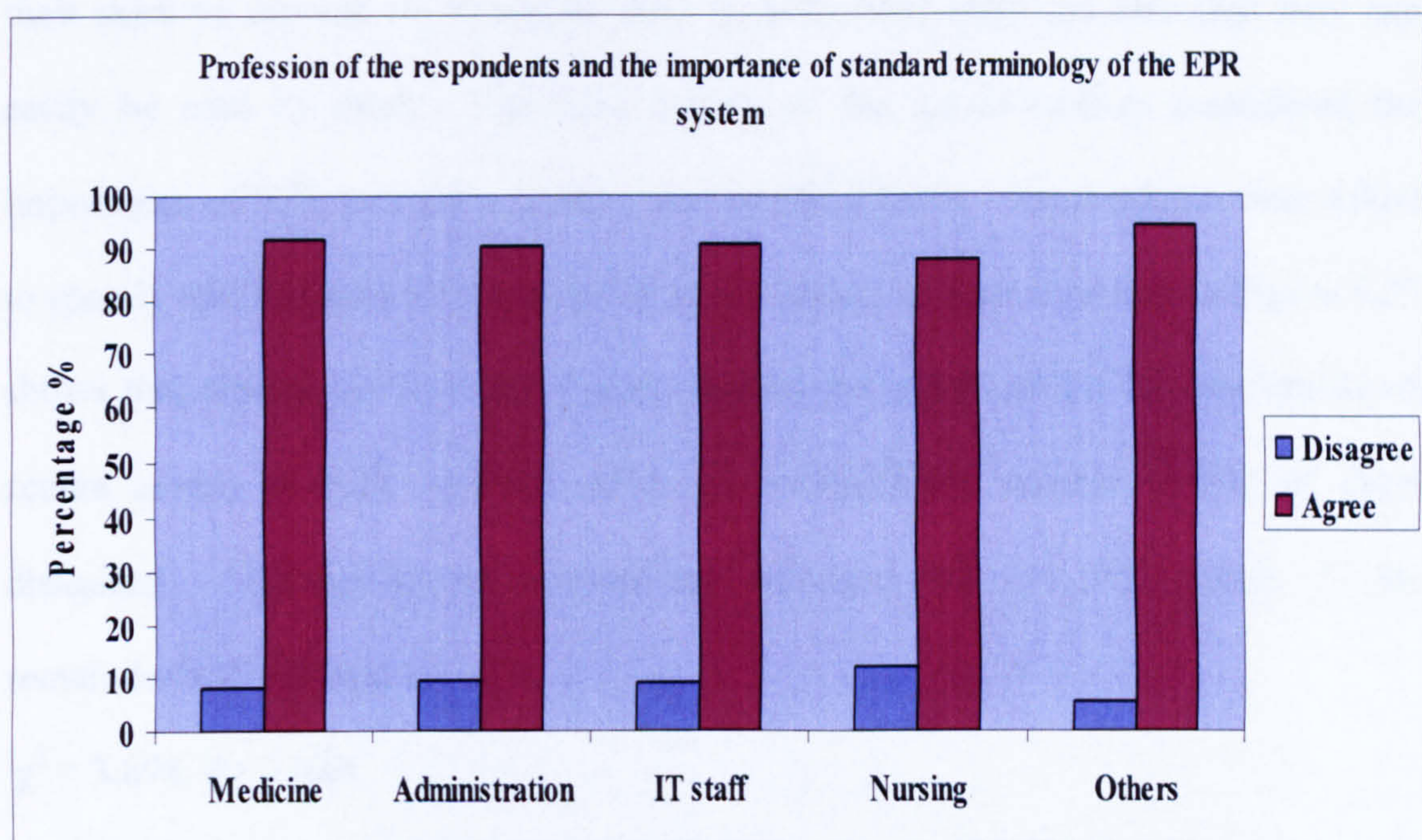
$$\chi^2 = 4.676, P = 0.197$$



**Figure 5.25 Age of Respondents and the Important of Standard Terminology for EPR system**

Doctors emphasised the importance of standardised terminology as essential for effective patient care. Respondents were asked to specify their view of standardised terminology and Figure 5.26 shows that of 136 doctors, 125 (91.9%) agreed, while 11 (8.1%) disagreed. Of the 83 nurses, 73 (88%) were in favour and 10 (12%) of them did not see the importance of standardised terminology.

$$\chi^2 = 1.594, P = 0.810$$



**Figure 5.26 Profession of Respondents and the Important of Standard Terminology for EPR system**

There was agreement overall indicating almost universal approval for standardised terminology amongst all respondent categories.

### 5.4.3 Security and Confidentiality Issues

Findings regarding security and confidentiality issues are relevant in meeting study objectives 2 and 5. To investigate the perceived benefits and disadvantages, the following cross-tabulations were used:

#### 5.4.3.1 Security of EPR Access

This is a most important aspect of patient care because patients need to be sure that their medical records are available only to authorised staff and also that they can easily be read by them. The third section of the questionnaires considered the importance of EPR to ensure security and confidentiality. Respondents were asked to specify the importance they attached to this aspect of their records and Figure 5.27 shows that almost 100% of the Qatari respondents agreed about the importance of secure access to EPR systems, while an insignificant number (1.8%) of them disagreed. The non-Qatari respondents indicated that (90.1%) agreed, of the remainder 9.9% disagreed.

$$\chi^2 = 3.898, P = 0.048$$

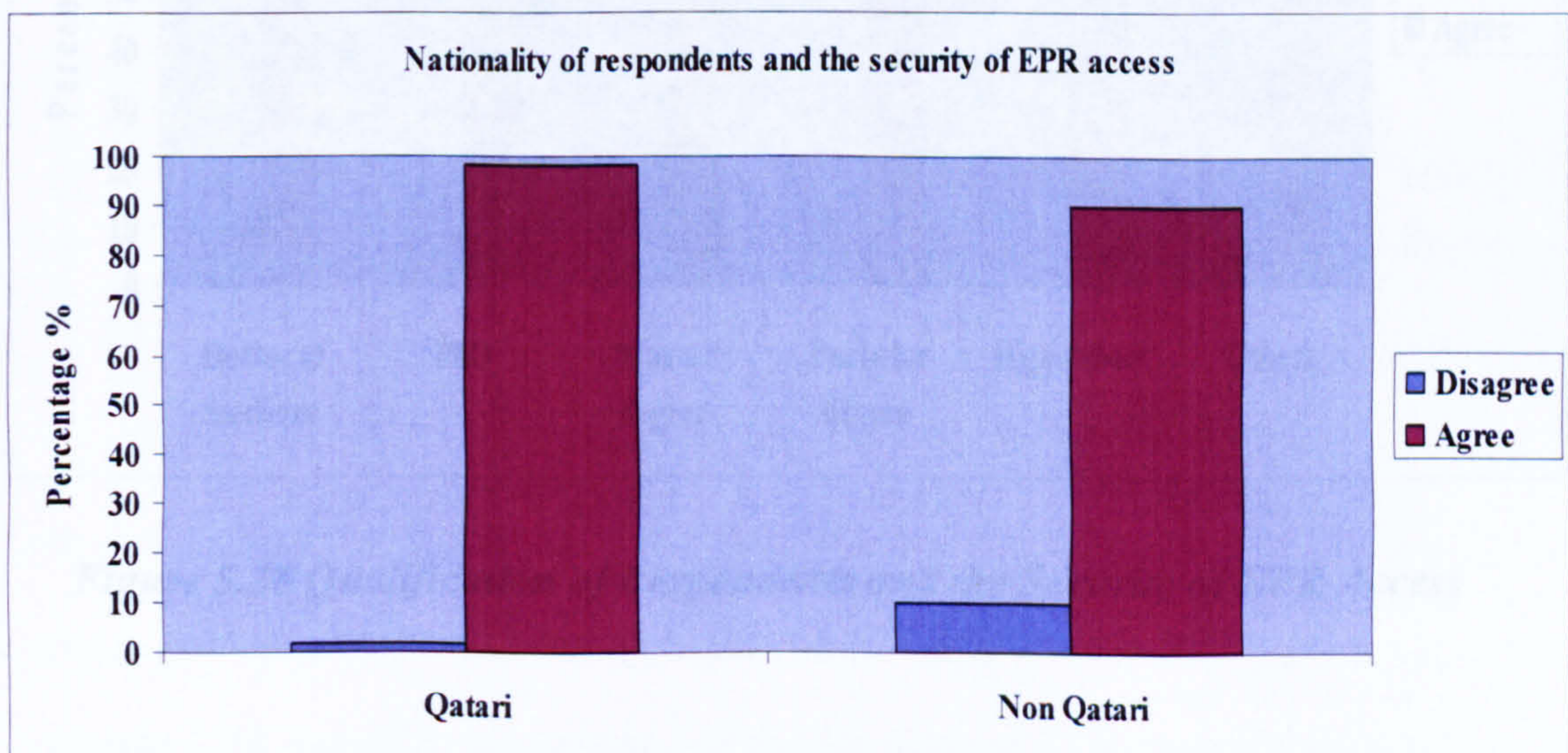
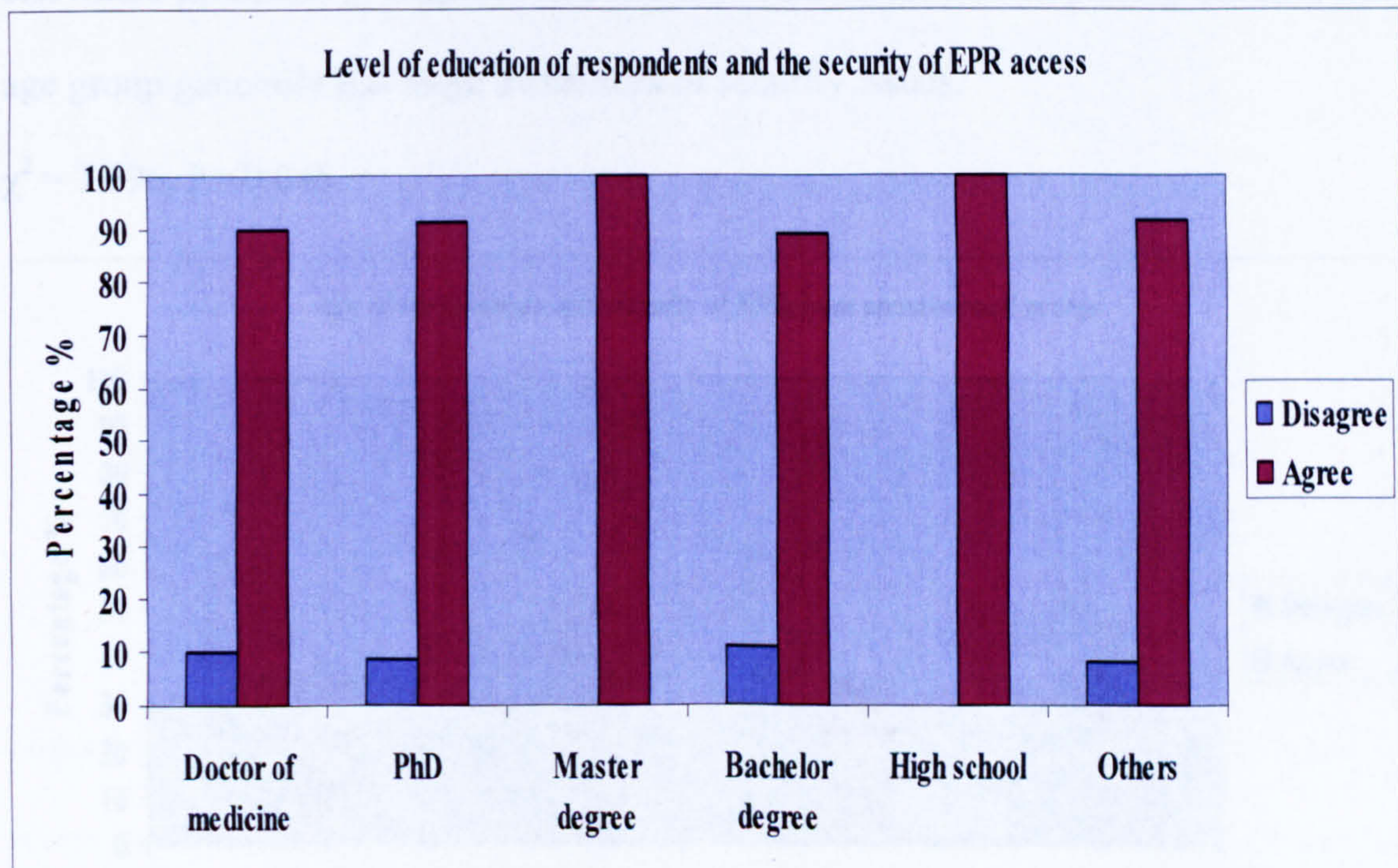


Figure 5.27 Nationality of Respondents and the Security of EPR Access

Figure 5.28 indicates that of 81 doctors, 73 (90.1%) focused on the need for confidentiality and a secure system for patient record keeping; only 8 (9.9%) disagreed. However, for those with bachelor degrees, out of 144, 128 (88.9%) saw security as a most important aspect of patient record keeping; the remainder of 16 (11.1%) did not see the necessity for confidentiality.

A chi-square test was used to examine whether there was a significant relation between the level of respondents, education and their views on confidentiality and the necessity for a security system where patients' records are in use. The chi-square result signified no statistical difference between the level of education and attitudes to security.

$$\chi^2 = 6.861, P = 0.231$$



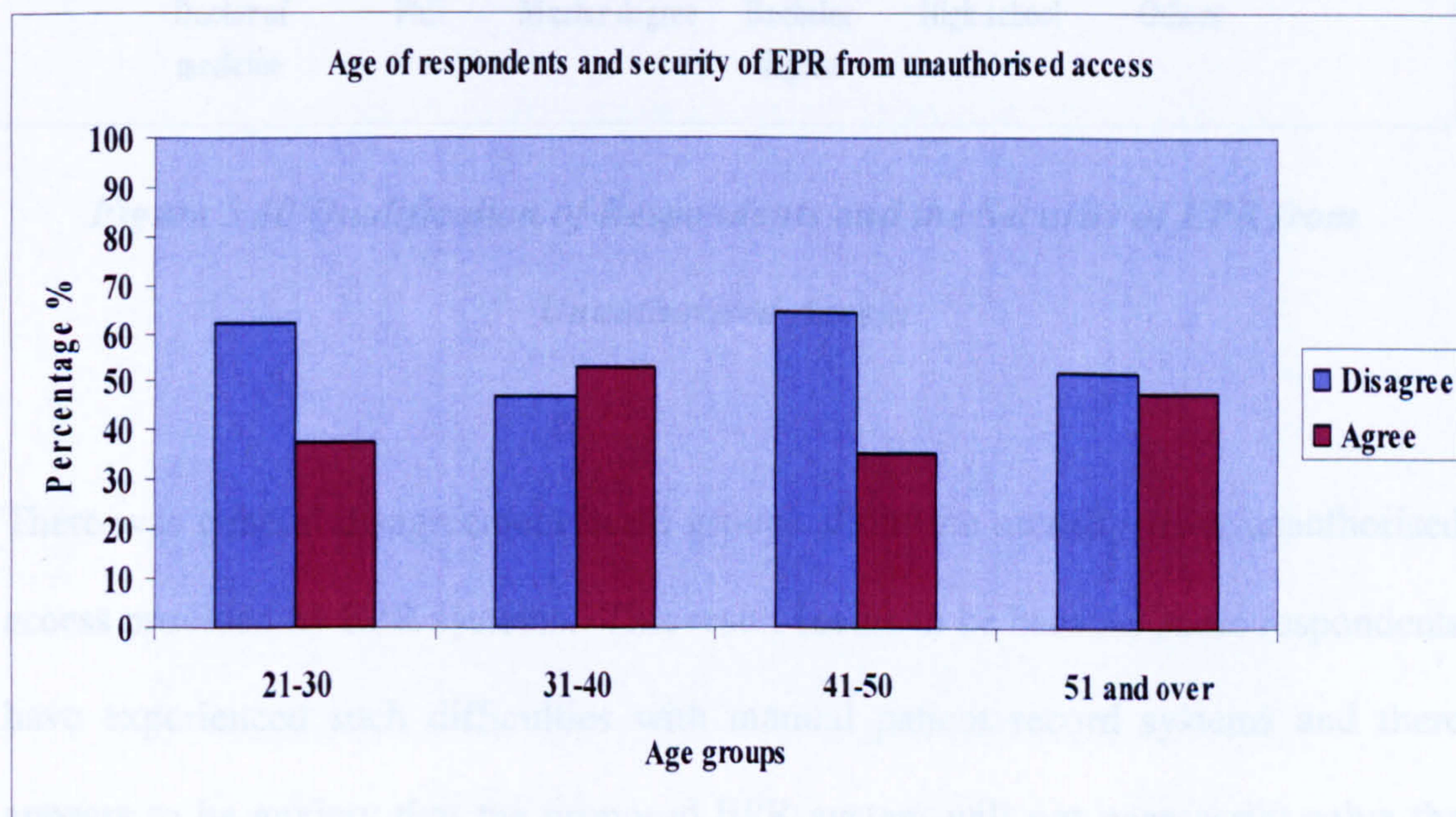
**Figure 5.28 Qualification of Respondents and the Security of EPR Access**

Analysis of those responses from all departments, age group, gender, years of experience and ethnicity, showed that the majority recognised the importance of security of access to electronic and all patient records.

#### 5.4.3.2 EPR secure from Unauthorised Access

Respondents were also asked if they regarded an EPR as being secure from unauthorised access. Figure 5.29 indicates that a very large proportion of the 119 in the 21-30 age group, 74 (62.2%) disagreed, saying they did not consider an EPR system was secure from unauthorised access; 45 (37.8%) agreed. For the 41-50 age range, from the total of 79, 51 (64.6%) disagreed similarly and 28 (35.4%) agreed. This seems to indicate that respondents from these age ranges have experienced elsewhere problems of unauthorised access. This result was surprising because this age group generally has more awareness of security issues.

$$\chi^2 = 7.996, P = 0.046$$

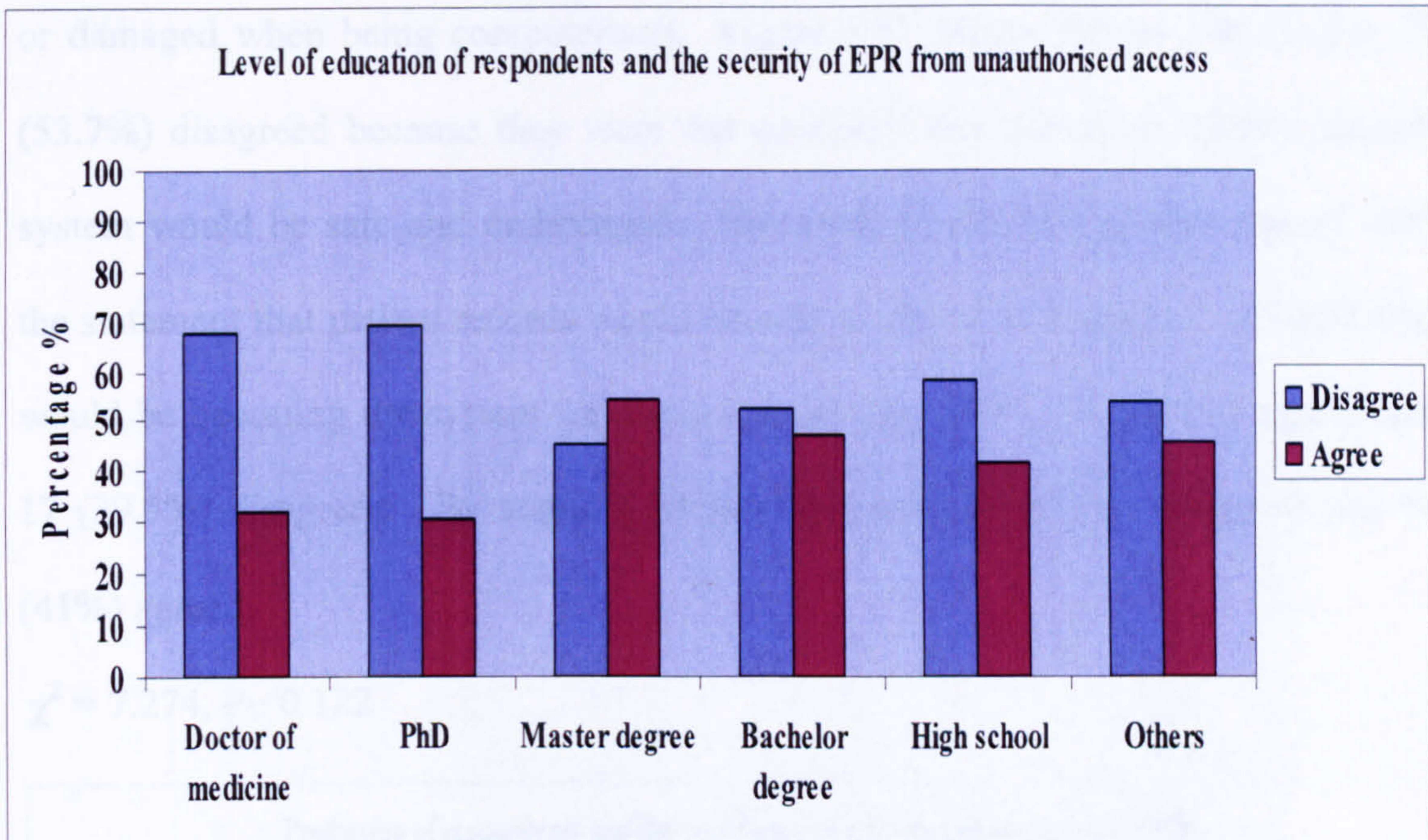


**Figure 5.29 Age of Respondents and the Security of EPR from Unauthorised Access**



Respondents were asked to specify the extent to which an EPR system is secure from unauthorised access. Figure 5.30 illustrates that of 81 doctors, 55 (67.9%) of the sample considered it to be insecure and 26 (32.1%) of them agreed it was secure. Of the 23 with a PhD, 16 (69.6%) disagreed and 7 (30.4%) agreed.

$\chi^2 = 8.959, P = 0.111$



**Figure 5.30 Qualification of Respondents and the Security of EPR from Unauthorised Access**

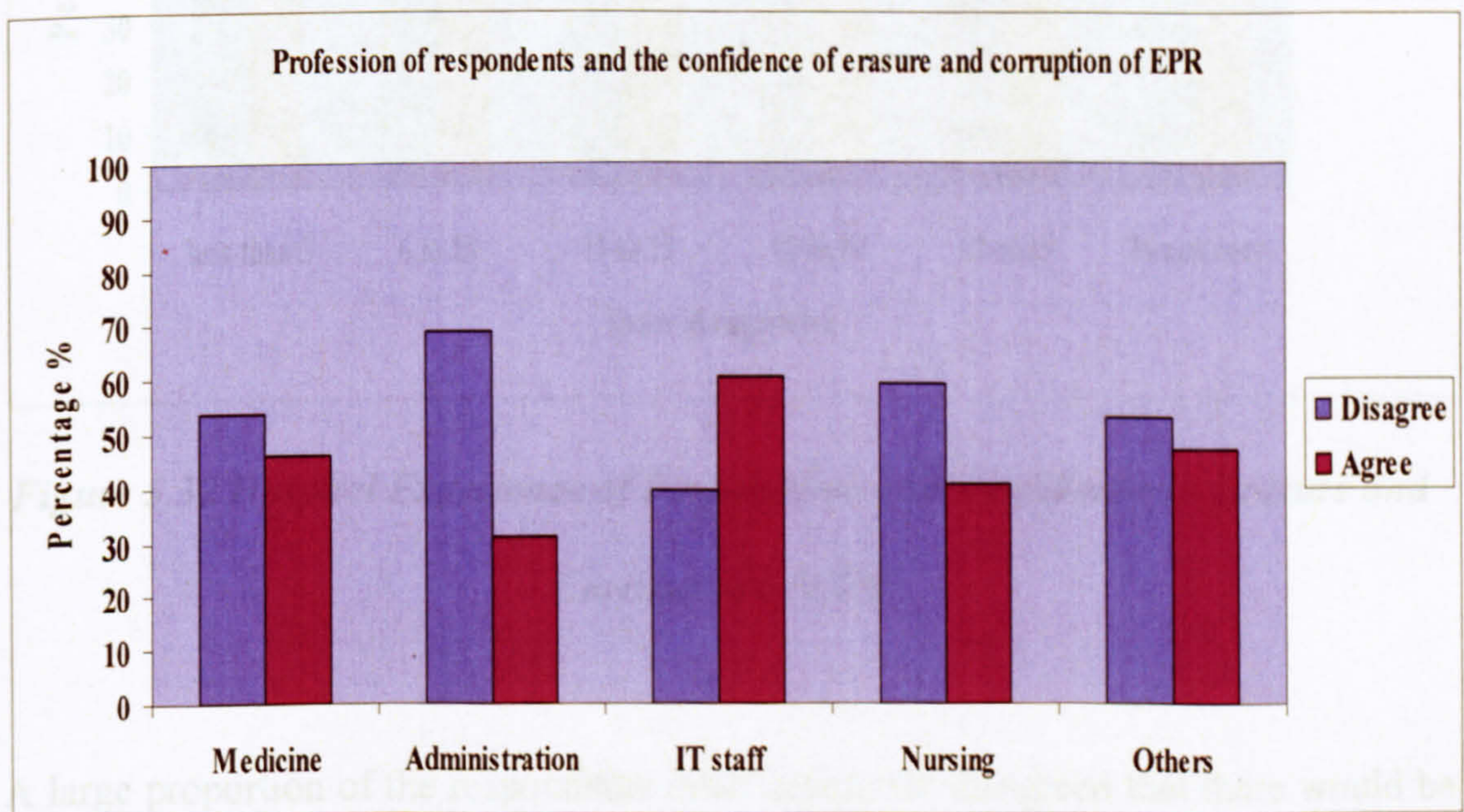
There was general disagreement in all groups about the security from unauthorised access provided by EPR systems. This result seems to be because some respondents have experienced such difficulties with manual patient record systems and there appears to be anxiety that the proposed EPR system will not necessarily solve the problem.

A  $\chi^2$  test was used to determine the link between all levels of education and the respondents to EPR security from unauthorised access. Results indicated no significant link between these variables.

### 5.4.3.3 Erasure and Corruption of EPR

Respondents were asked if they thought patient records might be accidentally erased or damaged when being computerised. Figure 5.31 shows that of 136 doctors 73 (53.7%) disagreed because they were not confident that electronic patient records system would be safe and undamaged. However, 63 (46.3%) doctors agreed with the statement that patient records would be safe in use of EPR system. IT staff who would be operating the system were more optimistic, of 43, 26 (60.5%) agreed and 17 (39.5%) disagreed. By contrast, of the 83 nurses, 49 (59%) disagreed and 34 (41%) agreed.

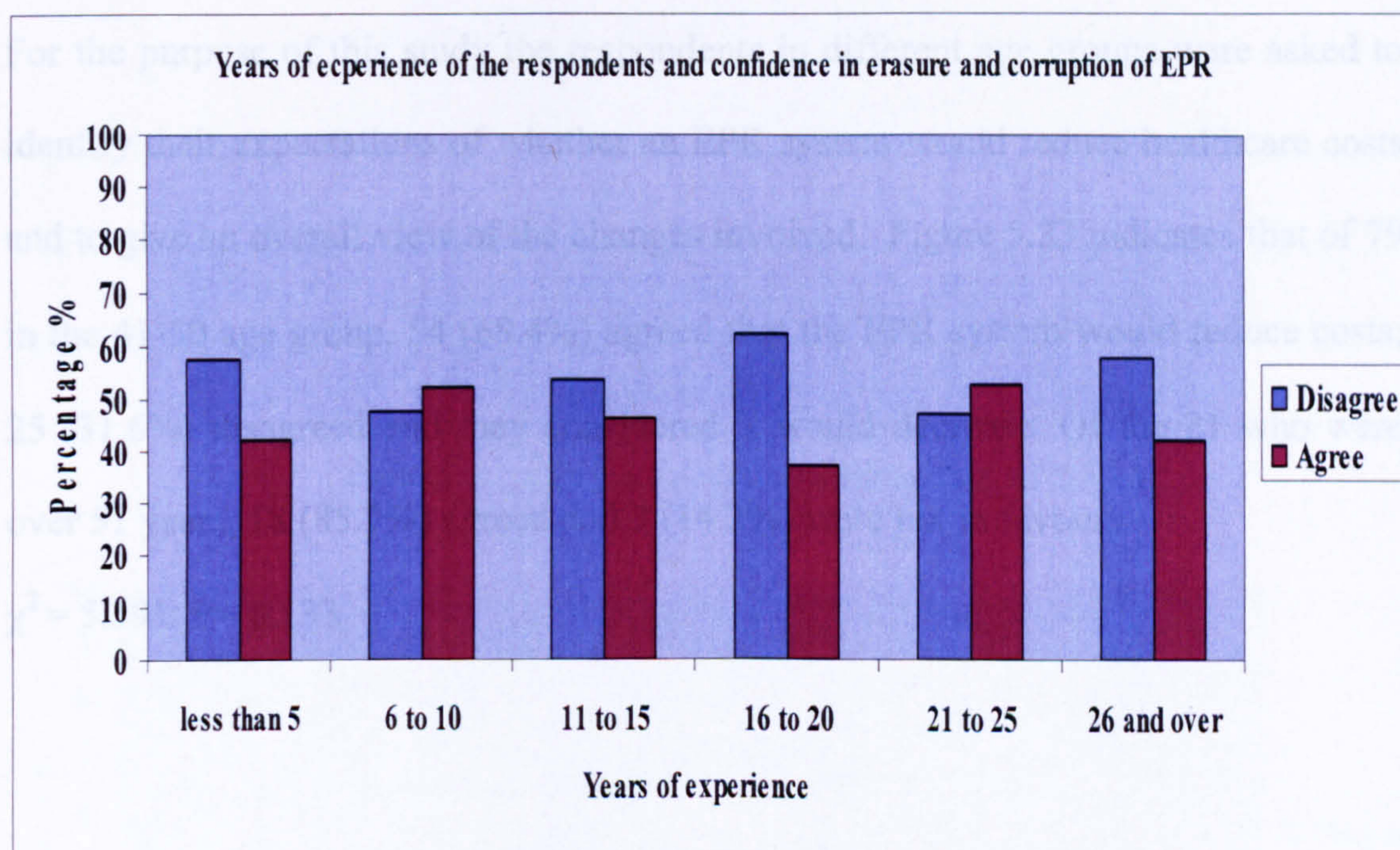
$$\chi^2 = 7.274, P = 0.122$$



**Figure 5.31 Profession and Confidence of Erasure and Corruption of EPR**

Figure 5.32 indicates that of all 128 respondents with less than five years experience, 74 (57.8%) did not think the proposed system would be secure because there could be erasure or corruption of data. Fifty-four (42.2%) agreed that the proposed system would be beneficial. Similarly of the 32 in the 16-20 years of experience, 20 (62.5%) disagreed and thought that EPR is not secure from erasure or any corruption of patient records. However, there were 12 (37.5%) who agreed that the proposed system is less likely to be damaged.

$$\chi^2 = 3.464, P = 0.629$$



**Figure 5.32 Hospital Experience of Respondents and Confidence in Erasure and Corruption of EPR**

A large proportion of the respondents in all categories disagreed that there would be a reduction in the loss of patient records by using an electronic systems and they were anxious about accidental erasure as exemplified above. In other words the

majority of respondents anticipated no appreciate change in the nonuser of times patient records are lost.

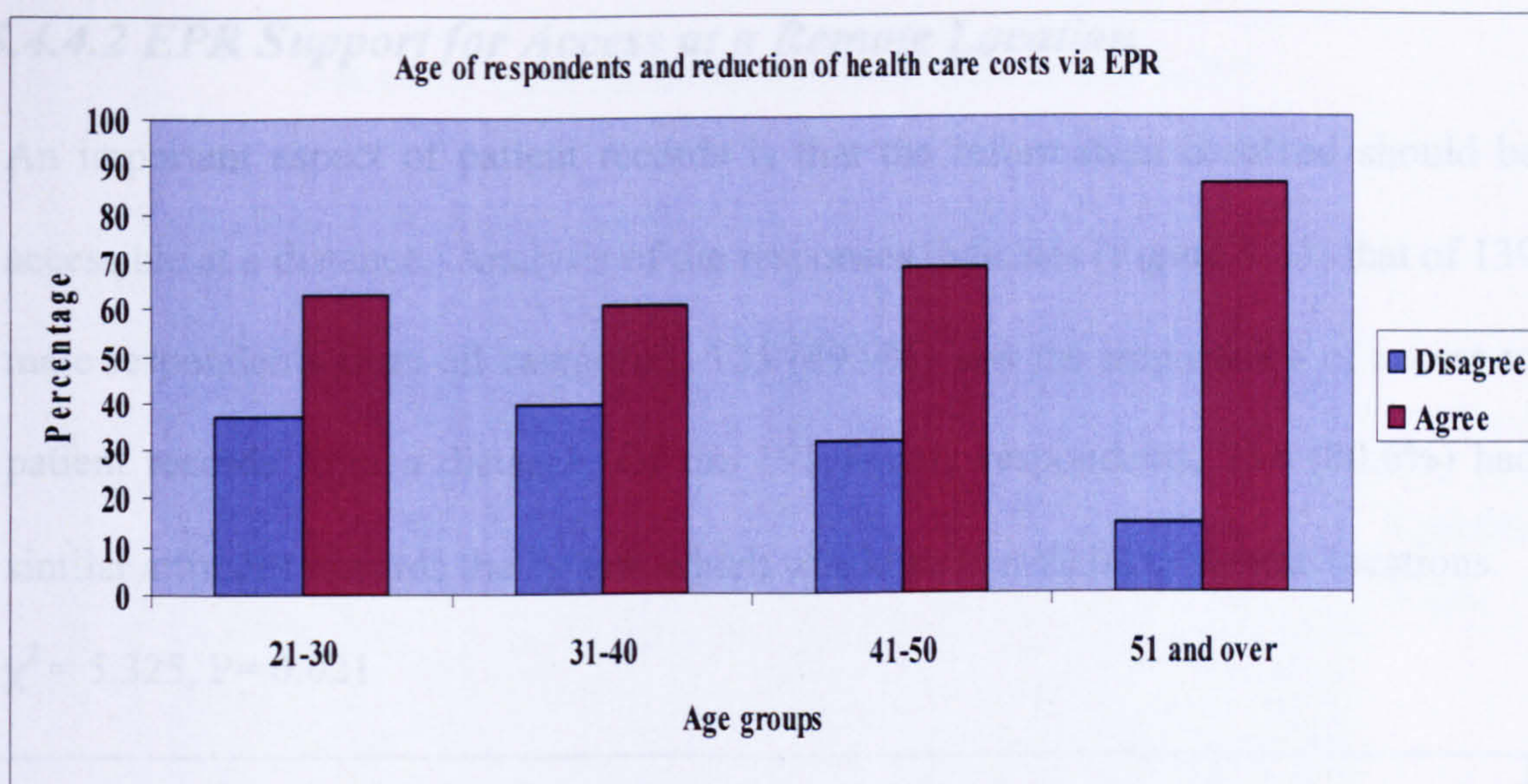
#### ***5.4.4 The Main Benefits of EPR Systems***

The identification of the benefits of introducing the EPR system to Qatar addresses the first aims of the study. To elucidate the benefits, the questionnaire was designed to explore the perceived importance of those benefits that reflect on improving patient care.

##### ***5.4.4.1 Reduction of Healthcare Delivery Costs***

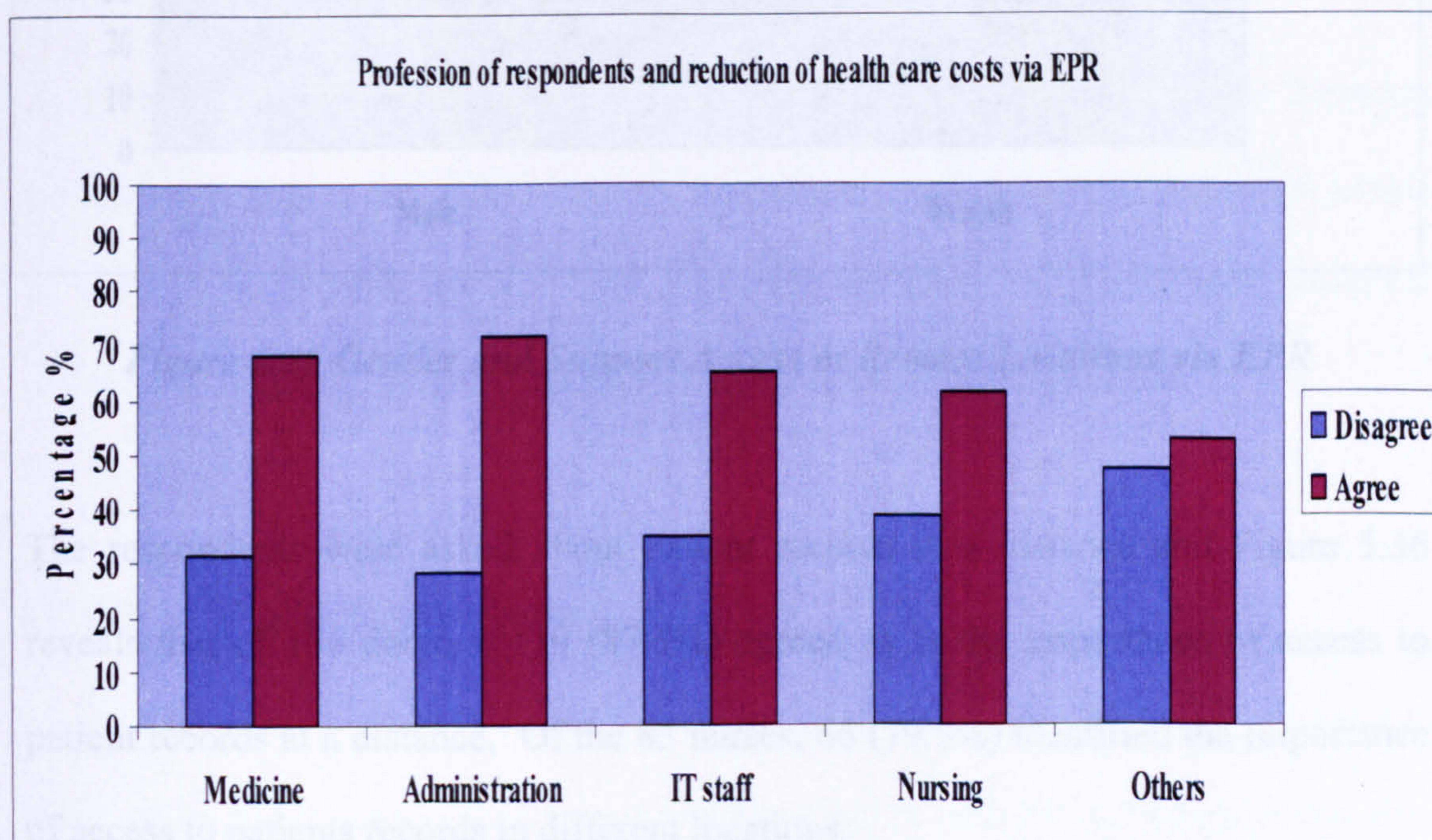
For the purpose of this study the respondents in different age groups were asked to identify their expectations of whether an EPR system would reduce healthcare costs and to give an overall view of the changes involved. Figure 5.33 indicates that of 79 in the 41-50 age group, 54 (68.4%) agreed that the EPR system would reduce costs; 25 (31.6%) disagreed and they considered it would decrease. Of the 21 who were over 51 years, 18 (85.7%) agreed and 3 (14.3%) were not in favour.

$$\chi^2 = 5.591, P = 0.133$$



*Figure 5.33 Age and Reduction of Healthcare Costs via EPR*

Figure 5.34 indicates that of 136 doctors, 93 (68.4%) thought that an EPR system would reduce costs, 43 (31.6%) disagreed. The analysis also indicates that of 83 nurses, 51 (61.4%) were in favour and the remainder disagreed.  $\chi^2 = 4.162$ ,  $P = 0.38$

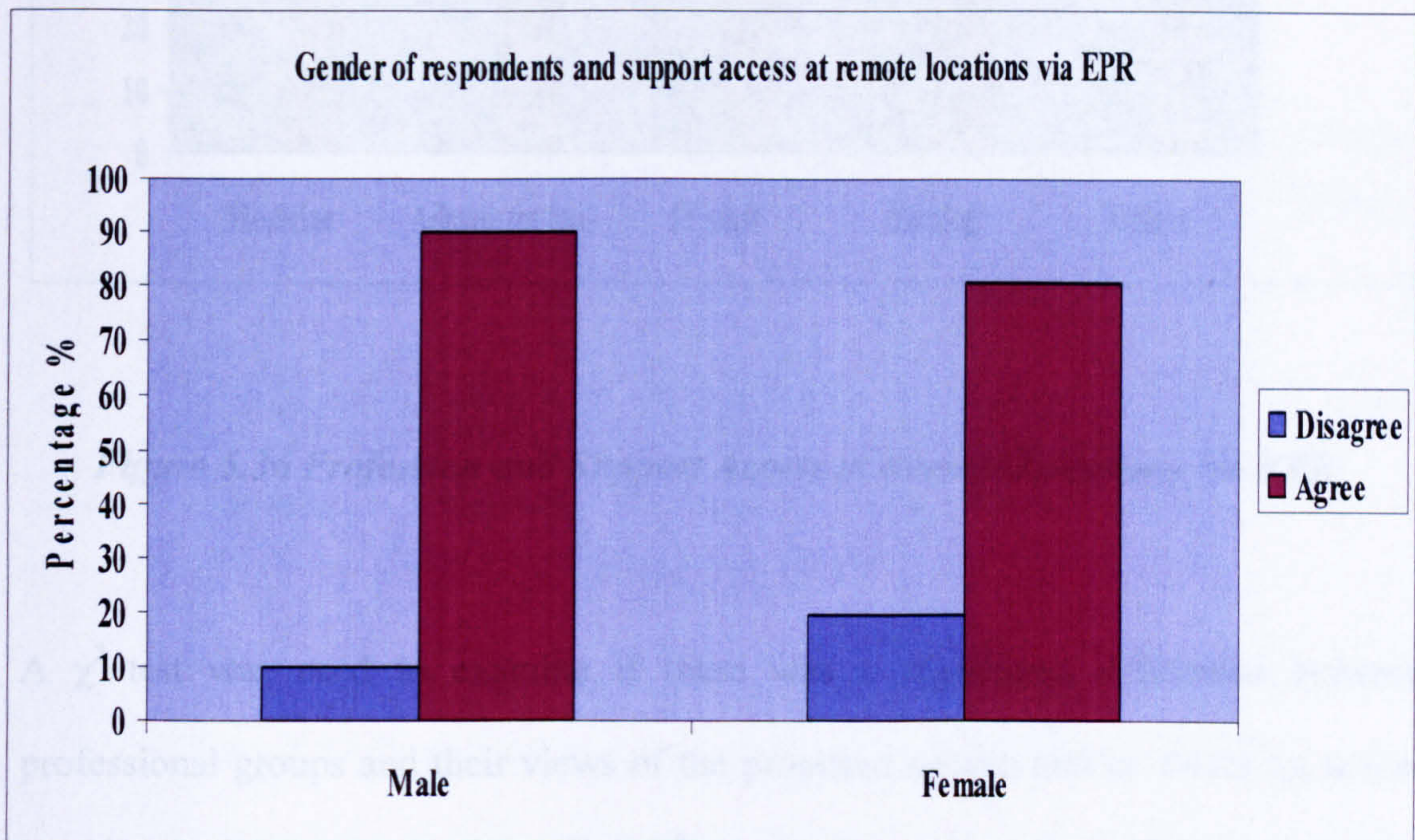


*Figure 5.34 Profession and Reduction of Healthcare Cost via EPR*

#### 5.4.4.2 EPR Support for Access at a Remote Location

An important aspect of patient records is that the information involved should be accessible at a distance. Analysis of the responses indicates (Figure 5.35) that of 139 male respondents from all categories, 125 (89.9%) saw the importance of access to patient records from a distance. Of the 191 female respondents, 154 (80.6%) had similar attitudes towards the system which would be beneficial in remote locations.

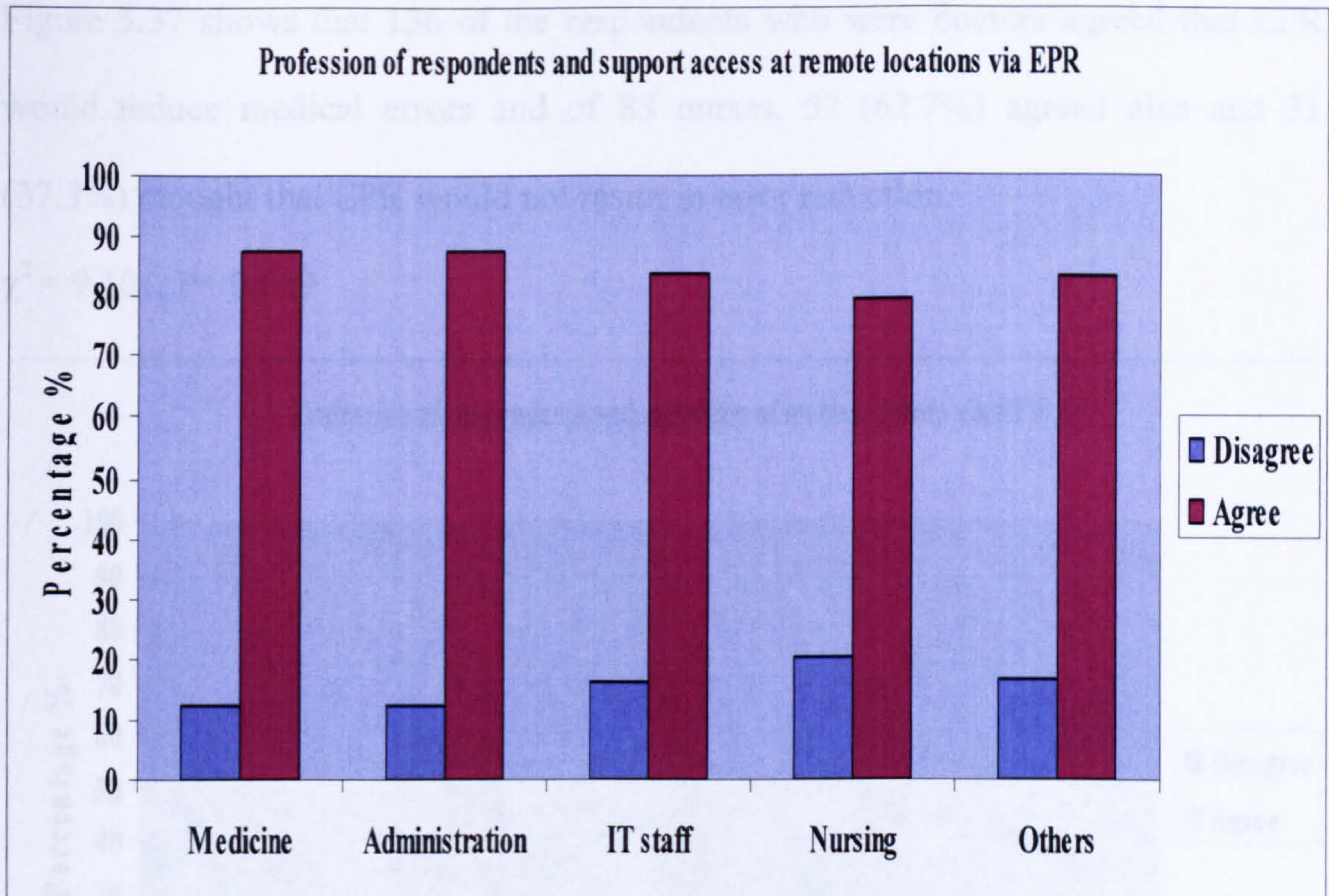
$$\chi^2 = 5.325, P = 0.021$$



**Figure 5.35 Gender and Support Access at Remote Locations via EPR**

The respondents were asked about patient records at a distance and Figure 5.36 reveals that of 136 doctors, 119 (87.5%) agreed as to the importance of access to patient records at a distance. Of the 83 nurses, 66 (79.5%) identified the importance of access to patients records in different locations.

$$\chi^2 = 2.791, P = 0.593$$



**Figure 5.36 Profession and Support Access at Remote Locations via EPR**

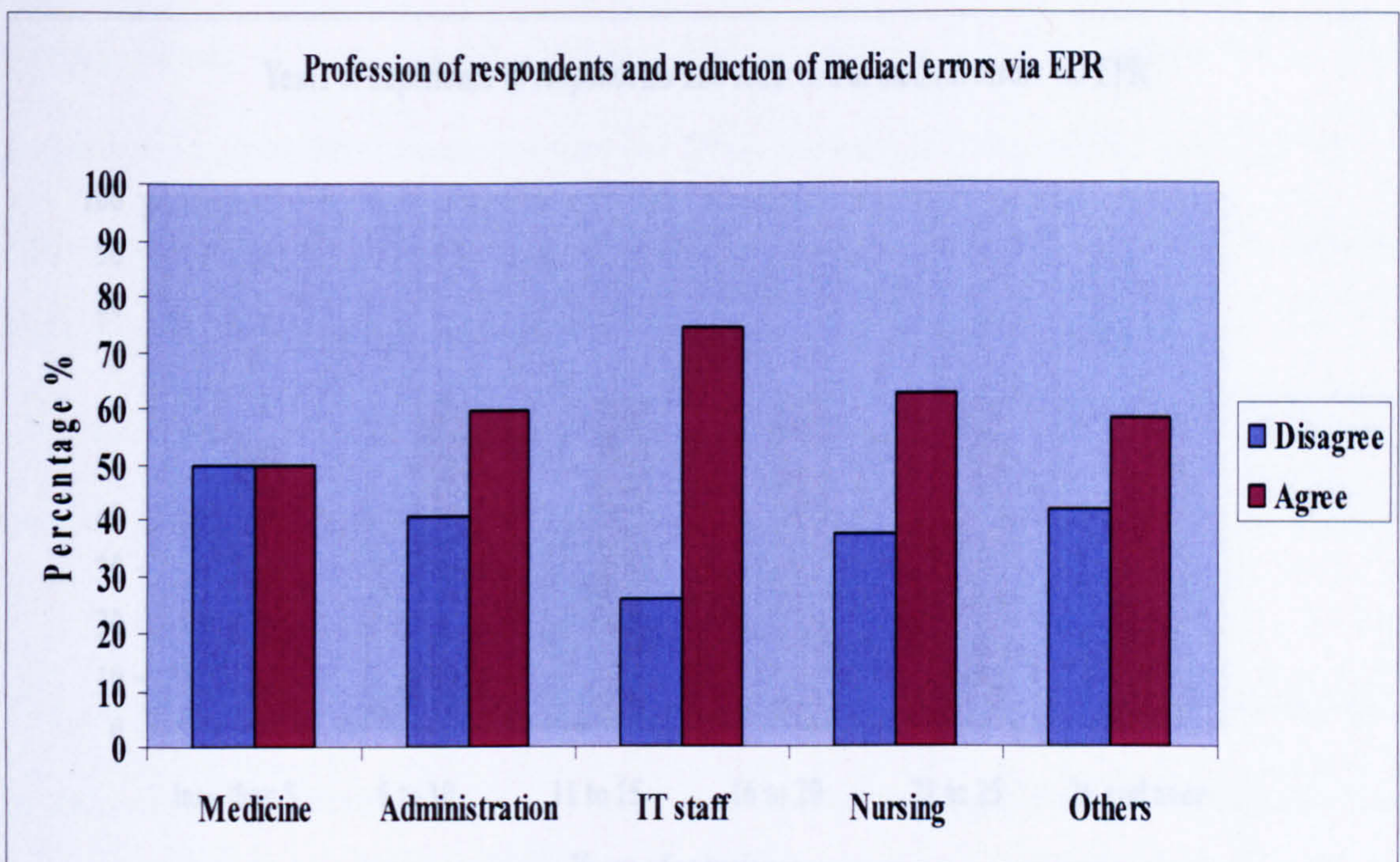
A  $\chi^2$  test was used to examine if there was a significant difference between professional groups and their views of the proposed system and its effect on access to records in remote areas. The  $\chi^2$  result indicated no significant statistical differences between professionals and EPR access in remote locations.

#### **5.4.4.3 EPR will Reduce Medical Errors**

Electronic patient record in relation to reduction of medical errors, the respondents were asked about their perception of and satisfaction with the reduction of medical errors as a result of the proposed system.

Figure 5.37 shows that 136 of the respondents who were doctors agreed that EPR would reduce medical errors and of 83 nurses, 52 (62.7%) agreed also and 31 (37.3%) thought that EPR would not result in error reduction.

$$\chi^2 = 9.101, P = 0.059$$



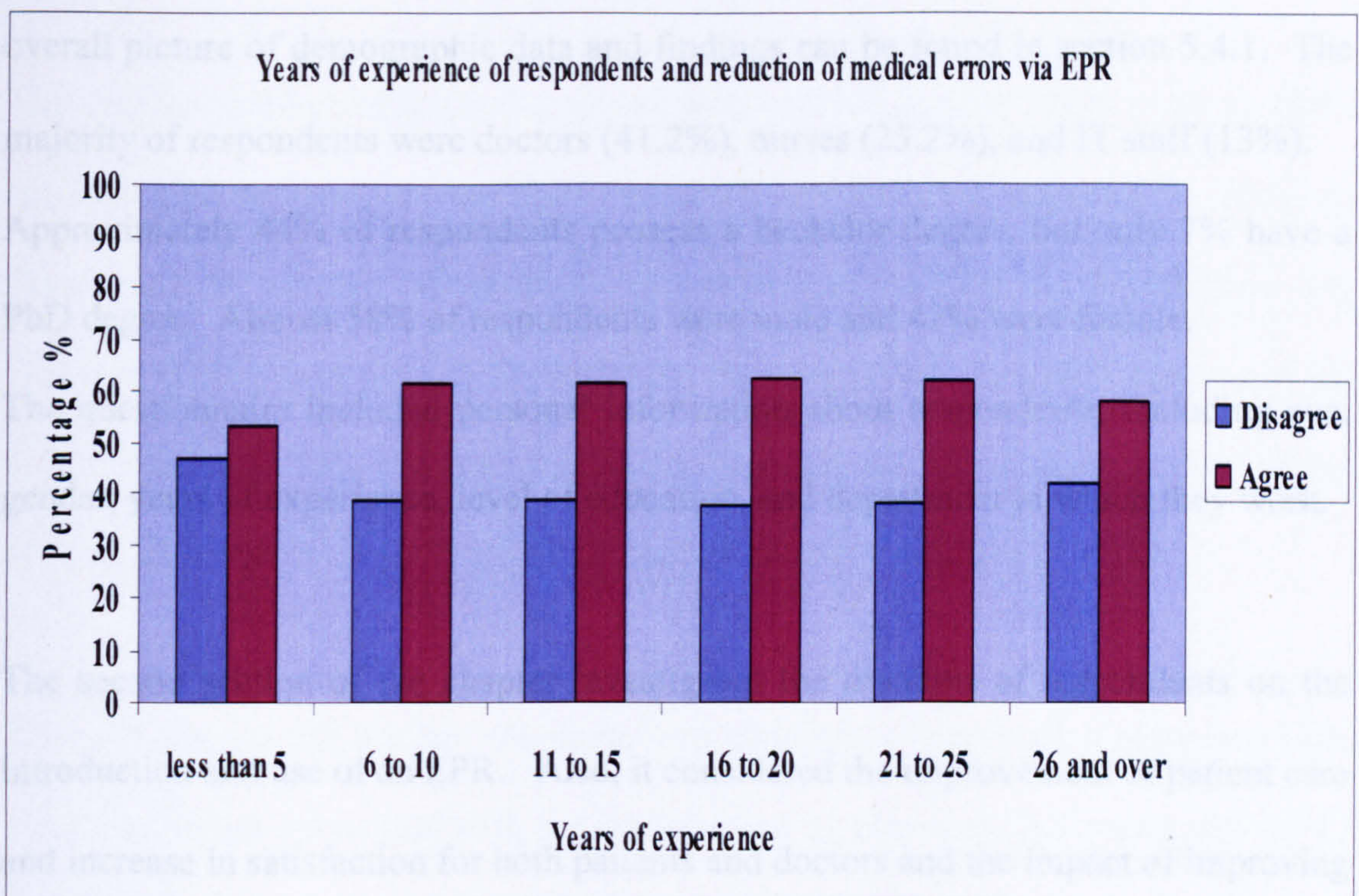
**Figure 5.37 Profession and Reduction of Medical Errors via EPR**

The years of experience for those in all categories of medical services appears to be an important factor in determining their level of awareness regarding the implications of medical errors. Figure 5.38 indicates that of the 128 with less than five years experience, 68 (53.1%) of them expressed their opinion that EPR system would assist in reducing medical errors. Sixty (46.9%) consider that EPR system will not necessarily reduce errors. However, 34 of those with 21-25 years



experience 21 (61.8%) considered that the EPR system would decrease errors whilst 13 (38.2%) expressed a negative view.

$$\chi^2 = 2.312, P = 0.804$$



**Figure 5.38 Hospital Experience Respondents and Reduction of Medical Errors via EPR**

These results indicate that a large proportion of staff in all categories take a positive view of the benefit of an EPR system in reducing errors.

**5.5 Summary**

This chapter has analysed data obtained from questionnaires distributed to 330 staff in four hospitals within the Hamad Medical Corporation. The four sections of this chapter reflect the different parts of the questionnaire. The first part provides an overall picture of demographic data and findings can be found in section 5.4.1. The majority of respondents were doctors (41.2%), nurses (25.2%), and IT staff (13%).

Approximately 44% of respondents possess a bachelor degree, but only 7% have a PhD degree. Almost 58% of respondents were male and 42% were female.

The questionnaire included personal information about respondents, including age, gender, years of experience, level of education, and department in which they work.

The second section of the chapter investigated the opinions of respondents on the introduction and use of an EPR. Also, it considered the improvement of patient care and increase in satisfaction for both patients and doctors and the impact of improving clinical processes. The most important aspects are the aims to decrease medical errors and improve patient care. The importance of training is an essential aspect of introducing EPR and there is a need for using standard terminology.

The third section of the chapter emphasised the need for security and confidentiality when dealing with access to patient records. This is seen as a most important issue in addition to a system to prevent unauthorised access. There is some anxiety that patient records could be erased or corrupted in the process of being computerised.

The last section of this chapter deals with the main benefits of using an EPR system. It focuses on the reduction of healthcare costs and the ease with which information can be quickly obtained from a distance. Most respondents feel there will be the benefit of a reduction in medical errors when the system is in general use.

The data that were collected and analysed will form the basis of Stage 1 (the problem situation unstructured) of the Soft System Methodology (explained in detail in Chapter 7). A number of potential themes related to EPR were identified and explored. These include: access, legibility, training needs, standard format and the importance of security and confidentiality. These themes will reappear in later stages of the Soft Systems model from which change statements can be drawn.

The next chapter will analyse the interviews undertaken to provide a more complete picture of issues associated with the introduction of electronic patient record (EPR) system in HMC hospitals.

**Chapter 6*****Interview Analysis******6.1 Introduction***

This research chapter reports the findings of a survey using a semi-structured interview conducted by telephone and it involved 30 respondents. The researcher described to respondents the importance of contributing their ideas to the study. Aspects described included the details of the proposed EPR system, its aims and objectives, as well as its potential advantages for users. The interviews were conducted with Doctors, Administrators and Nurses from Qatar (HMC) as shown in Table 3.2.

The purpose of this chapter is to present findings from the semi-structured telephone interviews undertaken during the period April to May 2006. The data form the evidence base for the 'problem situation unstructured' in the SSM study that follows in the next chapter. This chapter also presents an analysis of the qualitative data from interviews conducted by telephone within HMC hospital staff in Qatar. The main aim of the interviews was to complement the findings of the questionnaire survey to establish a richer description of the problem situation.

The 30 respondents were selected randomly from staff lists of HMC by using simple stratified sampling. Interviews were conducted at times agreed with the respondents. Organising the time for interviews was difficult, and on some occasions emergencies made the respondents unavailable to keep their appointment so further arrangements

had to be made for more appropriate time. All the interviews were recorded with the respondents' permission, which made data analysis easier.

## ***6.2 Analysis and Importance of the Pilot Study Semi-structured Telephone Interviews***

Analysis of semi-structured telephone interviews for the pilot study involved four doctors and one administrator from HMC, the age range being 32 to 60 years old. There were 10 questions relating to the manual record keeping system and 5 to EPR systems and respondents were invited to add any comments if they wished. By discussing the pilot study with a variety of respondents, the researcher found considerable support for the introduction of EPR in Hamad Medical Corporation (HMC) in Qatar. The great majority of replies were similar in welcoming the introduction of electronic patient records.

As a result of the pilot study, one question was deleted because it proved irrelevant, and a different question was provided to discuss the respondents' willingness to discuss particular topics.

## ***6.3 Difficulties Encountered in the Telephone Interviews***

In one third of the 30 interviews, despite agreements about timing, the respondents were unable to participate because of some unexpected commitment. It was necessary to arrange another time. This considerably delayed the completion of the research.

The use of mobile phone and calling card created other communication problems. During the conversation there were frequent interruptions because the line was disconnected and it was necessary to re-dial to continue the conversation.

In addition, on several occasions there was an echo which made it difficult to hear responses clearly.

Despite these difficulties, the staff were as helpful as they could be and their patience and consideration were appreciated.

#### ***6.4 Reactions to the Existing Manual Patient Records System***

This section of the interview focused on various aspects such as of files legibility, time consumed while searching for files, space, details of medical information for patient, confidentiality and communication among departments and hospitals. The majority of respondents, both medical and administrative staff, had experienced some problems with the existing patient records system. These included misfiling, illegibility, lack of sufficient detail, and lack of transfer of information from one hospital to another and between departments. There was also concern about the confidentiality of the manual system.

##### ***6.4.1 Difficulty in Obtaining Patient Records***

One difficulty in obtaining patient records was misfiling which delayed diagnosis and treatment, as the following examples demonstrate:

*“Misfiling causes a huge problem of delay in the treatment and diagnosis for both patient and doctor”. (Dr M ~Dr~ 6 ', Paragraph 10, 145 characters).*

*“A lot of times we are facing problems because almost 20% of patient records are missing” (Dr N K ~Dr~ 10', Paragraph 10, 104 characters).*

Also the misfiling caused much difficulty and waste of time. One physician commented as follows:

*“The misfiling causes delay in seeing the patient and in providing quick and accurate information” (Dr H 1', Paragraph 14, 147 characters).*

The administrators also experienced difficulty in obtaining patient records quickly and the searches were time consuming. As one remarked

*“When located in a different area it takes time to find the patient record very frequently this is because it is manual” (Mr M NU ~Adm~ 14', Paragraph 10, 144 characters).*

Misfiling was also a problem experienced in certain hospital departments where patient records not available for short stay patients e.g. the maternity unit were considered essential but often difficult to locate. One nurse commented as follows:

*“13,000 deliveries per year means it can be difficult to locate a particular patient record, it can be kept somewhere else where it could be a problem to obtain it” (‘Mrs N ~N~ 22’, Paragraph 10, 387 characters).*

The other difficulty of obtaining patient records was with regard to the time involved to locate the files. Many interviewees had difficulties in this respect. For example one Doctor commented as follows:

*“Missing details or misplaced records and sometimes recent information has not been added to the patient file which is on paper. We have these difficulties here” ( ‘Dr A R ~Dr~ 19’,Paragraph 10, 276 characters).*

Several physicians mentioned similar problems, while nurses pointed out that it was often difficult to locate the required information quickly as it was stored elsewhere after three years. Currently, there have been difficulties in obtaining a complete up-to-date patient file. One nurse explained as follows:

*“They are not bringing the files to us, they are sending by fax specific data only, notes, progress notes or lab results. Because of the incomplete information provided time is wasted and the treatment is dangerously delayed” (‘Mrs T ~N~ 24’, Paragraph 10, 468 characters).*



Other concerns about the difficulties of obtaining information from patient records included difficulties in accessing manual records in comparison with electronic recording, illegibility, and data in the file not available in chronological order, and delays in obtaining files, One Doctor gave the following example:

*“Most times it is very difficult to find a patient’s file, it could either be wrongly placed or kept at a different clinic” (‘Dr A EZ ~Dr~ 30’, Paragraph 10, 132 characters).*

Another mentioned

*“Even in an emergency there may be a delay of three to four days before the patient’s records could be obtained” (‘Dr M G ~Dr~ 25’, Paragraph 10, 139 characters).*

Concern was also expressed about the problems in medical research when patient records were not readily available because of uneducated and untrained staff.

One Doctor mentioned the difficulty of obtaining patient records which were not combined when more than one department was involved in the treatment. He said

*“There should be only one file fore each hospital patient so that details of treatment in more than one department can be readily available” (‘Dr I AH ~Dr~ 11’, Paragraph 10, 321 characters).*

### 6.4.2 Experiences with Handwriting in the Existing Patient Records System

The interviewees were asked about their experience of handwritten patient records. All revealed that they had experienced problems, usually caused by bad handwriting and spelling. All the doctors mentioned problems with some hand written patient information causing difficulties in treatment and medication. There was sometimes the need for doctors to ask one another what had been written about patients and their treatment. If handwritten instructions are difficult to read they can cause problems and not only delays in treatment. As one doctor remarked

*“I am not encouraging the continuation of handwritten records because we are still facing a lot of problems with that. Imagine if a patient is in a serious condition, it is very hard to read doctors writing to provide the appropriate medicine. 80% of physicians have miserable handwriting” (‘Dr N K ~Dr~ 10’, Paragraph 21, 186 characters).*

Physicians are very busy, and attend more than one clinic; their writing is not always easy to read. As a doctor said

*“I am facing this problem because my handwriting somebody else can not read because I am in a hurry and there are plenty of patients I must see, so I write just a few words and abbreviations that are difficult to read. All doctors have this problem” (‘Dr A R~Dr~ 19’, Paragraph 21, 525 characters).*

Another commented

*“My handwriting is terrible and difficult to read so it is hard for another doctor to continue the patient’s treatment and procedures”*  
*(‘Dr A EZ ~Dr~ 30’, Paragraph 21, 243 characters).*

One administrator said

*“The bad handwriting causes a lot of problems for the staff of the transcription department when they start to write an abstract of the physician’s notes, we have a temporary solution by asking the physician to write in capital letters”* (*‘Mr M NU ~Adm~ 14’, Paragraph 21, 156 characters*).

Other administrators also expressed concern about the correct interpretation of many handwritten patient records and one interviewee remarked

*“When the handwriting is not clear to read a letter will be sent to the physician, requiring him or her to improve their legibility”* (*‘Mrs EV ~Adm~ 15’, Paragraph 21, 365 characters*).

Nursing staff were asked their opinion about handwritten patient records and interviewees commented that

*“Because both notes and signatures are often illegible it becomes necessary to spend valuable time trying to discover who wrote the unclear report and this is a frequent occurrence” (‘Mrs N ~N~ 22’, Paragraph 21, 112 characters).*

*“Physicians bad handwriting causes problems for other staff and today I have seven prescriptions returned by the pharmacy department because the Staff there were unable to read the handwriting. This caused a delay in the patients receiving their medication. There should be a good hand writing course to improve this situation” (‘Mrs WE ~N~ 21’, Paragraph 21, 542 characters).*

All 30 staff who were interviewed had experienced problems in using medical records (MR) system because of reports having been badly written.

### ***6.4.3 Transfer of the Manual Information from one Hospital to An Other***

Respondents at all four hospitals in the Hamad Medical Corporation (HMC) group were questioned about their experiences of obtaining or transferring information of patients and their treatments. The majority of respondents were dissatisfied with the present manual transfer of information between one hospital and another which is costly, slow because of lack of transport and also leads to frequent misfiling of information, sometimes during transfer from one hospital to another. There was

concern too that the patient records when transferred to other hospitals were incomplete.

Several physicians gave examples of this.

*“It is not satisfactory because we suffer from a lack of information when only parts of the records are available and these do not necessarily contain all the information required” (‘Dr A EZ ~Dr~ 30’, Paragraph 24, 213 characters).*

Other doctors expressed concern about the availability of information when patients were transferred from one hospital to another. As one said

*“It is very, very bad. I do not like the way files are handled and often information is missing because only one page is sent when patients transfer from Hamad to Al-Amal hospitals” (‘Dr I AH ~Dr~ 11’, Paragraph 25, 402 characters).*

*“In transferring from one hospital to another data can be lost and sometimes the information is sent to the wrong department instead of the requested one” (‘Dr AJ ~Dr~ 2’, Paragraph 26, 201 characters).*

Another surgeon said

*“I am not satisfied with the manual patient record system because I cover the three hospitals and files are often lost during the transfer of patients from one to another and it can be harmful to those who have had surgery” (‘Dr M ~Dr~ 6’, Paragraph 24, 181 characters).*

A gynaecologist had experienced problems in obtaining patients records from other hospitals and said

*“I had a pregnant patient with a cardiac problem and I had difficulty to obtain her file which was at the Women’s Hospital, what was received was different from what was requested and it took a long time to obtain her file and this affected the patient” (‘Dr M S ~Dr~ 26’, Paragraph 25, 470 characters).*

Misfiling in the transfer from one hospital to another was mentioned by several interviewees. Also administrators were unhappy about the present manual system of transferring patient records which can be misplaced. In addition some information may be incomplete.

*“It is very difficult to transfer a whole file, sometimes in an emergency the physician needs to see the patients entire record which may not be readily available in these circumstances” (‘Mr M NU ~Adm~ 14’, Paragraph 24, 156 characters).*

An important aspect of confidentiality is the way in which patient files are transferred from one hospital to another and this should be the responsibility of authorised staff. There was unanimous agreement about this with all administrators concerned.

There was also general agreement that patients should not have more than one appointment on the same day at more than one hospital. As one administrator pointed out

*“It is very difficult to access patient records when there are appointments at different hospitals or clinics on the same day. Also information can be lost in the transfers when there are more than one”*

*(‘Mrs E D~Adm~ 13’, paragraph 24, 158 characters).*

One administrator saw the value of faxing information to other hospitals which would prevent the loss of documents. She also mentioned that at one hospital there is a form on which ticks can indicate the information required from a patient’s file.

Nurses also expressed concern about the difficulties of transferring information from one hospital to another. In addition there was concern about faxing patients’ information when requested and sometimes this could be time consuming. As one nurse commented

*“This manual system wastes our time and paper” (‘Mrs MAR ~N~ 20’, Paragraph 24, 251 characters).*

At all levels of those interviewed there was general agreement that this existing manual system caused many difficulties in the transfer of information from one hospital to another. Misfiling during the movement of documents from one location to another even in the same hospital has caused problems.

#### ***6.4.4 Lack of Confidentiality in the Existing Manual System***

Every one of the 30 interviewees expressed their concern about the lack of confidentiality in the existing manual system. There was a lack of acceptable standards in the way patient records were compiled, stored and used because rules and procedures were frequently disregarded.

Every interviewee had experienced problems caused by the present system in which any unauthorised staff could have access to the complete patient files.

There is no security system to control access to patient files and no restriction on copying details. One doctor laughed when asked what the confidentiality problems are in the present system. The reply was

*“What confidentiality? There is no confidence in the security of the manual patient information. Every one who knows English can read the file which can cause massive problems later on” (‘Dr M ~Dr~ 6’, paragraph 26, 219 characters).*



Another doctor remarked

*“It is not a secure system; anyone can take a file from the shelf and read it. There is no privacy as physicians it supposed to be our responsibility to maintain a high degree of security for all patient records but, instead of this being a secure place, it is just “an open book” (‘Dr M S ~Dr~ 26’, paragraph 27, 194 characters).*

Another doctor said

*“I actually had the experience a few years ago, when there were complaints about a doctor and the patient concerned went to the files and changed some words in the notes” (‘Dr N K ~Dr~ 10’, paragraph 26, 335 characters)*

The administrators were also aware of a lack of confidentiality when manual patient records were used. It would be easy for various people to have access to the patients’ documents and some could easily be lost. One supervisor who was responsible for patient records commented that

*“The manual system is not secure. Honestly we are suffering from this insecure filing system” (‘Mrs H A ~Adm~ 28’, paragraph 26, 129 characters).*

In addition, other administrators said that

*“We try to provide a high level of confidentiality, we have a policy but no instructions on how it can be carried out successfully, especially when some staff do not follow the policy required” (‘Mr MAJ ~Adm~ 29’, paragraph 26, 255 characters).*

There are problems even when staff try to follow the rules, sometimes even with the use of the fax documents are lost because they are sent to the wrong number which causes lack of confidentiality.

Nurses, too, were worried about lack of confidentiality when using manual patient records which could be seen by others while being delivered. One nurse pointed out that

*“There is no security in using manual patient records despite our efforts to ensure confidentiality. It is necessary to educate people to understand the importance of confidentiality” (‘Mrs N ~N~ 22’, paragraph 26, 561 characters).*

Another nurse had experience of physicians disregarding confidentiality. She pointed out

*“Doctors when discussing patient’s cases should use the conference room to preserve the confidentiality of the information, however, they often discuss in the open ward area” (‘Mrs T ~N~ 24’, paragraph 26, 250 characters).*

All nurses emphasised that whoever was using the manual file was responsible for its security because patient files are transferred to many different departments, each of which has a responsibility for its safe keeping and confidentiality.

## ***6.5 Attitudes Towards the Introduction of an Electronic Patient Record (EPR) System***

### ***6.5.1 Advantages of EPR System***

After considering the various problems experienced with manual patient record systems, the possible introduction of Electronic Patient Record (EPR) as soon as possible was welcomed by all the interviewees. The questions aimed to establish details of awareness and perception of EPR systems and how they could best be introduced for Hamad Medical Corporation (HMC) hospitals in Qatar.

The majority of interviewees had some knowledge of EPR systems which they had encountered elsewhere, and some referred to favourable reviews of systems in medical journals.

Interviewees were asked to describe the advantages they anticipated in introducing an EPR system for HMC.

The majority expressed the view that EPR would improve patient care because of the easy accessibility, security, time saving, speed, accuracy, compactness, absence of duplication, legibility, easy and quick communication, and eventual cost saving.

All the interviewees agreed that an EPR system with its easy access would be better than manual record keeping. One doctor said

*“I have not had experience of Electronic Patient Records System but where they are in use I have seen how easy it is to access information”*  
*(‘Dr MR ~Dr~ 9’, paragraph 31, 128 characters).*

An administrator focused on the importance of accessibility of information and said

*“With EPR it is so easy to obtain information quickly from any part of the system in comparison with a manual system”* (*‘Mr MAJ ~Adm~ 29’, paragraph 32, 116 characters*).

Interviewees from all departments welcomed the security of EPR and its ability to sustain confidentiality. Pin codes and passwords would ensure that confidential information is available only to those who are authorised. As one doctor remarked

*“Everyone has his or her special user name and password and no one else can access some information without specific authorisation”* (*‘Dr A R ~Dr~ 19’, paragraph 33, 133 characters*).

Almost every interviewee emphasised the importance of EPR because of time saving involved. As one doctor noted

*“Time saving can be life saving for example with medicine required urgently which can be obtained readily by EPR”* (*‘Dr S ~Dr~ 4’, paragraph 32, 149 characters*).

Another doctor remarked

*“All the information about the patient is immediately available, there is no delay as there would be with manual records” (‘Dr B A ~Dr~ 8’, paragraph 31, 49 characters).*

The speed with which an EPR system provides information about patients and their previous treatment was appreciated by all interviewees.

To obtain patient information instantaneously on a screen is one of the most important developments in patient care, because its speed can be life saving.

The information provided by an EPR is important because the information is all in one place and can be added to and accessed easily. One nurse said

*“All the patient data is accurate and detailed, in the right format for use in research, and up to date” (‘Mrs N ~N~ 22’, paragraph 31, 258 characters).*

Electronic records are space saving which is of great importance. This benefit was appreciated by many interviewees.

The advantages of EPR include the lack of duplication. In some instances manual patient records were duplicated, but this is not necessary in an EPR System.

The many examples of problems arising from hand written records were frequently mentioned by interviewees. They caused many difficulties and delays in providing

medication or treatment. There was general agreement that this was something which only EPR could prevent because it would always be legible. One doctor remarked that

*“All patient data will be clear, no more struggling with the hand writing” (‘Dr A EZ ~Dr~ 30’, paragraph 31, 63 characters).*

*“Computers will solve the terrible hand writing problem, print is so clear, especially for medical reports” (‘Dr M G ~Dr~ 25’, paragraph 31, 113 characters).*

Another advantage of introducing EPR system is ease of communication; more than one physician can search for the same patient data simultaneously which would be an impossibility with manual files. There is also the possibility of obtaining patient information at a distance, which is both time and money saving.

### ***6.5.2 Disadvantages and Barriers of Introducing an EPR System***

In discussing the possibility of introducing an EPR system, interviewees were aware of various problems and possible barriers which might be involved during their use but the problems were fewer than the advantages. The interviewees in general were anxious about identified problems in adopting a new system, but their opinions changed when they related to the benefits in using EPR system in other countries. In comparison with manual patient records, an electronic system would be so much quicker to use and the records easier to amend when necessary.

The difficulties they envisaged included the damage which a possible virus might cause, power or computer failure, and the overall cost including training. There was

a general anxiety about the training required and how the system would work during this time and concern about how long this introductory process would take. Concern was expressed about the possibility of unauthorised use and misuse of the system as well as accidental erasure of data. There was anxiety also about the provision of sufficient equipment.

All interviewees were anxious about the possible loss of data resulting from a virus.

As one doctor stated

*“There is a virus ‘huger’ which can be introduced to a computer and destroy all the data, like the money stolen from a bank’s ATM machine” (‘Dr AL ~Dr~ 3’, paragraph 33, 142 characters).*

Another remarked that viruses were a problem, but it is possible to use a computer ‘back up’ system to prevent loss of data.

One administrator emphasised the importance of having an electronic ‘back up’ for patient information to prevent accidental erasure and preserve confidentiality.

Power failure was another cause for concern mentioned by most interviewees and the possible loss of data. One doctor mentioned a recent experience when there was

*“A breakdown of electricity at Hamad General Hospital affecting only the left side of a ward and it was not repaired for 6 hours and the computers were also affected. There was an emergency generator but*

*this provided power for lighting only and not for computers” (‘Dr A R ~Dr~ 19’, paragraph 35, 313 characters).*

A nurse pointed out that

*“Any new system will have to consider emergency procedures for computers if there is a power cut” (‘Mrs N ~N~ 22’, paragraph 33, 84 characters).*

A few interviewees saw the overall cost of a computerised system as being a problem, but the majority thought this was not a problem for Qatar.

### **6.5.3 Training**

Planning training was seen as a problem because only a minority of hospital staff have experience of using computers of any kind. Concern was expressed about the length of time involved in training and whether it would be directly relevant to their different needs. One doctor said

*“You need to train the staff how to deal with the new system, you need a lot of expertise in EPR to train the different staff concerned” (‘Dr N ~Dr~ 5’, paragraph 33, 130 characters).*

All interviewees saw the importance of training to ensure the new system worked effectively. There was general concern about how much time would be required for training because most were so busy. One surgeon said



*“How long will the training take? We are very busy with both clinics and operations” (‘Dr M ~Dr~ 6’, paragraph 37, 245 characters).*

One interviewee saw possible difficulty in training older staff and commented

*“They do not like computers; they prefer the old fashioned system” (‘Mr D ~Adm~ 27’, paragraph 34, 150 characters).*

Other administrators disagreed and argued that he had done a survey of older people’s reactions to the use of computers and discovered they were keen to use such facilities.

The interviews revealed anxiety about lack of knowledge of the use of EPR system and computers in general and the dangers of lack of confidentiality.

Another disadvantage of EPR system causing concern frequently expressed was about records. As one interviewee noted

*“If there is no control from authorised persons the system will be abused” (‘Mr M N ~Adm~ 12’, paragraph 33, 224 characters).*

The possibility of accidental erasure of data causes problems, but now most computers have a back up system which is able to reinstate the deleted or corrupted data.

## ***6.6 The Difficult Issue of Changing from Manual to Electronic Patient Record***

Changes to any system create some anxiety and every effort was made to ensure that the users of the proposed patient records system had an opportunity to express their anxieties and to be reassured of the benefits. It was important that all concerned had the opportunity to discuss their particular concerns, especially that patients should benefit from the proposed change and the difficulties which had increased with manual records. Careful preparation was necessary to reassure users that the new system would include training in all aspects of its use. The difficulties mentioned by the interviews in changing from manual to electronic systems included costs, manpower, training, data protection, time, culture and acceptance of the new system.

Interviewees expressed concern about the high cost of installing an EPR system from experience elsewhere, and concern in medical journals, though they thought the costs once it was in use would be less than manual systems.

One doctor supported this view and noted

*“The cost is going to be high in the beginning but we are not worrying about cost, that is the concern of administrators” (‘Dr S ~Dr~ 4’, paragraph 38, 108 characters).*

In general, all the interviewees expressed concern about the time taken in converting from manual to electronic records and the need for a comprehensive course on how to obtain and use the patient data with separate courses where necessary. One

surgeon when asked about the difficulties anticipated in changing from manual to electronic systems was very optimistic and supported the change

*“Most surgeons would have some knowledge of the use of computers but older members may find some difficulty in using an electronic system. I feel sure this will be overcome with practice and I think it would be very worth while” (‘Dr N K ~Dr~ 10’, paragraph 39, 302 characters).*

A nurse was less optimistic and said that

*“I think a training period will be necessary for staff to gain good results, not just a notice saying that the change will take place” (‘Mrs N ~N~ 22’, paragraph 37, 332 characters).*

Some of the interviewees were worried about the time and difficulty of changing from manual records to EPR system and that at first it might take longer than using paper records.

Time is so important for physicians and the main reason for introducing an electronic system is the saving of time for all who use medical records. All the physicians interviewed were anxious to avoid anything that might involve more time than the existing system. As one remarked

*“Maybe it will take time to gather the data and information but it will be essential for the success of the proposed system” (‘Dr M G ~Dr~ 25’, paragraph 37, 128 characters).*

Another physician was anxious about the length of time it would take to transfer the data in the existing record system to a computerised system, but new patients could be added more quickly electronically. This was supported by an administrator who said

*“The proposed system may be ease for new patient records but transferring the existing records will take a long time because some involve more than one volume, some patients records extend to more than 25 years and require three or four volumes” (‘Mr MAJ ~Adm~ 29’, paragraph 38, 277 characters).*

Various interviewees concluded their remarks by saying that it will be quite difficult for staff in all areas to change from manual to electronic patient records because they regard hand written records as part of their culture. Acceptance of the new system varies amongst the interviewees from enthusiasm to anxiety.

Although, the great majority of interviewees expressed some concern about the difficulties of changing the patient records system, one was most enthusiastic about the proposed change highlighting all the benefits which would result from an electronic system. As he said

*“Every system takes time to become familiar but I am sure that after a short period of time they will find the electronic system is much better and faster. In addition to saving time the information can be available at any place in the system and also can link the system to the pharmacy department to check the availability of medication. I prefer electronic records” (‘Dr A R ~Dr~ 19’, paragraph 39, 26 characters).*

### ***6.7 Summary***

This chapter has reviewed the findings of telephone semi-structured interview analysis.

Interviewees revealed a lack of knowledge about Electronic an Patient Records (EPR) System and the necessity of a well organised training scheme before introducing the new electronic system.

The interview results reveal the need for clear information about the introduction of an EPR system and how it will affect the variety of staff involved.

## *Chapter 7*

### *Systems Intervention*

#### *7.1 Introduction*

In this study the Soft System Methodology (SSM) developed by Checkland has been applied to assist in the analysis of the data obtained and to develop a conceptual model of the current patient records system at HMC. Beginning with the identification of problem content and elements of the systems relevant to their solution, SSM has been used to analyse the problem and to develop a model of an effective system. In Chapter 3 the definitions of the hard and soft systems of resolving problems were stated. The analysis of quantitative data was assisted by using a hard system approach (the questionnaire), which provided information such as the optimum numbers of the medical record users satisfied to improve patient care. Although this is an important factor it is only one aspect of a larger picture which requires a holistic approach of a complex system. In the case of this study the use of a soft system methodology was seen to be the most appropriate. There are seven stages in SSM analysis from the initial examination of the problem to formulating the necessary steps to resolve it.

In this chapter, the application of SSM in this study is presented in its logical sequence from Stage 1 to Stage 4 as outlined in Chapter 3, P 89-92 Research Methods.

**7.2 SSM Stage One: Analysing the Current Problem Situation**

The findings reported in Chapters 5 and 6 are used here to inform stage one of the Soft System Methodology (SSM): the questionnaire survey measured the attitudes of respondents toward the introduction of EPR and their opinions, also the semi-structured telephone interviews have highlighted the current situation and the difficulties of the manual medical records system at the Department of Medical Records at Hamad Medical Corporation in the State of Qatar. This study describes the problem situation on the basis of the analysis undertaken in Chapters 5 and 6 and this includes analysis of the responses to the questionnaires and to the interviews which revealed a set of problem issues. To analyse the unstructured problem situation in detail, perspectives of the decision makers, i.e. those who influence the organisation of the medical records system (doctors, nurses, and other hospital staff who use medical records), were investigated; and are represented in Figure 7.1 to show the research problem situation in a diagrammatic form.

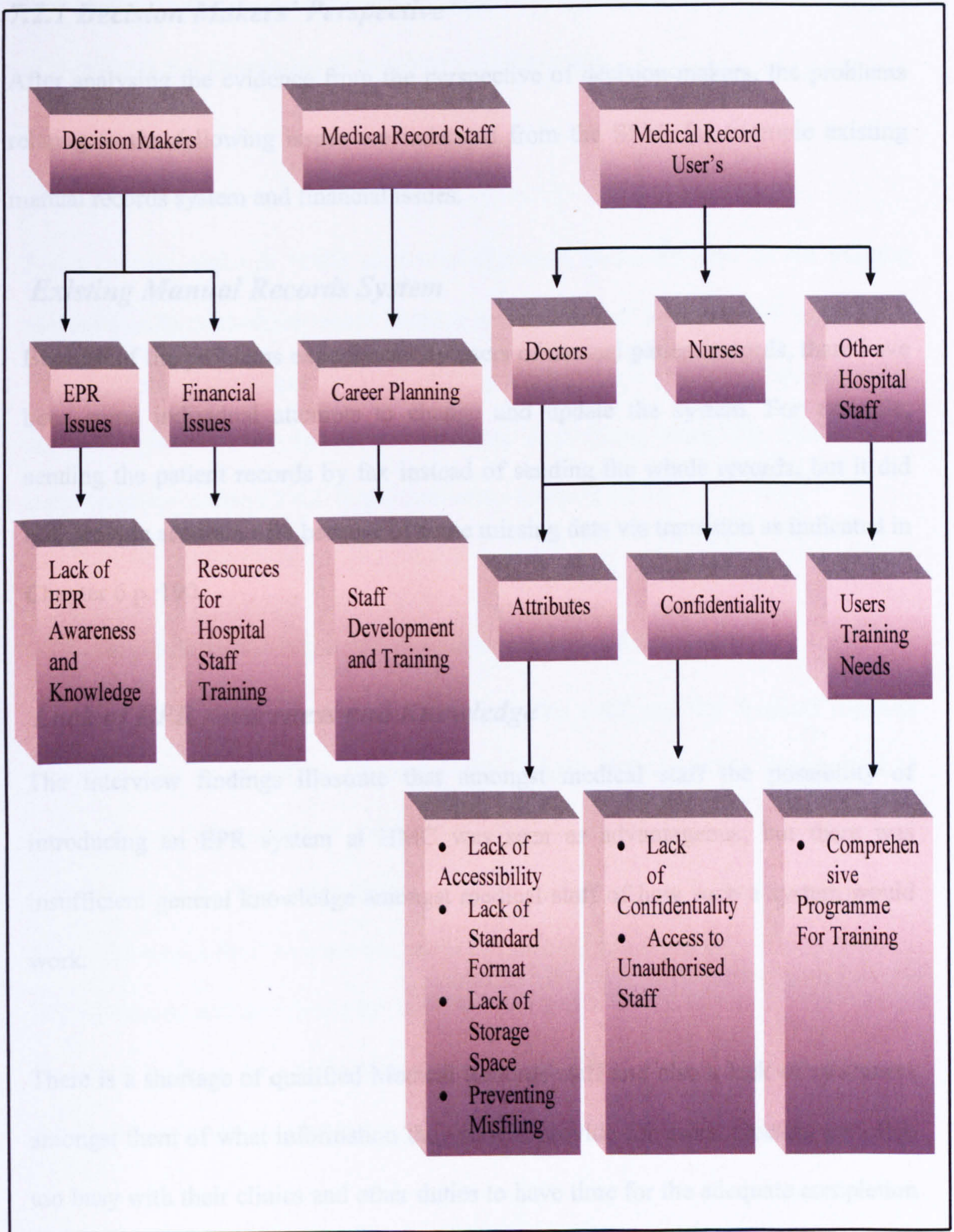


Figure 7.1 Research Problem Situation (Stage 1)



### ***7.2.1 Decision Makers' Perspective***

After analysing the evidence from the perspective of decision-makers, the problems relating to the following issues are indicated from the SSM, for example existing manual records system and financial issues.

#### ***Existing Manual Records System***

Because of the problems experienced by users of manual patient records, there have been some individual attempts to change and update the system. For example, sending the patient records by fax instead of sending the whole records, but it did not, provide accurate data because of some missing data via transition as indicated in Chapter 6 p. 190.

#### ***Lack of EPR Awareness and Knowledge***

The interview findings illustrate that amongst medical staff the possibility of introducing an EPR system at HMC was seen as advantageous, but there was insufficient general knowledge amongst medical staff of how such a system would work.

There is a shortage of qualified Medical Records staff and also a lack of awareness amongst them of what information they should provide for users. Doctors are often too busy with their clinics and other duties to have time for the adequate completion of patient records. Anwar and Ansari (2002) saw the need for continuing professional development (CPD) to increase awareness of new techniques such as EPR which would improve the standard of patient care. They noted that it was

encouraging to see the development of workshops and courses to improve the level of awareness and knowledge of healthcare professionals.

### ***Financial Issues***

Some concern amongst HMC staff was expressed about the cost of the existing manual system of medical record keeping and the lack of awareness of the costs of EPR systems. Expenditure for staff training in addition to providing equipment for an EPR system could be seen to present a problem, from the evidence of questionnaires (section 5.4.2.5) and interviews (section 6.5.2).

### ***7.2.2 Administrative Issues in Relation to Patient Records***

In Qatar many professional sectors lack qualified staff and the Medical Records Department is no exception. Analysis of telephone interview data (section 6.4.1) indicated that 50% (n=30) of respondents were concerned about the current lack of experienced staff. This could be due to the fact that there are currently no qualified Medical Records Staff to meet the needs of users working at HMC. There is also a lack of training and no scheme for staff development.

Chapter 6 findings indicated the importance of qualified Medical Records Staff and the need for appropriate training to run the system efficiently and effectively.

### ***7.2.3 Perspective of the Medical Records Users***

The issues affecting Medical Records users' perspectives include the MR attributes, confidentiality and their own training needs.

- ***Availability of Attributes***

There is evidence from interviews that the Hamad Medical Record (HMR) lacks the following attributes, easy access, standard format, storage space and prevention of misfiling. These factors are considered in more detail below.

- 1. Accessibility***

The interview responses (6.4.1) indicated concern about the difficulty of obtaining data from Medical Records and the prolonged time involved in their retrieval. It is essential to provide good access for Medical Records throughout HMC at remote locations for the retrieval of information to meet the needs and satisfaction of all authorised medical staff at all times.

- 2. Storage Space***

Respondents also indicated some anxiety about the lack of sufficient storage space to enable all records to be readily accessible in emergencies. Some respondents also pointed out that the storage areas currently used for records of patients who had not been treated during the past 2 years were not sited in the hospital. Their files were stored in a building some distance from the hospital and this lack of availability of medical records had caused problems for the medical staff in dealing with emergency situations.

### **3. *Standard Format***

The findings of telephone interviews indicate concern about the need for a standard format to meet the necessity of improve patient care in the Medical Records Department at HMC. It is important to establish a standard format for medical records (Demuynck and De Decker, 2005). The lack of a standard format has caused much anxiety, which was evident from the responses from the findings of interviews (section 6.4.2) carried out; the vast amounts of illegible hand writing contained in the Medical Records also caused serious problems to users. This may be due to a lack of awareness of the importance of a maintaining a standard of legibility for all to read and lack of awareness of the widespread use of medical records in HMC.

### **4. *Mis-filing***

The analysis of the interview (100 %, n= 30) respondents (section 6.4.1) indicated that there is general concern about the problems caused by mis-filing, especially in emergency situations. The unstructured nature of the present medical record system caused much anxiety to respondents who were unable to locate relevant information quickly. The problems of mis-filed and unobtainable records were expressed by some of the respondents and they attributed the difficulties to the employment of unqualified Medical Records Staff.

These problems may also arise as a result of a lack of awareness of the importance of patient documents and how to prevent mis-filing.

- ***Confidentiality***

This issue is identified in the literature to be one of the most important aspects of medical records management. (Tingle, 2002., Feldbaum & Dick 1997; Schuman, 2004). The findings from both questionnaires (section 5.4.3) and interviews (section 6.5.1) endorse this documented finding and show that the main aim for doctors and nurses at HMC is to have a quality service. Only if this is the case will the users have confidence that an electronic patient records system would be secure and will safeguard confidentiality. To achieve this objective the system needs to be developed to give access to authorised users only as indicate by interviewees. There was a universal agreement that confidentiality was the most essential aspect of any patient record system. The existing manual system was seen by respondents of all categories to be inadequate in providing the necessary confidentiality for all patient records. Security of patient records was seen to be of the greatest importance to protect the information, because respondents had experience of a lack of care in this respect with the existing system of patient record keeping.

- ***Training Requirements***

Both questionnaire (section 5.4.2.6) and interview (section 6.5.3) respondents emphasised training as one of the most important factors. Training in the use of EPR is seen as one of the main factors in establishing a satisfactory system. An important part of a well-developed strategic plan to introduce an EPR system is a training system for all staff who are involved with creating or using patient records. (Porcheret et al, 2004; Cheung et al, 2005). The interviews indicated a main aim would be to provide

appropriate and comprehensive training for staff to achieve maximum satisfaction in using the new system.

The willingness of staff to be interviewed can be attributed to the fact that the respondents were anxious about lack of training in the use of existing manual medical records system.

### ***7.3 SSM Stage Two: The Problem Situation Expressed (Structured)***

By analysing the problem situation a rich picture (RP) has been built up of the existing patient records system. The RP makes possible the selection of particular viewpoints and the choice of a relevant system for the next stage. To assist this it is necessary to consider the problem content and how to improve it. Checkland (1981, p.165) recommended that the RP needs to include aspects of structure, processes, and matters such as complaints, criticisms and feelings etc. to give a comprehensive picture of the prevailing climate. Another important feature is that it should include the relevant facts about the organisation being analysed. Lewis (1994, p.56-72), argues that the RP enables relevant facts to contribute to useful discussions more effectively than other methods such as the use of Texts, Tables or Figures.

Additionally, the holistic approach taken presents key information in the form of an illustration to highlight particular areas of interest. It has been used where appropriate in this research, e.g. to present facts, attitudes and situations related to the use of medical records in HMC.

Elliott and Starkings (1998, p.132) stated that a RP should identify issues and conflicts of interest which are important and relate to the creation of an information

system which is both efficient and effective. Its use is to encourage analysis in addition to exploring problems. In addition, the RP revealed the interests and responsibilities of those involved in the system, as well as encouraging discussion about areas where the responsibility is not clearly stated (Skelton, 2000).

Using SSM, problems were identified and structured, beginning with the identification of problem content and elements of the systems relevant to their solution.

### ***7.3.1 The Rich Picture (RP) Expression***

The rich picture (RP) illustrates the holistic vision of the system of interest in pictorial form (see Figure 7.2). The data collected this study through questionnaire and telephone interviews are reflected in this diagrammatic representation and the problem situation summarised to help its understanding. The main internal actors in the system are represented as human figures, and the system focuses on lack of knowledge, confidentiality, strategic policy documents, and financial support for training, in addition to lack of co-operation between hospital clinical staff and a lack of qualified medical record staff as shown by X in Figure 7.2. 'Think' bubbles indicate the major concerns and scissors indicate some form of conflict.

The exterior environments that affect the problem situation, such as the influence of external perspectives are represented by big eyes. These environments include the Ministry of Health, Hamad Medical Corporation and World Health Organisation (WHO).

The RP shows how the Medical Records users are frustrated by the lack of training in the use of the Medical Records system. However, Medical Records staff themselves are similarly frustrated due to their lack of and or inadequate training and the effect it has on their inability to help users effectively.



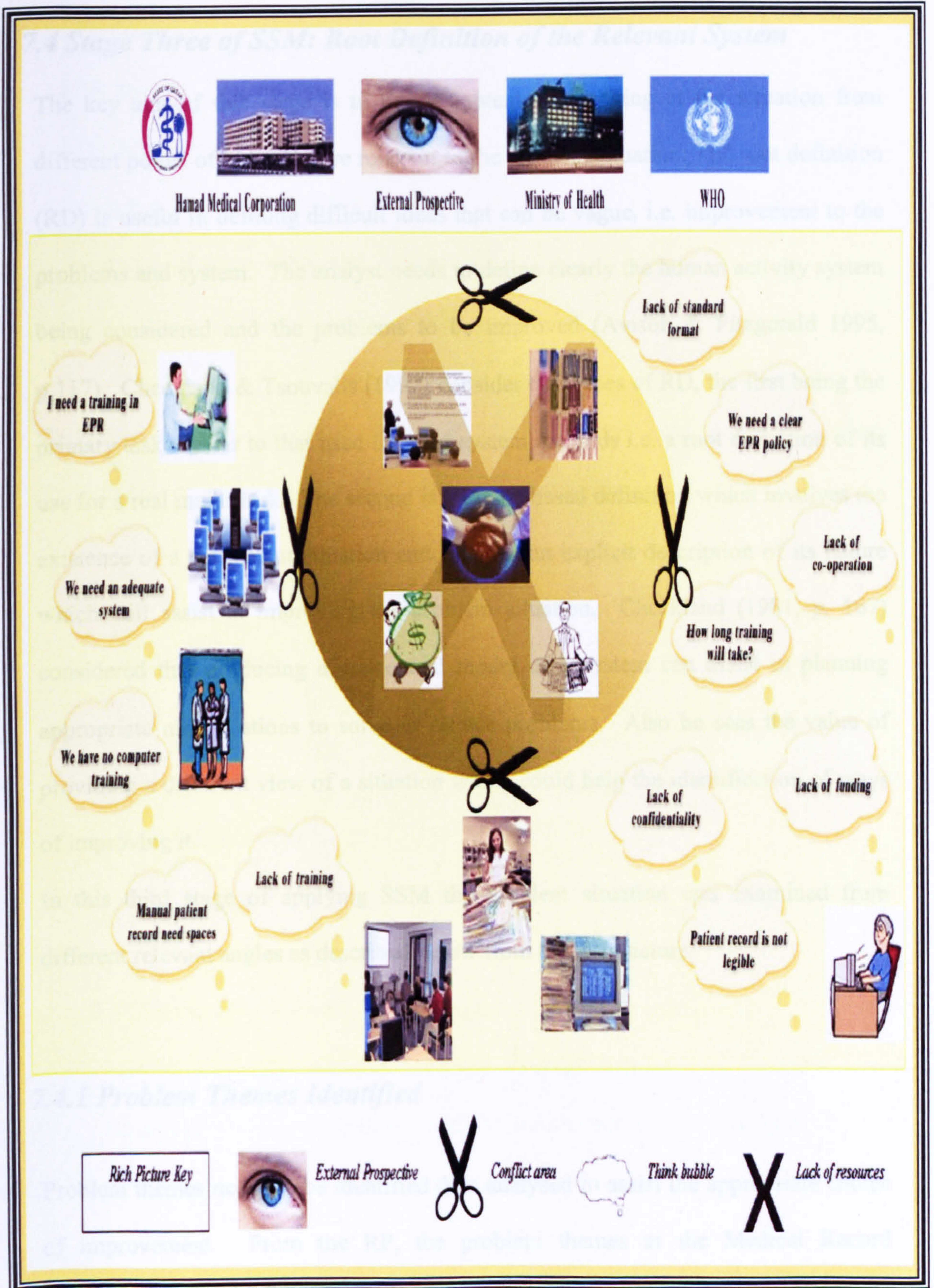


Figure 7.2 Rich Picture: holistic view

### ***7.4 Stage Three of SSM: Root Definition of the Relevant System***

The key aim of this stage is to define systems by looking at the situation from different points of view that are relevant to the problem situation. The root definition (RD) is useful in defining difficult ideas that can be vague, i.e. improvement to the problems and system. The analyst needs to define clearly the human activity system being considered and the problems to be improved (Avison & Fitzgerald 1995, p.117). Checkland & Tsouvalis (1997) consider two types of RD, the first being the primary task similar to that used for hard system methods i.e. a root definition of its use for a real major task. The second is an issue based definition which involves the existence of a permanent situation and requires an explicit description of its nature which will assist in improving the problem situation. Checkland (1981, p. 167) considered that producing a conceptual model of a system can assist in planning appropriate modifications to solve or reduce problems. Also he sees the value of providing a different view of a situation which could help the identification of ways of improving it.

In this third stage of applying SSM the problem situation was examined from different relevant angles as described below from the rich picture.

#### ***7.4.1 Problem Themes Identified***

Problem themes needs to be identified then analysed to assist the appropriate choice of improvement. From the RP, the problem themes at the Medical Record Department associated with the following as:

- EPR attributes

- EPR awareness
- EPR training
- EPR infrastructure
- Perception of value of medical records
- Perception of value of hospital clinical staff
- Co-operation within departmental staff

The seven relevant systems identified above can be combined into two problem themes outlined below which will be analysed using SSM.

***Problem Theme 1: Socio-technical Problem Themes***

- EPR attributes
- EPR awareness
- EPR training
- EPR infrastructure
- EPR security

***Problem Theme 2: Information Management and Co-operation Issues***

- Perception of value of medical records via confidentiality
- Perception of value of standard medical records between hospital staff
- Lack of co-operation within HMC departmental staff

From the above problem themes, suitable root definitions (RDs) can be provided.

### **7.4.2 Root Definitions**

#### ***Socio-technical System Issues***

Any new system for medical records keeping must provide users with adequate information which can be readily accessed by authorised staff. The proposed root definition for this system is as follow:

**HMC owns the patient records system and seeks to improve organisation and communication of patient data by means of EPR. The hospital administration committee supports the improvement of the medical records systems by implementing EPR. This would require a new technical infrastructure, increasing staff awareness, improving staff training, providing appropriate facilities and infrastructure to provide efficient access to medical records to assist clinical decision making.**

A CATWOE analysis revealed the following to be the key elements of any future EPR system:

**C:** Medical staff, Patient administration staff

**A:** Medical staff and Medical Records staff

**T:** From manual to electronic recording of patient data

**W:** EPR is useful in achieving information for better access to medical records and assisting in clinical decision making

**O:** Director of Medical Records Department and Hospital Administration Committee

E: Awareness, infrastructure, attributes, training, and funding

From the application, therefore, the technical system issues root definition is well created.

*Information Management and Co-operation System Issue*

In order to improve information management for decision makers and medical records staff it is necessary to provide a strategic plan that helps the successful development and implementation of patient records systems. Co-operation amongst HMC hospital staff is essential for recording patient information. Information management and co-operation issues can be defined as:

**HMR Hamad Medical Record strategic plan to increase awareness amongst decision makers and medical records staff towards the introduction of an EPR system which would improve perception of the required HR skills. To improve collaboration amongst hospital staff to provide effective and efficient authorised access to medical records. To achieve an integrated medical records system to meet the requirements of all relevant staff necessitates procedures to be negotiated and agreed.**

A CATWOE analysis of the information management and co-operation can be outlined as follows for this proposed relevant system:

**C:** Decision-makers and medical records staff

**A:** Decision-makers, medical records staff and the strategic planning committee

**T:** To move from lack of awareness of EPR and co-operation amongst hospital staff to effective awareness

**W:** Better information leads to better care

**O:** Director of Medical Record Department and Medical Director of HMC

**E:** Measurement, information, communication and changes in the cultural, speed of technology change, security and confidentiality.

Therefore, the information management and co-operation system issues root definition is presented.

### ***7.5 SSM Stage Four: Creating Conceptual Models***

The CATWOE analysis informed the formulation of the conceptual models developed in this study. In SSM, conceptual models are derived from well-formed root definitions and in these circumstances the conceptual model represents the activities diagrammatically by the root definition. Model building in this context is used to describe something relating to the problem situation rather than the problem itself. To create this for the systems being considered, in a suitable form, a conceptual model as described in the root definitions, the main activities were analysed to discover those which were essential for the system to function effectively. From these, a diagrammatic model was produced to indicate which factors were dependent upon one another.

In most contexts in this study a conceptual model is devised for each individual root definition and the creation of two root definitions and conceptual models develops into an iterative process of discussion and alteration to reach an acceptable conceptual model.

The necessary activities have been chosen for each root definition in this study are as follows:

**A. *Socio-technology System (Figure 7.3)***

1. To improve cooperation
2. To improve organisation
3. To provide efficient accesses
4. To improve infrastructure
5. To improve facilities
6. To increase staff training
7. To increase awareness
8. To develop EPR
9. To improve decision-making
10. To improve patient record keeping
11. To improve patient care

**B. *Information Management and Cooperation System (Figure 7.4)***

1. To increase awareness
2. To improve skills
3. To improve strategic planning

4. To improve collaboration
5. To introduce EPR
6. To achieve an integrated medical records system
7. To improve patient care



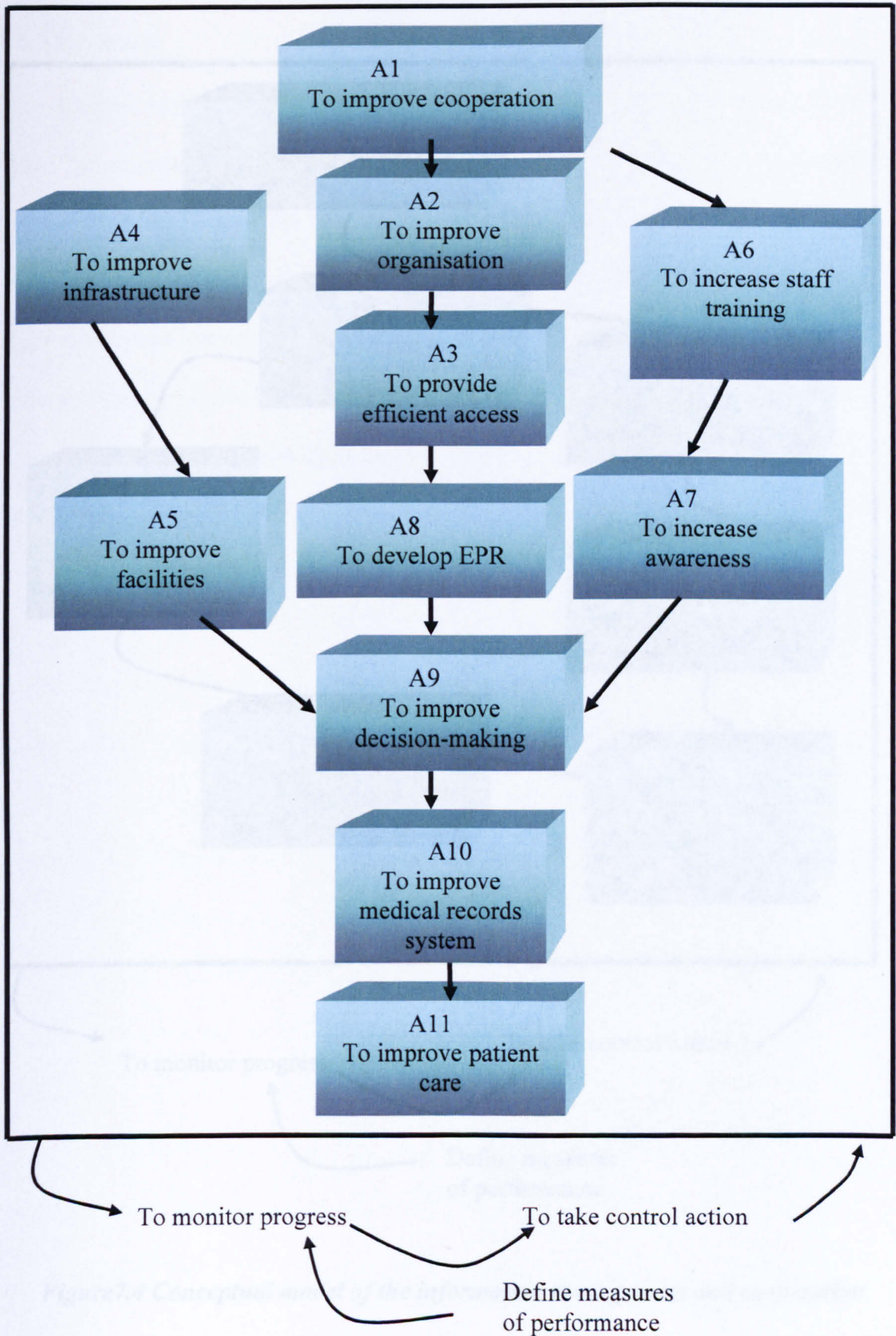
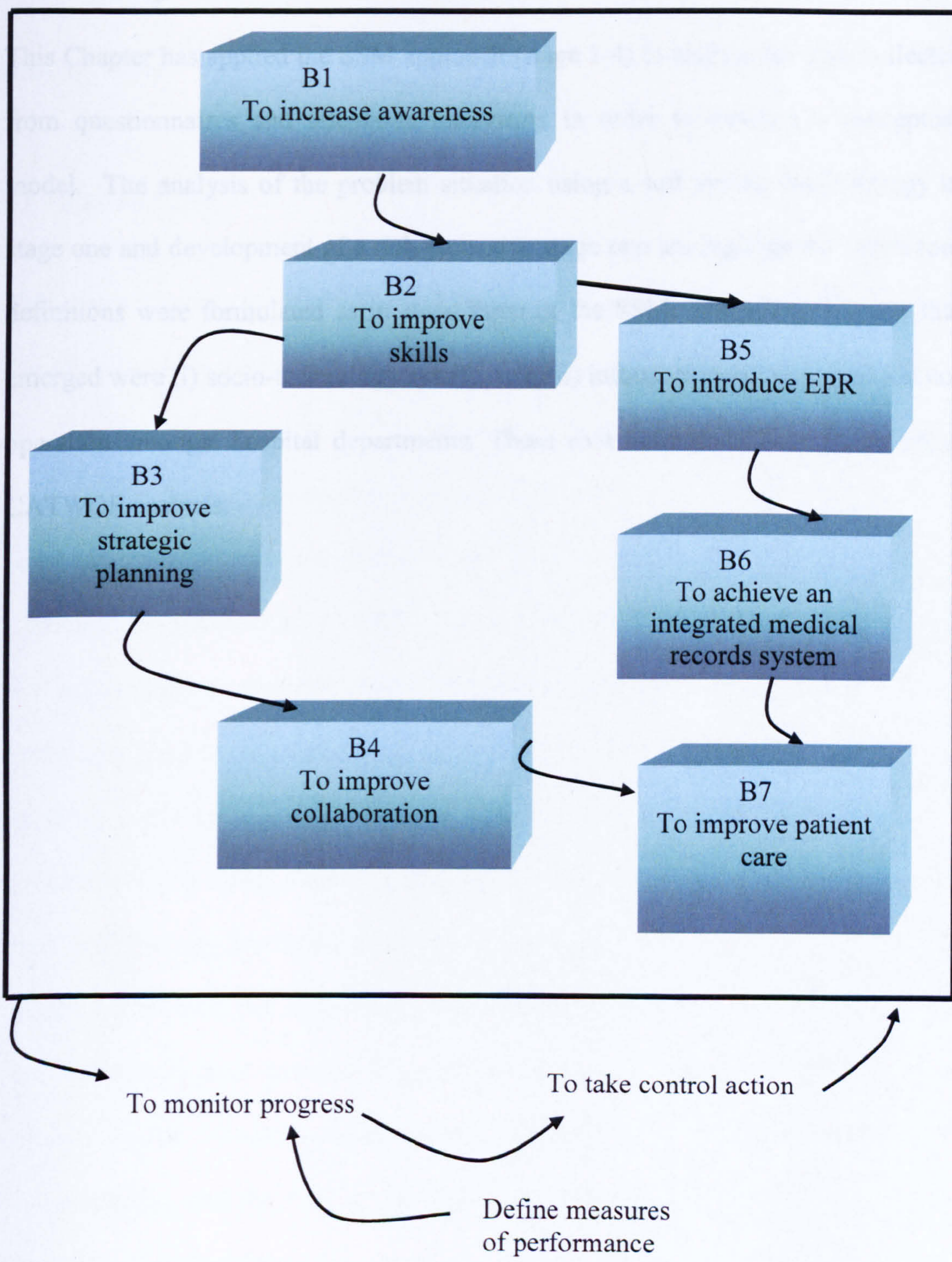


Figure 7.3 Conceptual model of the socio- technical system



*Figure 7.4 Conceptual model of the information management and cooperation system*

***7.6 Summary***

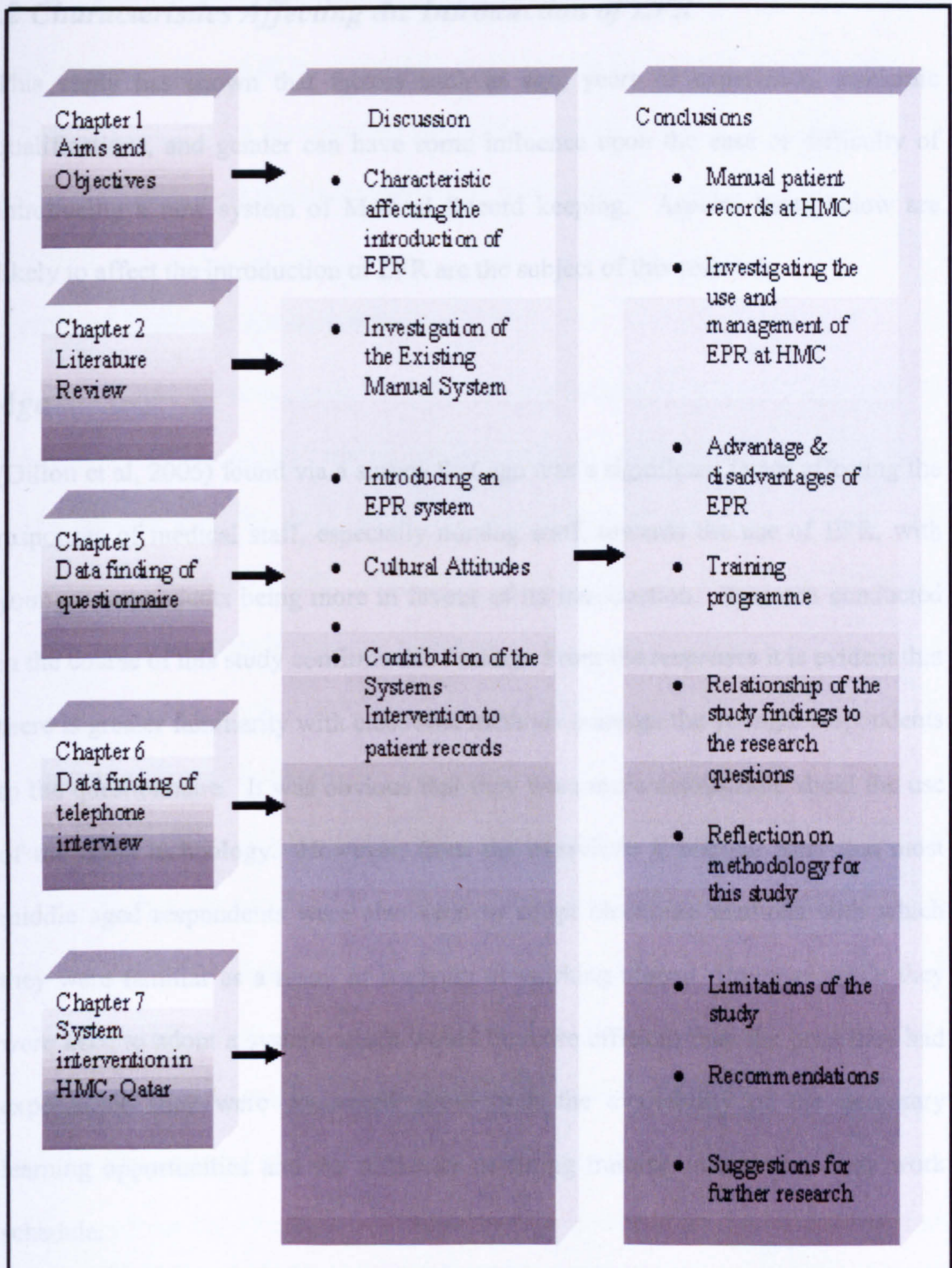
This Chapter has applied the SSM approach (stage 1-4) to analyse the data collected from questionnaires and telephone interviews in order to develop a conceptual model. The analysis of the problem situation using a soft system methodology in stage one and development of a rich picture in stage two are highlighted. Then root definitions were formulated as in stage three of the SSM. The relevant issues that emerged were (i) socio-technology system, and (ii) information management and co-operation amongst hospital departments. These root definitions were tested using CATWOE analysis.

## *Chapter 8*

### *Discussion*

#### *8.1 Introduction*

This chapter brings together evidence from the literature review and findings from the questionnaire survey and telephone interviews. These are then discussed within an SSM framework (Figure 8.1 illustrates the study discussion roadmap) in order to pave the way for the introduction of an EPR to HMC in Qatar. The literature review revealed a lack of relevant studies in the Gulf region and in Qatar in particular. Therefore the application of an EPR is discussed in the light of literature relating to systems already in use elsewhere. The findings confirmed the importance of (i) ensuring a good fit between the design of the EPR system and the needs of all types of users (eg clinicians, nurse, pharmacists etc) and (ii) a well-managed change process which includes a suitable education and training system for all the hospital staff and reduces workload of individuals to give them time for training. The findings from both the structured questionnaires and semi-structured telephone for staff interviews have revealed the problems associated with the existing medical records system. These include mis-filing; lack of confidentiality; illegibility; inaccessibility; and the lack of information management systems. The outcome of the problem analysis provides material for this discussion and for the formulation of a conceptual model of the proposed EPR system.



**Figure 8.1 Roadmap of Issues Discussed**

## ***8.2 Characteristics Affecting the Introduction of EPR***

This study has shown that factors such as age, years of experience, academic qualifications, and gender can have some influence upon the ease or difficulty of introducing a new system of Medical Record keeping. Aspects listed below are likely to affect the introduction of EPR are the subject of this research.

### ***Age***

(Dillon et al, 2005) found via a survey that age was a significant factor affecting the responses of medical staff, especially nursing staff, towards the use of EPR, with younger respondents being more in favour of its introduction. Research conducted in the course of this study confirms this finding. From the responses it is evident that there is greater familiarity with electronic methods amongst the younger respondents to the questionnaire. It was obvious that they were more enthusiastic about the use of the latest technology. However, from the interviews it became clear that most middle aged respondents were also keen to adopt electronic methods with which they were familiar as a result of studying or working abroad. However while they were keen to adopt a system which would be more efficient than the ones they had experienced they were concerned about both the availability of the necessary learning opportunities and the difficulty of fitting training into a very busy work schedule.

A small minority of the oldest respondents who were interviewed and completed questionnaires revealed some anxiety about using the new system, but they expressed enthusiasm to learn the new techniques required and to use their

experience to best advantage. In discussion with the interviewees it became obvious that they were in favour of the proposed system because of the predicted ability to provide a better service to users than the present system and their main concern was how to provide the best results for patients by improving their care.

### ***Years of Relevant Experience***

Analysis of the questionnaires indicates the importance of years of experience in relation to the respondents' replies. However, some of the newest recruits may be more familiar with the most up to date electronic methods and equipment used elsewhere. However, those with long experience can also make important suggestions to improve the record system.

### ***Academic Qualifications***

The level of education is an important factor in the attitude of hospital staff towards the introduction of EPR. Brodt & Stronge (1986) noted this in the case of nurses affected and their attitude towards computerisation. These findings reflect those which arise from primary data collection in this study; the questionnaires provided a good source of information about attitudes to support this development. In addition respondents perceived that EPR could save much paperwork and time.

Responses from the fifteen doctors interviewed emphasised the need to change from manual to electronic administration of patient records, because of difficulties experienced with the present patient record system. There was concern about the problems already cited (misfiling, lack of confidentiality and the time involved etc) in obtaining the patient records and a shared view that improvements are essential.

Doctors expressed concern also about their lack of knowledge about EPR systems in general which they felt would make the introduction of any new system more difficult. This finding underlines the importance of providing carefully developed learning opportunities tailored to the different needs and learning styles of the varied groups of staff involved.

Education and knowledge were seen as vital factors which can affect patient care and improvement.

### ***8.3 Investigation of the Existing Manual System***

The existing patient record system depends upon all members of staff involved using an agreed format and vocabulary to record patients' health problems and prescribed treatments. This requires a standard legible format so the information is readily available whenever it is needed. Hoekema et al (2005) argued that a variety of information which may be needed is not always immediately available in hospital records, especially in cardiology departments. Sometimes, in emergencies, information about patients has not yet been entered into the hospital records system. The authors were very aware even with an EPR system that it is sometimes necessary in emergencies to use a manual system to provide effective treatment.

#### ***8.3.1 Difficulties Experienced with the Existing Manual System***

##### ***Misfiling***

All 30 interviewees expressed their opinions about the existing manual patient record system and the majority (90%) of the opinions were negative. There were difficulties



in obtaining patients' records because of misfiling. This affected patient management in all aspects of treatment, causing problems for both clinical professionals and patients. The analysis of interviewees' responses also indicated a universal anxiety about missing documents which affected the work of administrators and clinical staff. Frequent concern was expressed about the possible danger to patients if their medical records were not readily available at all times. Such concerns include inappropriate or multiple drug prescribing including drugs that may be contraindicated with existing prescriptions. This represents an obstacle to the accessibility of medical records as illustrated in the rich picture of the SSM for this study (Figure 7.3 refers, see p.211).

The above aspect was reflected by several respondents who were interviewed in various hospitals, examples include the following:

*“Misfiling is a terrible problem that we are facing almost every day”.*

*“Because of misfiling we are delaying the treatment of patients treatment only resumes when files are made available”.*

*“I have a long experience in this hospital about cases in which operations are delayed because of incomplete patient records and these have caused huge problems for both patients and doctors”.*

*“I am not satisfied with the present system of record keeping which caused in some cases delays, missing documents, and incomplete patient files”.*

*“The present system of patient record keeping is a barrier rather than an asset to both patients and doctors. I emphasised the necessity for patient records to be readily available and detailed especially of the patient is diabetic, has any cardiac problems, or has had previous operations”.*

The literature reveals that the difficulties of misfiling have been discussed in various studies, such as Stein (1997) and Coiera (2003). Both authors noted that paper records can be lost or misfiled by users. In addition they can also be damaged, are bulky to transport, and so it can be difficult to find specific information. The same problem of misfiling raised in this study has been addressed by Weber (1995) who found that it was easy to lose important documents. The literature emphasises that proper record keeping systems require the use of maintaining appropriate standards, as Stratmann et al (1982) recommended that the complete medical record must contain patient profile, history of illness and physical examination and diagnosis data that included laboratory, radiology data.

### ***Storage of Patient Records***

Another factor causing concern was the increasing need for space to store patient records. This was mentioned by many of the interviewees because the layout of the Hamad Medical Corporation (HMC) hospitals did not provide sufficient space for this vital administrative requirement. In addition, concern was expressed about the location of patients' records in a separate building. The time taken to obtain records from a distant building could lead to fatal consequences in some circumstances. The space implications of storing manual medical records are cited by Gerald (1994). The rich picture of the SSM shows the lack of space for storing patient records in the Medical Records Department and identifies space is an important issue to be considered as a problem theme (Figure 7.4 refers, see p. 218).

Findings in this study are similar to those reported by Young (2000) and Coiera (2003) who emphasised that the disadvantages of paper records is the space required to store them and the addition of new records. Microfilming of records is not seen as a satisfactory solution as it requires additional effort is costly and the records are not easily retrievable. By contrast EPR can store a huge quantity of data from an unlimited period.

### ***8.3.2 Confidentiality in the Existing Manual Patient Record System***

From the findings of interviews reported in Chapter 5, confidentiality emerged as an important concern for all participants, although at present, with manual patient records system it is difficult to achieve. There is evidence that hospital staff at various levels have access to patients records and it is possible for unauthorised

people to obtain and alter them (Chapter 5). It is an important part of any treatment that patients should have the minimum of worry and reassurance of confidentiality is an essential factor.

The same problem of confidentiality in the manual patient record system raised in this study has been addressed by other studies which support the study findings, such as Cassidy (2002) and Mount et al (2000). Both studies found that confidentiality and security were of greatest importance and the information recorded tended to be that which clinicians used rather than the information that other users required.

Several respondents gave comments about lack of confidentiality with manual patient records systems:

*“What confidentiality? There is no confidence in the security of the manual patient information. Every one who knows English can read the file which can cause massive problems later on”.*

*“I actually had the experience a few years ago, when there were complaints about a doctor and the patient concerned went to the files and changed some words in the notes”.*

The above comments imply that since the manual system lacks confidentiality and security in terms of access, users can easily manipulate information contained in the files. Furthermore, Hagland (2004) suggested that the difficulty of security for paper records can be considered as a natural disaster for patient care.

To ensure the confidentiality of manual patient records, it is essential that all who have access to these documents are aware of the rules to be applied to their use. This view is supported by McGuire (2004) who noted that a system must meet the particular requirements of privacy and confidentiality of a country because not all would require the same standards. In addition, Cassidy (2002) and Mount et al (2000) observed that confidentiality and security were of greatest importance and the information recorded tended to be that which clinicians rather than other users required.

Interviewees indicated that they had a problem in relation to the lack of an official confidentiality policy about the present system and this has led to some confusion. The lack of a confidentiality policy has made it more difficult to obtain information relating to this study.

An important aspect of the manual medical records system was frequently mentioned; the system inhibited what could be recorded, knowing that the information may become available to unauthorised readers. The interviews analysed by the researcher indicated that the majority of those interviewed had experience of lack of confidentiality in the present manual patient record system.

### ***8.3.3 Legibility***

To have legible patient records is beneficial to all who need to use them. Handwritten medical records can be illegible and dangerous if written in a hurry because time is required to decipher them. A significant number of respondents

were aware of the need to improve patient records but under the present system this would be difficult. Of those interviewed, a large proportion expressed dissatisfaction with the existing handwritten system, where hand-written notes were sometimes illegible. The respondents interviewed indicated how the present handwritten patient records had caused problems and in emergencies vital time was lost in trying to decipher them. Most interviewees had expressed difficulties with diagnosis, treatment and pharmaceutical requirements. The above aspects were reflected by several respondents who were interviewed in various hospitals.

As a respondent with a pharmacist said:

*“Badly handwritten prescriptions caused considerably delays in providing what could be urgently needed treatment”*

*“The handwriting is very poor, that sometimes I am unable to read it clearly and this difficulty of illegibility cause a lot of problems to continue a patient’s treatment”*

*“Of course it’s very important the handwriting to be clear and we are suffering from illegibility in the existing system that I am not encouraging the manual writing because it will effect patients in general and especially the chronic condition”*

In addition, because of misinterpretation of handwritten instructions which were not clearly written, patient care in general is not always appropriate.

Problems caused by illegibility of handwritten patient records were also reported by Fischer and Blonde (1999) and agreed with Wellen et al whose findings in 1998 showed that using handwritten patient documents is time consuming and the need to decipher unclear handwriting can cause delays, especially if there are many documents for a particular patient.

The importance of having standardised legible formats for patient records in both manual and electronic systems is necessary to avoid omissions and improve patient care. The literature review revealed the necessity for a standard legible format from studies performed in USA, UK and other European countries in which the patient records were either manual, or electronic. However, the results of the questionnaires and interviews reveal that HMC policy issues need to be resolved, that is the policy statements need to be transformed into appropriate action lists. Nevertheless, also there is a lack of standardised terminology which causes problems. Patient records in a standard legible format could improve treatment and both patient and physician satisfaction.

The problems involved in a handwritten medical records system, as expressed by interviewees from all departments in addition to the literature review, indicate that this is a matter which can directly affect patient care. The findings from telephone interviews illustrated that the majority of interviewees expressed the importance of using an agreed standard format for patient records in order to enable rapid access to key information. In Chapter 5, the failures of handwritten patient records and how these can affect the treatment of patients are explained by the interviewees, reflecting

the emphasis in the literature on the need for patient records to be easily read, to contribute the improvement of patient care and their satisfaction.

#### ***8.4 Introducing an EPR System***

New information technology can improve medical care and reduce costs in the longer term. EPR enables information to be available globally in a standard format and significantly reduce medical errors. The authors emphasise the value of privacy for both patients and doctors which can be achieved by the use of EPR. Patients are anxious that their medical history should not be publicly available and doctors do not wish their comments to be publicised. The EPR system protects patients privacy by controlling the accessibility of their medical records. (Demuynck & Decker , 2005).

From the interviews it became clear that there was an awareness of the use of EPR systems elsewhere but there was rather a cautious response to the idea of introducing the system throughout Qatar.

To introduce an EPR system in Hamad Medical Corporation (HMC) in Qatar would be a challenging and pioneering undertaking. Schmitz (1979) indicated the importance of EPR systems and he was a pioneer in anticipating their benefits. Health information in general can benefit from an EPR system to provide accurate and up to date records. As discussed earlier, the existing patient record system includes different aspects and the rich information from the literature and interview analysis demonstrated the potential difficulties. However, introducing EPR as a new system to improve patient care would be beneficial. Discussing the advantages and



disadvantages of the result of the questionnaires and telephone interviews add their impact on introducing EPR system for Qatar. The SSM analysis contains a problem theme to introduce an EPR associated with the information management that originates from the primary evidence collected in the questionnaires and telephone interviews.

Several authors note that there was a cautious approach to the introduction of EPR in other countries. The need for a well structured introduction to the change is considered to be essential to achieve good organisation, cooperation, and improvement in performance. (Kovner, 1990; Bickford, 1995). Wang et al (2003) and Haak et al (2003) supported strongly these arguments in favour of EPR systems. In particular, the time saving involved, reductions in the workload, lower costs as well as the benefit of accurate and up to date details of treatment and the avoidance of mistakes caused by missing patient records are cited as key advantages.

#### ***8.4.1 Management of Change***

To introduce a complex new electronic system requires a carefully designed programme to make the change successful in a complex organisation like HMC hospitals. Results of this study have confirmed the importance of a suitable education and training system as a key part of a change management strategy. Such education and training must be designed not just to promote new skills and knowledge of procedures for using EPR systems but also for understanding of the need and benefits of such systems. and reassurance that their concerns, fears and aspirations will be taken seriously and improve individual performance and this

should result in overall improvements if it also meets workplace requirements. Porcheret et al (2004) emphasised the importance of training and said there was no difficulty in organising this with practices and they provided time and researchers. The project team designed appropriate training programmes to meet the specific individual needs, in addition to those of professional groups including GPs and nurses, and the practices in general.

The findings from both structured questionnaires and semi-structured telephone interviews indicated the importance of training at all levels and the need for a clear understanding of what computers can do and not do, in the context of patient record keeping. Concern was expressed during some of the interviews about the time involved in training and whether this would be used effectively. EPR technology changes rapidly and clinical staff need awareness of how to use it effectively, both for input and to retrieve information. However, achieving the improvements in accuracy and speed of creating and retrieving patients' records is of such significance that arrangements should be made to reduce normal work commitments while individuals engage in training.

One of the problem themes in the SSM considered the value of patient information. The root definition of the value of this system is to improve the awareness and attitude of medical record staff via the additional benefits of EPR. This became evident from the analysis of the questionnaires and telephone interviews. The positive response depends upon appropriate training to enable staff at all levels to use it effectively. Training is the key in any system development, one of the problem themes in the SSM was related to the technical problems, RD of the technology

system is to enhance the awareness of medical and hospital staff by increasing the benefits of the EPR.

Most of the doctors were in favour of introducing an electronic patient record (EPR) system, but because of their official duties they are frequently and unpredictably overloaded. Elaborating on this theme the majority said that one of the major problems was finding time in relation to the amount of work required in seeing inpatients and outpatients and the urgency with which this was sometimes needed. Their work schedule was so congested it would be difficult to fit into a training programme. The possibility of providing individual instruction and practice in using an electronic patient record (EPR) system could help to overcome this difficulty. It will also be important to consider ways of temporarily reducing the workload of individuals while they engage in education and training processes.

In introducing training for an EPR system it is essential to encourage staff to recognise its benefits rather than the inconvenience of having to learn new techniques. From analysis of the 30 interviewees attitudes towards the introduction of electronic patient record (EPR) training, it became obvious that this was essential because there was anxiety that there may not be sufficient training to improve patient care.

Training of hospital staff would ensure that the introduction of the new system improved their own practical and professional efficiency. In addition the rapid access to scientific information would be improved. Several respondents gave

comments about the importance of training in introducing electronic patient record (EPR) systems:

*“Training is the most important to be consider in EPR introduction, and how to train the staff who will deal with the new system. However, it needs an experience people to train the staff about the EPR system”*

*“I am emphasising the necessity of training for EPR system as experienced elsewhere and it will affect the successful introduction of the new system, it appears that lack of knowledge about computer effectively reachable”*

The majority of respondents to the structured questionnaires emphasised the importance of electronic patient record (EPR) training because a lack of it could result in confusion and it would be a disadvantage. 70.6% of the 21-30 age range of respondents were strongly in favour of training. 64.2% doctors emphasised the necessity of training for the introduction of EPR and considered the impact of it on patient care. This view is supported by a large proportion of interviewees who also emphasised the need for an applicable training programme to make effective use of the system. The majority of medical staff were enthusiastic about the introduction of EPR at hospitals but a lack of training could result in unsatisfactory patient care.

The importance of staff training raised in this study has been addressed by Cheung et al (2005) when introducing an EPR system in Hong Kong. They focused on the importance of a standardised training for all staff who dealt with the system.

Several authors emphasise the importance of training in terms of time saving and improving knowledge of the ways in which the system can best be used (Atkinson, 1997; Mansoor, 2002; Haak, et al, 2003). This body of evidence gives strong support for investment in a comprehensive education and training strategy as part of a systematic change management process.

The findings of questionnaires and interviews achieved the objectives of the study to identify the training needs for existing HMC medical and MR staff at all levels for the use of Electronic Patient Record (EPR) and for any staff subsequently appointed.

#### ***8.4.2 Security System in EPR***

To ensure that confidentiality is maintained, clearly stated methods of security must be observed by all who have official access to patient records. The security system must also enable authorised staff to obtain information quickly in emergencies.

A security system requires a specific procedure to obtain access to patient records and this would be different for different categories of medical staff, for example surgeons and pharmacists would have different requirements when dealing with the same patient. Clerical staff may require only access to patients' data rather than to diagnostic or treatment details which may frequently be needed by doctors and nurses. For example, passwords may be used by authorised staff to access to certain parts of patient records. All members of staff would require a precise notification of all types of records they are permitted to access. Moreover, Tranberg & Rashbass (2004) noted that the introduction of EPR now makes it possible to restrict access to patient records in such a way that different types of information can be accessed only by specified staff where paper records were accessible in their entirety to all users.

An EPR system can limit access to patient records so that different sections are available to different professionals, administrative and other groups who need to use them to perform their particular duties. They mentioned that giving patients access to their records could be beneficial and that they should be encouraged to do so, because this would give them a clearer understanding of their medical care.

The importance of a security system was apparent from the responses to the questionnaire. There was however a difference between respondents in their attitudes towards security. 85 out of 136 (62.5%) doctors, for example, did not think that the EPR system would provide security from unauthorised access and 46 out of 83 (55.4%) nurses thought likewise. Also, 19 of the 43 (44.1%) respondents of the IT staff thought unauthorised access would not be prevented by an EPR system. This response is perhaps not surprising because they are so familiar with the electronic methods of patient record keeping. There was a similar agreement from the findings of the interviews, and anxiety about security in general as expressed by doctor

*“I am so anxious about damage which could be caused by electronic  
“Viruses” which are difficult to eradicate and back up systems may be  
unable to save vital information”.*

From both interviews and questionnaires, the introduction of an EPR system and the importance of security were found to be a general concern, for instance the non-Qatari responses about EPR security elsewhere showed that 159 of 274 (58%) had experienced lack of security, their general view of EPR systems security was negative as a result of these experiences. Of the Qatari respondents 29, out of 56

(51.7%) agreed that security of the EPR system was inadequate. Perhaps these views resulted from the existing system being insecure and lack of knowledge about EPR systems.

The importance of secure access to EPR systems was a concern expressed by 98.2% of Qatari respondents to the questionnaires in addition to the 30 interviewees. For the prevention of accidental erasure and preservation of confidentiality it is necessary to have a 'back up' system and this was emphasised by 100% of the telephone respondents and 53.7% of Doctors in the questionnaires. This should reassure users who were afraid of accidentally losing vital information. Atkinson (1997) noted that there was anxiety about computer failure, but users could be reassured that a back up system will prevent patient information from being lost.

The same problem of security raised in this study has been addressed by other studies like that of Young (2000), who define the protection of patient information "from accidental or intentional access by unauthorised people, from unauthorised modification, and from unauthorised accidental or intentional distraction" (Young 2000, p.120). Security, privacy and access of patient records were the main concerns of all interviewees who believed that access to EPR should be restricted to authorised staff only, this supports what Mnjama (2001) stated about the authorisation to access patient records. There is no Data Protection Act in Qatar to protect the patient data either manually or electronically. Such an Act elsewhere enables citizens to check the accuracy of their records and ensure they are not used illegally and this is the system in UK.

### ***8.4.3 Confidentiality issues in EPR system***

With the introduction of a new system of record keeping an important aspect to be considered is confidentiality, and it is necessary that all users of the system are aware of the appropriate procedures. Information about patients and their treatment must be safeguarded so that it is accessible only to those authorised to use it. It is important that patients have confidence in both manual and electronic patient records and in the system governing their use and their accessibility. HMC should include assurance about their policy on patient confidentiality defining its aims in this respect.

Previously in Chapter 5 the subject was discussed and also the interview analysis revealed a lack of policy and procedures in the existing system. There was general concern amongst the almost majority of the interviewees about the lack of confidentiality in the present manual system. Concern arose from the experience of patient records which were frequently left in places which were insecure.

The above aspect was reflected by several respondents who were interviewed in various hospitals; examples include the following:

*“We suffer a lot from lack of confidentiality in manual system and I am more optimistic that the EPR system will solve some of problems regarding the privacy and it will be more secure offering the user a password that will prevent the patient record from unauthorised access”.*



*“One of the advantages of introducing EPR system, preserve confidentiality and it will be a standard format of policy for all level of medical staff”.*

*“The EPR system providing secure information that confirms the access of it with a pin number and password, however, the question is if any virus rises can EPR system prevent all the data?”*

*“The introduction of an electronic patient record (EPR) system I saw as a solution to the most problems. I am supporting the idea of a password to access the patient records to preserve their confidentiality”.*

Strasberg et al (1998) supported the necessity for confidentiality in electronic patient record systems (EPR) and said that doctors were hesitant in providing information about patients when they knew this information would not necessarily be treated confidentially. However, Griew et al. (1999) studied the problem of confidentiality in EPR systems and how access to patient records by authorised users could best be organised.

It is an important aspect of any treatment that patients should not have to worry about aspects such as confidentiality which could affect their recovery.

The lack of confidentiality in the manual system as expressed by most interviewees; and the risk of records being seen by unauthorised persons, resulted in a very significant support for the use of EPR. From the analysis of questionnaires and

telephone interviews in detail, the importance of confidentiality in EPR was seen to be one of the major benefits. The overwhelming support for an electronic patient record (EPR) system also resulted from the fact that the patient information would be available readily in a standard format for authorised users at any time.

The findings from questionnaires and telephone interviews indicate that the patients' electronic records will be more secure by using a user name and pin, password. It is important that there is an official procedure for the creation and use of patient records and as Thomson and Wright (2003) emphasised, supporting the use of a password to ensure the security of patient records. They also noted the saving of time, though at first it may take longer until the system becomes familiar.

This would achieve a study objective of standardised patient record keeping.

The primary data sources from the telephone interviews emphasised the importance of the value of patient records and the lack of policy in the medical record department about compiling them. Data in patient records are generally sensitive and should be treated as confidential. In the literature review chapter, Demuynck & Decker (2005), Stausberge (2003) and Anderson (2000) support this view of confidentiality which adds to the value of the information in medical records. Factors revealed by the interviews and SSM analysis showed lack of experience of EPR within HMC in addition to lack of qualified medical records staff.

The discussion above emphasises the importance of having a clear policy and a strategic change management plan to support an effective introduction of EPR. Equally important is the provision of qualified staff to assist in a smooth change

over. From similar changes elsewhere as well as those reported in this study it has been found essential for success of EPR to have knowledge of the skills necessary to introduce an EPR programme.

Preserving confidentiality and reassuring users about this is a problem with the introduction of any new system. In the case of EPR there are safeguards in the system which prevent inadvertent disclosure of patients' records.

#### ***8.4.4 The use of an EPR system to improve patient care***

From the questionnaires there was general agreement that the introduction of EPR system would improve patient care. This would necessitate having more details available in a standard format of each patient's condition and treatment. The ease of obtaining or adding to accurate and up to date patients records electronically saves time, and reduces medical errors as supported by Deutsch et al (1994) who noted the rapid increase in methods of dealing with patient records and the value of computers in providing information rapidly and accurately and the ease with which additional information can be added. Computers enable doctors to store patient information and process data for clinical use. The records include a wide variety of information to include details of past and present state of health and of medication and its effects.

Responses to both questionnaires and interviews emphasise the importance of improving the quality of patient care. To achieve this, findings indicate that the patient information must be accurate, easy to access and legible. The benefit for patients will be that they receive an improved quality of care as the result of more

detailed and informed diagnosis. Pyper et al (2004) enabled 100 patients from a randomised sample to consider various aspects of access for patients to see their own records. These included ease of use, confidentiality and security, accuracy, and printing records. The majority found this useful but lack of medical terminology and abbreviation required some explanations.

One of the problem themes in the SSM was related to the value of patient records, the RD of the technology and information system is to improve patient record by increasing the advantages of the EPR.

From the analysis of both questionnaires and interviews there was a clear concern about improving patient care by the introduction of an EPR system. The majority of questionnaire respondents indicated the importance of an EPR system in improving patient care. From respondents of age 51 year and over, 95.2% were agreed that EPR would improve patient care and in considering responses from those with different levels of education 90.1% with a medical degree expressed the importance of EPR systems in improving patient care. There were similar favourable responses from telephoned interviewees 90% of whom saw the advantages of the system to improve patient care. Examples of the responses include

*“The main advantage of EPR would be improving patient care”.*

*“All the information about the patient is immediately available and this will improve patient care”.*

*“In EPR all patient data is accurate and in the right format that will help to improve patient care”.*

This is supported by Woodward (1995) who said that to improve patient care records must be accurate, complete and in a standard format to meet all the requirements. Wang et al (2003) also emphasise that EPR systems improve patient care, reduce medical errors and provide better access to information.

Anderson (2005) considered EPR in relation to pharmacists and how the system could reduce dangerous and costly errors. The electronic patient record (EPR) system was seen to be of great advantage in improving patient care.

### ***Medical Errors***

One of the most important aspects of medical records is their ability to prevent or cause medical errors. They need to be able to provide detailed, legible, and accurate information about past and present treatment and this is not always achieved with hand written documents. Prescriptions, for example, need clear instructions about the quantities of medicines involved and when they should be used as indicated by minority of interviewees. The names of some medicines could be confusing if not clearly written and the results could be fatal in some instances. Both patients and physicians could be adversely affected by misinterpretation of difficult to read hand written instructions.

Medical errors can occur when doctors diagnose patients' conditions incorrectly with possible fatal consequences and it is important to have a record of which reduction

was prescribed. Without well kept patient records it would be difficult to avoid serious medical errors.

There was considerable concern amongst interviewees about the defects of the existing patient record system and its effect on medical errors. In general there was concern about the dangers this involved. 80% of the interviewees were worried about the effect of medical errors in the existing system. However, they thought that an EPR system would effectively reduce the numbers of medical errors because the system will provide accurate information in a standard terminology and legible format as supported by Knaup (2006) who considered that EPR should improve patient care by reducing errors, achieving better communication between specialists, saving of time and improving efficiency.

The results of analysing the questionnaire in relation to the reduction of medical errors as a result of using an electronic patient record system, reveal that of the respondents the doctors were divided 50/50 in their estimate of the reduction of errors. Nurses were similarly divided in their responses with 62.7% in favour and the remainder not seeing that EPR would reduce medical errors. In comparison 74.4% of the IT staff envisaged the proposed system contributing to the reduction of medical errors because they would be setting up the system. Both doctors and nurses were more cautious because they were less familiar with the new system and were anxious about any ways in which it would be different from their familiar procedures.

**8.4.5 Cost**

Introducing a new electronic patient record system will inevitably involve financial limitations but in the long term, if appropriately implemented, could reduce costs considerably if implemented appropriately, paying due attention to managing the change effectively and sensitively. The high cost of maintaining a system of paper records, the time taken to retrieve and return them and the consequences for patient care of course will be set against this. From the questionnaire findings it was clear that while some respondents were concerned about the cost, many considered that in the long term EPR would be less expensive (58.8% of doctors anticipated a reduction in cost from introducing EPR in the long term although 41.2% disagreed with this). 71.1% of the nurses were also optimistic that costs would reduce in the long term as a result of implementing EPR. Perhaps not surprisingly, 69.8% of the IT staff were confident of cost reduction from EPR in the long term.

The analysis of interviewees' responses indicated that 90% stated they had no great anxiety about the cost of introducing EPR because of the obvious benefits which would flow from the introduction of EPR to improve patient care. The doctors and nurses interviewed indicated that although the introduction of EPR might be costly, that does not present a real problem in a wealthy country like Qatar.

A review of international literature indicates that the cost of EPR is high but in the long term could result in savings. For example, Koeller (2002) saw the possibility for considerable cost saving because paper based records did not assist clinicians and healthcare staff as effectively as EPR.

### ***8.4.6 Cultural Attitudes***

It has been the custom in Qatar to think very carefully before making radical changes, and many administrators need to be convinced of the benefits of any change before it can be implemented. The Hamad Medical Corporation (HMC) is a government organisation, and the authorities are government employees who are unaware of the importance of EPR and lack of IT experiences. This may be due to their lack of experience of EPR systems elsewhere. A slow cultural change is anticipated as younger staff are appointed.

From the interviews regarding possible change from manual to electronic systems of patient records, there was a minority who would prefer to retain the existing system rather than change to electronic because they see it as a part of their culture. A change of attitude would be required to make the proposed alteration to the patient records system.

This cautious attitude is understandable and legitimate since it reflects a responsible concern to reduce unplanned negative consequences for HMC. These concerns should be acknowledged and addressed in planning the introduction of electronic patient record (EPR) system at Hamad Medical Corporation (HMC).

### ***8.4.7 Barriers to the Introduction of an EPR System***

Respondents described obstacles they would encounter in introducing an EPR system and many said that they would find the implementation stage to be stressful,



identifying lack of time as a general problem and a serious concern for most of the respondents. Doctors were concerned that because of the fact that they had a variety of demanding duties such as clinics, operations, consultations, ward visits, meetings and other administrative duties they would not have adequate time to learn how to use the new system and incorporate it into their working practices.

Lack of knowledge about EPR systems on the part of the users was seen as a barrier to the uptake of an EPR system by the majority of interviewees. This was seen as a significant problem because resources had not been available to develop the development of the required learning and understanding of the proposed EPR system.

Another problem worthy of note was the security of any new system and the importance of confidentiality revealed by the respondents to both the structured questionnaires and semi-structured telephone interviews. In relation to confidentiality there was great concern about the protective methods that would be used and also how effectively passwords would ensure no unauthorised, or accidental access, or corruption of information. Stausberg et al (2003) considered both manual and electronic records and found deficiencies in both systems. The conclusion was that no system could be guaranteed to be perfect. Both paper and electronic records had been found to be inconsistent. They considered that medical staff should be made aware of this and combine where possible both types of record, though this may be expensive. It is not possible unless valid data are available to provide an accurate record in whatever format.

### ***8.5 Contribution of the Soft Systems Analytical Approach to Medical Records***

A multi-method approach was used to examine the issues and to devise an appropriate system to meet the needs of users and to improve the Patient Records system. The multi-methods applied in the study include Checkland's Soft System Methodology (SSM). The literature review discusses its previous application in the health sector (eg. Mingers 2002; Mingers 2003; Mingers & Gill, 1997).

This research study is the first to apply SSM to consider how an electronic patient record (EPR) system could be of benefit to the Medical Record Department within HMC in Qatar and its patients. The choice of SSM allowed not only an analysis to help understanding of the issues from examining the problem situation, but also guided the formulation of a plan of action to improve the existing problem situation. The information collected during fieldwork was obtainable as stage one of the SSM. Stage two of the SSM, the rich picture (RP), reflected on the real situation in the Medical Record Department in pictorial form. Chapter seven discussed in detail the seven relevant systems; these seven systems were reclassified to two, socio-technical system issues and information management and co-operation system issues as relevant systems. In stage four of the SSM, the conceptual models helped to identify the activities of the model and in which sequence they have to arise.

In Qatar the existing medical record system reflects the importance given to health care and the recognition that it could be improved if the methods were updated. The human elements including culture and confidentiality were of importance in

designing a new system. Information acquired as a result of fieldwork included many comments in favour of replacing handwritten patient records with an electronic system because the former caused problem issues. Doctors, nurses and administrators gave their perspectives of the present and proposed patient record systems, reflecting the aims and objectives of the research study. The conceptual model of electronic patient record (EPR) identifies the sequence in which the proposed changes should take place, and possible problems can be highlighted. The plan included changes in structure procedures, attitudes and culture.

The proposed changes in procedures were described in a model for Hamad Medical Corporation (HMC) medical records, and their efficiency and effectiveness in providing enhanced patient care.

### ***8.6 Summary***

This chapter has summarised the main findings of the questionnaires and telephone interviews and discussed their implications from an HMC staff perspective within a framework derived from SSM. On the basis of the evidence from the questionnaires and telephone interview responses and the literature survey, the introduction of an EPR system at HMC was supported in principle. Within the interview sample of Hamad Medical Corporation (HMC), staff were largely dissatisfied with the existing patient records system. Problems were seen to be a lack of confidentiality in the present system at HMC hospital. Difficulties surrounding the present patient record system include lack of appropriate training and recruitment of suitably qualified staff.

However significant concerns were expressed regarding the steep learning curve that would be involved, especially for older members of staff, in developing the necessary knowledge and skill to use an EPR system effectively. Difficulties of finding the time to learn in already busy schedule were a particular source of anxiety for some respondents. Experience internationally makes clear that none of these problems or barriers are insurmountable. On the contrary, they are can be successfully addressed provided there is recognition of the issues and willingness to invest in the necessary planning and preparation and the application of internationally established best practice in change management.

It is clear from the literature that this study could be considered as pioneering. It attempts to fill the knowledge gap which exists in healthcare information systems in Qatar. The integrated conceptual model provides a prediction of how an EPR system could be established for hospitals in Qatar. It would be technically possible, desirable and beneficial to the health care system in general. This study has made a constructive contribution by focusing on an area of study that is significant especially in the Medical Record Department in HMC in the state of Qatar.

## **Chapter 9**

### **Conclusions and Recommendations**

#### **9.1 Introduction**

This chapter provides conclusions derived from the research and also some recommendations of as to how to introduce electronic patient record (EPR) systems within HMC in Qatar. There are also recommendations for further research about EPR in the context of technology transfer. The conclusions reflects upon the research questions, aims and objectives of the study.

#### **9.2 Overview of the Study Findings**

This research represents the first systematic study of the current manual system of patient records at HMC in Qatar and the improvements which could result from the introduction of an EPR system. Empirical data were collected using structured questionnaires and semi-structured telephone interviews with staff at HMC, which were found to be the most appropriate research methods. Whereas the telephone interviews provided valuable, providing in-depth data which became the basis of the analysis and discussion of the findings, the questionnaire survey was useful in providing a broad brush approach to uncovering the issues surrounding the procurement and implementation of the HMC EPR.

The study uses Checkland's Soft Systems Methodology approach to provide a framework for investigating the patient records system at the Medical Records Department, HMC. The benefits of the use of SSM are that it is not only a method

for learning and understanding the issues under investigation, but it also enables the creation of a plan of action to improve the existing situation.

There was general agreement among the respondents that the introduction of EPR would be of benefit and could solve the problems experienced in the existing manual patient record system to improve patient care within HMC hospitals. The respondents expressed the view that improvements in patient care will arise as a consequence of all the relevant information about previous and present treatment being made readily available in one place. There will be absolutely none of the problems of illegibility and, further, confidentiality will be improved because patient records will require a security code to gain access.

The present study revealed a number of problem areas requiring attention because the existing manual patient record system prevents quick access to vital information. Handwritten paper records can easily be misplaced or be not in the correct order and additionally it is difficult to preserve confidentiality.

Findings derived from information obtained in the questionnaires indicated some perceptions such as anxiety about confidentiality of the EPR, perhaps due to a lack of experience of such systems.

### ***9.2.1 Manual Patient Records at HMC***

The first objective of this study was to investigate the use of existing manual patient records system at HMC hospitals in Qatar. A principal sources of information used to achieve this objective was individual interviews. The analysis of the responses revealed general dissatisfaction with the existing manual patient record system expressed by the majority of interviewees in all departments. Both doctors and

nurses referred to many defects of the present manual system which caused irritation and potential exposure to reducing patient safety. Such obstacles can affect the improvement of patient care and delay important treatment. From the findings the major problem of the traditional paper based record system appears to be misfiling of records causing difficulties in obtaining information quickly in emergencies. These findings formed the basis for discussing Stage one and two of SSM that helps to specify the problem situation from the respondents' perspective. The results from the interviews reveal that there was a general anxiety that manual patient records were often illegible, and as a result appropriate patient care was affected. These issues were discussed in this study in Chapters 6 and 7.

### ***9.2.2 Investigating the potential use and management of EPR at HMC***

The second objective of this study was to investigate how EPR could improve access to, and management of, HMC medical records. The main sources of information used to achieve this objective were the responses to the structured questionnaires and semi-structured telephone interviews with hospital staff at all levels. It was surprising to discover that of the majority of respondents from the questionnaires and from interviews 90% were eager to improve the medical record system by the introduction of EPR.

The respondents' experience of the existing manual patient record system gives them awareness of issues of access to paper-based patient records and insight into how EPR could improve this situation.

There was general agreement that an EPR system would provide immediate access at a distance from all locations, and this would improve the management of medical records.

The literature indicated there was a strong but qualified approval of EPR systems expressed in the views of countries where the system had been adopted some time ago. There was a rich picture in the literature reviews of experiences in many different countries where EPR had been successfully introduced with resultant improvements in patient care. While experiences were generally favourable, common issues of concern included the high cost and breaches of confidentiality through unauthorised access. Also from the reviews it was clear that to achieve success in the introduction of EPR system requires significant investment not just in the technology for EPR but in the human and organisational aspects such as the need for education and training, adequate work time for learning and reassurance that adequate help would be available when problems arose.

The findings of this study support the views of Burton et al (2004), Bush (2002), Svenningsen (2003), Smith, (2003), Amatayakul (2005), and Novak (2005) that emphasised the advantages of an EPR system as time saving which can be life saving and, cost effective, whilst maintaining confidentiality and, making transfers to other physicians easy and immediate whilst reducing errors. In addition to these advantages there is no need for transport of records, not are duplicate tests required. All staff involved in improving the quality of care and patients can be provided with details of their medical condition in easily comprehensible terms and accurate medication lists, legible notes and prescriptions.



The advantages in general far outweigh the disadvantages of introducing an EPR system. These issues were discussed in this study in Chapter 2.

A review of the results presented in Chapters 5 and 6 show that respondents in general were in favour of the benefits of EPR. The evidence positively indicates a belief in the improvements in patient care which would result from the introduction of an EPR system. The impact of a variety of problems experienced by respondents because of the present patient record system caused them to consider favourably the benefits of introducing an EPR system. Nevertheless there were respondents who had experience of EPR elsewhere and its advantages, and this had a positive influence on their responses. Consequently the benefits of EPR including accuracy, accessibility, legibility, confidentiality and time saving considered in the literature review, the questionnaires and interviews indicates general approval of the introduction of EPR.

From the evidence presented above, objective 2 was achieved in full.

### ***9.2.3 Standardisation of patient records***

The third objective of this study was to establish how patient records could be standardised. The principal sources of information used to achieve this objective were the academic literature, and the questionnaires and interviews with different levels of hospital staff. The importance of having standardised formats for patient records in both manual and electronic systems is necessary to avoid omissions and improve patient care. The literature review revealed the necessity for a standard format from studies performed in USA, UK and other European countries in which the patient records were either manual, or electronic. However, the results of the questionnaires

and interviews reveal that HMC policy issues need to be resolved, that is the policy statements need to be transformed into appropriate action lists. Nevertheless, there is also a lack of standardised terminology which causes problems. Patient records in a standard format could improve treatment and both patient and physician satisfaction. These issues were discussed in this study in Chapters 2 and 7.

### ***9.2.4 Training Needs***

The fourth objective of this research was to identify the training needs for HMC staff, both clerical and medical in the use of EPR. Principal sources of information used to achieve this objective were the literature, in addition to interviews and questionnaires. There were few differences in the views expressed between the literature and the responses from the questionnaires and the interviews in relation to be benefits and the necessity for appropriate training. The responses of the interviewees revealed their anxiety to ensure that the training would be related to their particular use of patient records. One of the major factors was related to training was the time at which this would take place in relation to their other responsibilities.

The issue of training was supported by the literature which also justified the time necessary to make the system effective for all users. This was discussed in this study, in Chapter 2.

***9.2.5 Barriers to the Introduction of EPR Systems***

The fifth objective of this research study was to investigate possible barriers to the introduction of an EPR system. The main sources of information to achieve this objective were an extensive search in the literature review in addition to the questionnaires and interviews. There was a wide range of information about possible difficulties in the literature and how they could be avoided. The results from the respondent's questionnaires and interviews support these findings from the literature review and both revealed the necessity of avoiding lack of policy, funding issues, lack of training and lack of confidentiality. The security of EPR systems was the main concern expressed by respondents. This issue about security was discussed in Chapters 5, 6 and 7.

***9.2.6 Strategic Plan for Implementation of EPR system in Qatar***

The sixth and final objective of this study (to develop a strategic plan for the development and implementation of an EPR system at HMC) has been met through the formulation of a conceptual model for HMC to consider along with need identified in the study to apply good practice in change management and to specify the design criteria to be met in developing the system. Such criteria include the need identified by Dudeck & Prokoseh (1995) to access previous medical information in order to make relevant decisions about current treatment. They also point out the importance of making records available in electronic formats, to facilitate access by users. This means that records need to be immediately accessible in addition to providing details of patients' medical history, treatment, outcomes and costs (IOM 1997). A related requirement is that patients are made aware that the new system has

the same degree of confidentiality as previous record systems and is accessible only to medical staff (Ball & Collen 1992). To achieve this, relevant criteria must be specified in the design of the system for any future EPR system to protect the security of these records.

### ***9.3 The Relationship of the Study Findings to the Research Questions***

The first research question was: What are the potential advantages and disadvantages of introducing and using an EPR system for medical records in Hamad Medical Corporation (HMC) in the context of increasing use of Information Technology (IT) in health services?

The Medical Records Department is responsible for patient records from all four hospitals at HMC. At present these are manual records and are the only documents giving full details of patients' disorders and treatment. From the findings of questionnaires and interviews it became obvious that hospital staff of all kinds had experienced problems with the existing manual record system (Chapter 4).

The increasing use of technology can make information quickly available in a legible format which could have a beneficial impact if used by the health services. Having a perception of the value of such a system would be reflected in improvement of patient care. This was discussed in detail in the literature review.

From the literature review (Chapter 2) various arguments about the problems and advantages of introducing an EPR system elsewhere were considered in detail. It became obvious from reviewing the experience of various countries that some authors were more optimistic about the success of EPR, while others remained

cautious about making such a change. There was some concern about the change making any impact on patient care.

Both respondents to interviews and questionnaires revealed that the present patient record system causes problems that would be avoided in an EPR system. The respondents interviewed were aware that there could be problems with an EPR system but it would be an improvement on the existing manual patient record system. Identification of the gap in knowledge about EPR systems in HMC in Qatar was an original contribution of this research.

The second research question was: What are the design requirements for the developing an effective EPR system in HMC?

The study findings show that the development of a successful EPR system requires a comprehensive design specification in order to meet the needs of all who will use the system in different ways. This can only be achieved through careful and thorough analysis of the needs of users of all types. To provide maximum benefit to all and improve patient care in general as has been achieved in other countries it is necessary to analyse the needs of its future users carefully and ensure the design meets these needs. The findings from interviews with staff in Qatar emphasised the necessity to develop an EPR system to solve the problems experienced with the present manual patient record system. This development will focus on the improvement of patient care and the preservation of confidentiality in all areas where it is introduced.

The third research question was: What are the attributes of a conceptual model for an EPR system which is appropriate within the existing culture in HMC?

Each country has its own particular cultural approach to consider when making any changes to traditional procedures. In relation to matters concerning health care an important aspect is confidentiality. Any change in the system such as EPR system must involve considerations of such cultural attitudes and the available technical infrastructure.

To develop an appropriate conceptual model for HMC EPR system it is necessary to consider a suitable model which is in keeping with the cultural sensitivities and to provide appropriate training for all staff who will need to use the system. The model developed as part of this thesis can be found in Chapters 7 and 8.

#### ***9.4 Reflection on methodology for this study***

Both quantitative and qualitative methods were used to provide an adequate range of opinions about the proposed change. A conceptual model used for investigating the existing manual records system at HMC hospital provided a suitable method of analysing the responses. The methods used for the interviews provided adequate information for analysis and indicated the value of this approach and the complementary data which was also collected and provided a clear and rich picture of the existing patient record system. Methodological triangulation as used in this research provided some different opinions from each approach.

***9.5 Limitations of the study***

The scope of this study was to consider the opinions of categories of hospital staff involved in the use of patient records. Nevertheless the random stratified sample selected for this study represented medical and administrative staff from different disciplines within the 4 HMC hospitals. It had to be assumed that the respondents would be as accurate as possible in their responses to the issues raised.

The structured questionnaires provided valuable information about respondents' attitudes towards the introduction of EPR, but the questions were closed as recommended and they were not about the existing manual patient record system.

This method did not result in rich gathering of data which more open questions would have revealed. By using structured questionnaires in this study consideration had been given to the valuable and limited time involved for medical staff and doctors in particular who were respondents. From the interviews rich data were obtained on a wide range of issues related to the current situation and the introduction of EPR.

However, there is no guarantee in research methodology that, despite taking care in formulating questions, they can be assumed to result in totally accurate responses. This depends on all respondents providing complete and accurate information.

**9.6 Recommendations**

The main recommendations of this study can be seen in Table 9.1 and they are divided into strategic planning, HMC policy, and management strategies. For the strategic planning level it is recommended that HMC appoint a representative committee to examine the situation of present manual patient record system and how it could be improved by the introduction of an EPR system. This will identify training needs for all categories of staff and enable them to improve patient care.

Clear strategies are required for financial planning in relation to the proposed new system and it would be helpful to have information on this aspect from other countries where EPR systems have recently been introduced. It is essential to have an experienced and qualified member of staff to organise the introduction, and smooth running of the system after the initial training.

Appropriate policy statements are necessary to achieve the recommendations. These include the need for a standard format policy so that information from one hospital is readily available if needed for use by another. Also establish a change management policy. Access to patient records also requires a standard policy to ensure that all are protected by passwords permitting access to authorised staff only, to ensure their security. Also it is necessary to have a policy which enables medical record departments at HMC to communicate readily with the Gulf Cooperation Council (GCC) medical record departments.

A policy for co-operation with international patient records systems is required e.g. from USA, Canada, Australia, UK, and other European countries. It would be



helpful to learn from the experience of such medical record systems and their training programmes.

To achieve the management strategies level it is recommended that training systems are devised for each type of user to improve the management of medical records. It would be necessary to establish a budget for EPR procurement and implementation which includes social aspects such as training. Also to develop a comprehensive change management process based on established international best practice.

<i>HMC Strategic Planning</i>	<i>HMC Policy</i>	<i>Management Strategies</i>
Appoint a representative committee, to examine the present manual system and plan the future EPR developments.	Establish an EPR policy appropriate for Qatar. Establish a change management policy.	Devise training systems for each type of user.
Prepare a training plan for all types of users.	Create a standard policy for all medical record staff at HMC.	Establish a medical records budget for EPR.
Plan financial requirements to establish and run the proposed system.	Plan a standard policy of access for those authorised to use the system.	Develop a comprehensive change management process.
Plan for obtaining information from those using EPR overseas.	Define a policy for co-operation with GCC countries.	
Appoint an experienced EPR instructor to train clinicians and clerical staff.	Create a policy for co-operation internationally, e.g. USA, UK and other European countries.	

*Table 9.1 Outline Recommendations*

***9.7 Suggestions for Further Research***

The empirical findings of this study suggest that there are a number of issues which could be explored in the future including further studies to continue further research in this subject:

- With regard to security the effectiveness of electronic patient records and their impact on patient's progress would be evaluated, and investigation undertaken of issues of data security in healthcare so as to develop suitable security methods to protect patient records in Qatar and HMC in particular.
- There is a clear need for more research in the Middle East that explores the hospital staff user's perspectives with regard to the impact of the EPR system on their work and on a patient's progress.
- Once the proposed system is implemented its impact on patient care can be evaluated, to make any necessary modifications for improvements. Also to study and analyse the cultural attitudes of medical staff of the Hamad Medical Corporation (HMC) in Qatar towards the introduction of new system would indicate any areas in which alterations were necessary.
- To examine the issues which influence the success or failure of EPR systems in other countries.

- To examine the possibility, and the anticipated impact of introducing a 'smart card' in health care for Qatar in terms of cultural impact and training programmes.

It is hoped that the conclusions, recommendations and suggestions for further investigation of this pioneering research will be of assistance in establishing an improved system of patient record keeping within HMC in Qatar.

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*Appendices*

***Appendix 1 Questionnaire Participants Letter***

Dear Participant in the Hamad Medical Corporation Practices Survey

I am a PhD student at Warwick Medical School, University of Warwick in the UK.

The topic of my thesis is “Electronic Patient Records in Hamad Medical Corporation, Qatar: Perspectives and Potential Use”.

I would be most grateful to you if you would complete the attached questionnaire.

Your responses will be kept confidential and only used to fulfil the purpose of this study.

The satisfactory completion of this research strongly depends upon your co-operation so please answer each statement to the best of your knowledge.

Please ensure that you carefully understand the following instructions before you start responding to the questionnaires: -

1. Attached is one copy of the questionnaire survey (in English).
2. Please respond to each of the questionnaire statements following the instructions given at the top of the questionnaire.
3. Please try your best to complete the questionnaire and return it within two working weeks.
4. Please insert your completed questionnaire in the envelope attached, seal the envelope, and hand it to your department's secretary so that the researcher can pick it up on her daily visit to the hospital.

Thank you so much for your co-operation.

Yours sincerely,

Foziyah Abdullah

PhD research student



**Appendix 2 Questionnaire**

**Strongly agree 5 Agree 4 Uncertain 3 Disagree 2 Strongly disagree 1**

The information in this questionnaire will be used solely by the researcher for the analysis of your responses. Your answers to this questionnaire will be treated in the strictest confidence and no attempt will be made to identify you or your response.

**Personal Data:**

1. Age (please circle) :

Less than 21    21-30    31-40    41-50    51-60    61 and over

2. Gender (please circle):

M                      F

3. Level of education (please circle which applies to you)

- Doctor of Medicine              PhD                      Master Degree
- Bachelor Degree              High school              Others

4. Years of experience in hospital (please circle)

Less than 5    6-10    11-15    16 -20    21-25    26-30    31-35    36 and over

5. Ethnicity

- Qatari                      Other

6. How would you classify your profession? (Please tick one option).

Medicine/Dentistry              [   ]

General management              [   ]

Administration                      [   ]

IT Staff                                  [   ]

Nursing                                  [   ]

Other (please specify)              -----[   ]

7. In which department do you work most of the time (Please tick)?

Professions Allied to Medicine [ ]

*Strongly agree 5 Agree 4 Uncertain 3 Disagree 2 Strongly disagree 1*

Clerical [ ]

Secretarial [ ]

General Management [ ]

IT Department [ ]

Nursing [ ]

Other Department ( please specify) -----[ ]

In the following questions, please use the scheme printed on the top of this page, (5 = strongly agree etc). Please tick ONLY choice for each of the question below.

***General opinions about EPR issues***

1) Do you agree that an EPR will improve patient care?

5     4     3     2     1

2) Do you think that an EPR will increase patient satisfaction?

5     4     3     2     1

3) Do you agree that an EPR will increase physician satisfaction?

5     4     3     2     1

4) Do you agree that an EPR will promote improved clinical processes?

5     4     3     2     1

5) Do you think that an EPR will reduce medical errors and improve patient safety?

5     4     3     2     1

6) Do you think in the long term that an EPR will reduce healthcare costs?

5     4     3     2     1

*Strongly agree 5 Agree 4 Uncertain 3 Disagree 2 Strongly disagree 1*

7) Do you agree that training programme would be an advantage?

5     4     3     2     1

8) Do you think there should be a standard terminology for all records in the system?

5     4     3     2     1

***Security of EPR system***

9) Do you agree there should be a security system in areas where there is access to EPR records?

5     4     3     2     1

10) Do you think that the Electronic Patient Record system is secure from unauthorised access?

5     4     3     2     1

11) Do you have an understanding of what an electronic patient record would contain?

5     4     3     2     1

12) Are you confident that your records will be less likely to become erased or corrupted when they become computerised?

5     4     3     2     1

*Strongly agree 5 Agree 4 Uncertain 3 Disagree 2 Strongly disagree 1*

***Main effects of EPR and its advantages***

13) What are the major factors driving the need for electronic patient record systems?

In the following questions, please use the scheme printed on the top of this page, (5 = strongly agree, etc).

a) It will contain or reduce healthcare delivery costs?

5	4	3	2	1
---	---	---	---	---

b) It will support access to patient records at remote locations?

5	4	3	2	1
---	---	---	---	---

c) It will reduce medical errors?

5	4	3	2	1
---	---	---	---	---

*Appendix 3 Permission for Telephone Interview*



Dear,

As a researcher at Loughborough University I am exploring the possibility of introducing an Electronic Patient Record (EPR) System for medical Records at Hamad Medical Corporation in my home country Qatar. I should be most grateful if you would grant me permission to interview by telephone appropriate members of the medical and administrative staff. It is anticipated that these telephone interview would take about 20-30 minutes each.

It would be much appreciated if you were able to let me know the most convenient dates and times, and the appropriate direct phone numbers.

I look forward to your early reply and hope that my studies will be of benefit to the already excellent health service in HMC in Qatar.

Please do not hesitate to contact me if you have any query.

Yours Sincerely

Foziyah Abdullah

[Foziyah2001@yahoo.com](mailto:Foziyah2001@yahoo.com)

PhD research student

Dept of Information Science

*Appendix 4 Approval Letter from Administration Director*



*To: Mr. Ahmad Nema*

*The Administrative Director of HMC*

As a researcher at Loughborough University I am exploring the possibility of introducing an Electronic Patient Record (EPR) System for Medical Records at Hamad Medical Corporation in my home country Qatar. I should be most grateful if you would grant me permission to interview by telephone appropriate members of the medical and administrative staff. It is anticipated each would take about 20-30 minutes.

I look forward to your early reply and hope that my studies will be of benefit to the already excellent HMC health service in Qatar

Please do not hesitate to contact me if you have any query.

Yours Sincerely

Foziyah Abdullah

Foziyah2001@yahoo.com

PhD research student

Dept of Information Science

Approved  
  
7/3/2006

*Appendix 5 Telephone Interview Questions*

*Telephone Interview Questions*

*Part 1: Manual Patient Record*

1-What are the best features of the existing system?

1- How would you describe the existing patient record system?

2- What problems have you experienced with the existing system?

3- Have you ever had difficulty in obtaining a patient record?

What caused this?

4-What is the most frequent problem?

5 - Has the present system ever been changed to avoid loss of documents?

If so how?

6- Is the manual system regularly backed up?

7- What would be the best improvement for the present system?

8-What difficulties have you experience by using hand written or notes?

9- What about transfer of information or notes from one hospital to another are these satisfactory or deficient in any way?

10-What are the confidentiality issues in the present system?

***Part 2: Electronic Patient Record***

11 - What do you know about electronic records? Can you describe or explain?

12 - What advantages do you anticipate from electronic patient records?

13 -What are the barriers or disadvantages of using electronic patient records?

14 - How do you think electronic patient record systems will ensure confidentiality?

15- What would you find most difficult about a change to electronic patient records?

16- Would you prefer to add anything to this interview?