

Assessing Demand for Health Informatics Education in Karachi, Pakistan

by

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BSc, St. Joseph's College, Pakistan, 1987

BSc, State University of New York Downstate Medical Center, USA, 2001

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of the Requirement for the Degree of

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In the School of Health Information Science

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## **Supervisory Committee**

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(School of Health Information Science)

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## **Abstract**

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The need for health informatics education is recognized by many countries which are now engaged in introducing technology to healthcare. Universities have been slow to respond to the need for health informatics professional education. Governments are also involved in initiatives to fund the development of curricula and programs in this area. Entry level and generic courses in health informatics are being developed in order to start education programs. There are now a number of such programs being initiated in some of the developing countries.

To meet this demand there is need for individuals who are educated in health informatics. These individuals should be able to perform health informatics related tasks and activities in order to serve the healthcare community better. The focus of their work should be on producing effective leaders in health informatics through formal educational programs and professional education. The purpose of this research is to answer the following research questions:

1) Is there a perceived demand for health informatics professionals in the healthcare institutions of Karachi as expressed by administrators of healthcare institutions?

- 2) Is there a perceived need for post-secondary Health Informatics education in Karachi as expressed by directors of academic institutions?
- 3) What types of skills and competencies will health informatics professionals need to acquire through educational programs in Karachi?

### **Setting:**

This research was conducted in Karachi, Pakistan in 2010 to determine the demand for health informatics education by interviewing representatives from academic and healthcare institutions in Karachi.

### **Participants:**

A snowball sampling methodology was used. Participants from different types of healthcare centers were interviewed including public and private healthcare centers, nongovernmental organizations, primary healthcare centers of Karachi, and academic institutions that include private and government institutes which are representative of the entire city.

### **Method:**

Approval was elicited from Human Research Ethics Board of University of Victoria to conduct the study in Karachi, Pakistan. The study described in this thesis used a qualitative design. Thirty participants including fifteen directors of academic institutions and fifteen head of administration of healthcare institutions participated in the study. The sampling methodology used was snowball sampling, which is a non-probability type of sampling. This is the type of sampling where samples are gathered in a process that does

not give all the individuals in the population equal chances of being selected [92]. The researcher identified an expert who provided the contacts of academic directors who were invited to participate in the study. The researcher conducted face-to-face interviews with them.

### **Findings:**

There are many educational gaps and there is also a lack of resources needed to fulfill the demand for health informatics education in healthcare institutions. Ways to improve education in health informatics were discussed and competencies required for health informaticians were established. By obtaining understanding about health informatics, the need for health informatics education to meet the demand of healthcare institutions of Karachi was identified. After reviewing details and results from the research, institutions can make an independent decision regarding choosing an appropriate approach to health informatics education that blends in with the culture of the target population.

The most important themes that were derived from the responses of directors of academic institutions fall under a number of different categories. Understanding of health informatics was expressed by participants as representing an integration of computer science and healthcare. It was also clear that subjects felt that capacity building was required for the development of skill sets related to data and system management. The status of HI education in Karachi was noted as being in its infancy, which was a constant theme in all the responses of the participants. Additionally, limited resources available along with a lack of financial assistance, lack of knowledge, manpower, educators and awareness were also a few prominent themes.

The administrators had hands-on experience in managing healthcare institutions and they expressed important themes with regard to understanding health informatics as being the management of data and the maintenance of patient records through computer science. The collection of encounters and compilation of clinical documentation was seen as the key concept behind medical records. Themes related to job market requirements included critical thinking, computer knowledge, understanding of medical terminology and specific expertise related to the HI field. Limited resources and scarcity of funds were seen as themes reflecting barriers for health informaticians in the healthcare organizations. Administrators expressed the need for developing academic programs to address manpower training for prospective employees.

**Conclusion:**

This paper presents results that could be a major contribution towards enhancing the approach of training professionals in the field of health informatics in Pakistan. This research will hopefully help educators adopt health informatics in their curricula and will encourage educators in the field to impart their knowledge to local people.

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## **Dedication**

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## **CHAPTER I – INTRODUCTION**

"Now is the time to make it happen where it matters, by turning scientific knowledge into effective action for people's health."

Dr. J.W. Lee: Director General of World Health Organization.

Health informatics is a discipline that addresses all aspects of understanding the management of information and aims to promote effective organization, analysis, management and use of information in healthcare. Data collected about the patient at the point of care forms the basis of healthcare provider knowledge and helps healthcare providers to make informed decisions about how to treat patients. Health informatics is the field that focuses on the study of healthcare processes at work in healthcare and how they can be supported using technology. It aims to help practitioners perform their job better. Health informatics is described as being at the intersection of the domains of healthcare and information technology and can be defined as: “the scientific field that deals with biomedical information, data, and knowledge – their storage, retrieval and optimal use for problem solving and decision making” [1]. Accordingly health touches on all basic and applied fields in biomedical science and is closely tied to modern information technologies, notably in the areas of computing and communication (i.e. medical computer science) [1]. It is considered the “rational study of the way we think about patients and the way that treatments are defined, selected and evolved. It is the study of how medical knowledge is created, shaped, shared and applied” [2]. “Health informatics can be seen as an independent professional area, characterized by an outspoken interdisciplinary and even transdisciplinary approach.” [3].

The need for education in health informatics is recognized by most countries that are involved in the introduction of technology in healthcare. Universities have been slow to respond and governments are just beginning to undertake initiatives that fund the development of curricula in health informatics education, including the development of entry level and generic courses [4-6]. Health informatics is the science of evaluating, implementing and utilizing technology to manage all information related to the patient care delivery processes (i.e. clinical, financial, and technological enterprises) [7]. The role of health informatics in improving the quality of healthcare that can be achieved by supporting information exchange among patients, clients and healthcare providers [8]. This information forms the basis for knowledge that can be used to make better decisions, hence, allowing continuous quality improvement over time. However, a paradigm shift is required in order to support such quality improvement. Therefore, it is essential that health informatics be considered a science and be promoted through education and training. The difference between data and information is their usefulness and to manage both wisely implies knowing “why to do something”, to manage effectively implies “knowing what to do”, to manage efficiently implies “knowing how to do it”, and “to muddle through” implies nothing and having lots of data around [9].

The systematic processing of data, information and knowledge and the efficient use of information technology are of considerable importance in the field of medicine and healthcare. As the complexity of healthcare increases, it becomes more likely that practitioners are working in a partially blind manner as all relevant information is often not readily available. The quality of care could be improved substantially if all relevant information about the patient was available to each healthcare practitioner. Hence, it is

important to create an interoperable patient information system that functions across healthcare enterprises including clinics, physician's organizations, hospitals, health plans and other provider organizations. Health informatics is a dynamic discipline at the forefront of these changes in healthcare. This field requires a high level of social fluency--students must acquire strong interactive skills in negotiation, business communication, team formation, motivation, problem solving and case analysis. Students should be attuned to the rapidly changing technologies, trends and standards in this field; where the quality of patient care and medical research can be significantly increased. [10].

The American Health Information Management Association (AHIMA), has conducted specialized programmatic accreditation in the discipline of health information management since 1943. AHIMA has operated jointly with the American Medical Association (AMA) and collaborated with the Commission on Accreditation of Allied Health Education Programs (CAAHEP) to increase awareness and promote the field. In 2004, the AHIMA House of Delegates voted to establish an independent accreditation commission (CAHIM) with independent authority in all matters pertaining to accreditation of educational programs in health informatics and information management. This accreditation provides public recognition of educational program accreditation.

It is not easy to fully understand the details of health informatics and related programs in health informatics in different countries that are embedded in different educational systems (see Table 1.1). The table describes the different approaches applied by various universities in different countries highlighting their focus of choice in establishing health informatics educational programs. One of the approaches applied by

the University of Chicago is the social approach which takes into account the socialization of the members of the society when forming their curriculum for their respective programs. In contrast, the University of La Sainte Union College in UK uses the block-release approach in which students combine usage of the distance learning materials with attendance in College for an intensive 2-day program. The majority of these universities have a heterogeneous target market which implies that they market to a diverse group of students from various parts of the world whereas some universities have a homogenous target market [80].

Table – 1.1 Health Informatics and Related Programs in Different Countries

Country	University	Target	Aim	Degree	Approach
Germany	University of Heidelberg	Homogenous	To qualify physicians and other healthcare workers	MSc	Healthcare oriented approach
Germany	University of Applied Sciences by Heilbronn	Homogenous	To qualify physicians and other healthcare workers	MSc	Healthcare oriented approach
Germany	University of Heidelberg	Homogenous	To qualify students from college entry level and base level students	Diploma	Informatics based approach
Germany	University of Applied Sciences by Heilbronn	Homogenous	More focused studies as has fixed catalog of subjects to be taken	Diploma	Informatics based approach
USA	University of Utah, Salt Lake City	Heterogeneous	Wider range as choices of specialization subjects is available	MSc	Informatics based approach
USA	University of Minnesota, Minneapolis	Heterogeneous	Wider range as choices of specialization subjects is available	MHI/MSc/PhD	Practice oriented approach / course oriented approach
USA	University of Chicago	Heterogeneous	Online	Msc degree only / MSc research only / Post Baccalaureate Certificate / IBHE Post Masters certificate / Joint Nursing and HI / Joint Pharmacy and HI	Social approach
Canada	University of Victoria	Heterogeneous	Hybrid (distance learning + on campus classes)	MSc	Capacity building approach

Country	University	Target	Aim	Degree	Approach
Canada	University of Victoria	Heterogeneous	On campus	BSc	Capacity building approach
Canada	University of Waterloo	Heterogeneous	Online	MSc	Research based
UK	La Sainte Union College of Higher Education	Heterogeneous	Online	MSc	Taught route approach / Flexible route approach / Block Release approach
UK	University of Wales, Aberystwyth	Heterogeneous	Distance learning program with focus on problem based learning or case based learning	MSc	Student centered approach
UK	Sheffield University	Heterogeneous	Problem based learning	MSc	Evidence based learning
Australia	Australian College of Health Informatics	Homogeneous	to educate nursing staff	MSc	Nursing centered approach
USA	Indiana University	Heterogeneous	to promote health informatics as a discipline	BS/Certificate/ MSc / PhD	Knowledge based approach
USA	Oregon Institute of Technology	Homogeneous	Educating working adults	BSc	Educational approach towards IT
India	e-Health Care Foundation	Heterogeneous	Educating working professionals	Certificate	Informatics approach
Pakistan	School of Physicians & Surgeons	Heterogeneous	Introducing Health Informatics as a subject to study	Additional subjects in Diploma of Health Management	Healthcare approach
Pakistan	COMSATS School of Management	Heterogeneous	Introducing Health Informatics as a subject to study	Additional subjects in Diploma of Health Management	Healthcare approach

By studying different programs in different countries, we can obtain a holistic view of the need for health informatics programs which can lead to the introduction of effective educational programs. [11]. The increased awareness of health informatics has given birth to an increase in the demand for distance education in health informatics and international collaboration [12]. Educational providers are realizing that issues involved in managing health information throughout the world are similar, irrespective of the funding and practice of healthcare. Although such health informatics programs address large markets, more flexible study approaches are required in order to continue professional development, involving opportunities offered by new technologies [13].

Many countries still do not have a central strategy or programs that focus on education and training in health informatics. Furthermore, a large number of people need training and education, but at differing levels [14-16]. Governments and health authorities in many countries have recognized the urgent need for a highly educated and trained workforce in health informatics, but universities have been slow to respond until recently.

There are several reasons for promoting education in health informatics: (a) as a response to the progress in communication and information technology, (b) in order to keep the health information updated because doing so is challenging in today's fast-paced society as the amount of medical knowledge is increasing, (c) there are economic benefits to supporting such education, (d) there is an increase in the scope of the education in this field, (e) trained people are required to carry out the functions needed in health informatics, and (f) in order to progress towards a healthy society it is important that efficient information regarding the patient be provided to healthcare providers [17].

The perspectives of 13 countries were studied and the authors of the report concluded that there is a lack of strong leadership, lack of appropriate funding and a lack of an organized strategy towards education in medical informatics [18]. A review of various websites hosted by health informatics associations of countries neighboring Pakistan suggests that the concept of health informatics is recognized, but proper establishment and development of associations is needed. The Saudi Association of Health Informatics [19], the Indian Association of Health Informatics [20] and the Chinese Association of Health Informatics [21] are a few of them. The Middle East Health Informatics Association is in the formative stage of developing the association [22]. The goal of these organizations is to spread awareness of health informatics

through conferences and education. The Japanese Association of Health Informatics [23] and Korean Society of Health Informatics are organized but are still in their early days [24]. A Chinese website describes health informatics as “a boundless ocean involving all levels of healthcare and all aspects of the physical world and mental world” and that all information collected must have a relationship and a connection among them [25]. Health informatics, healthcare informatics and medical informatics are at the intersection of information science, computer science, and healthcare as described by the Chinese Health Informatics Association. Chinese health information systems (HIS) have made significant progress, especially after the SARS outbreak in 2003. The major components of the Chinese HIS are: (a) the Routine Health Statistic Information System (RHSIS), which annually collects information and data on health facilities, human resources, equipment and services provided to outpatients and inpatients; (b) the Disease Surveillance System (DSS), which is a web-based reporting system on more than 30 infectious diseases; (c) the National Household Health Services Survey (NHHSS), which collects information every five years on the health status, access to care, satisfaction, demands and utilization, expenditure, and behavior such as smoking and drinking; (d) the Maternal and Child Health Care Surveillance System, which collects information annually on Maternal and Child Health Care, and (d) the Health Supervision Information System (HSIS), which annually collects information on food, public facilities and schools as well as on environmental changes [26].

Monash University in Australia offers a Graduate certificate in health informatics [18]. The University’s aim is to provide excellence in medical informatics in the areas of research, teaching, development and community service. It serves as a focal point for

industry, government, academia and various disciplines of medicine seeking to integrate technology with healthcare. The University Of Otago Department Of Information Science, New Zealand, [27] offers a Postgraduate Diploma in health informatics (PGdipHealInf) that is intended for healthcare professionals whose prime focus is the area of clinical care delivery, management, education, quality assurance, information systems, or research. The University of Otago also offers a Master of Health Science (mHealSc) to interested students. There is a need to raise the level knowledge of healthcare professionals and to teach them the principles of health informatics [28]. The Swansea University School of Health Science, UK, [29] offers the only MSc in health informatics in Wales that aims to fulfill a broad cross-section of needs of the healthcare community. Students need to complete six modules and a dissertation. The focus of the program is on the informatics needs of those working specifically in the healthcare environment.

Healthcare professionals and healthcare administrators are two broad categories of people that need to be dealt with and considered when developing curricula for health informatics in order to ensure the relevancy of health informatics education to the real world of healthcare. Healthcare professionals and healthcare administrators differ in their education and training and perform different tasks and usually generate, receive, transmit and use different sets of information. There is often little communication between healthcare professionals and healthcare administrators resulting in a poor understanding of what the other does. A systematic review of health informatics by Hasman [30] recognizes that one of the major tasks of health informatics is modeling

processes. The biological, communication, decision, engineering, educational, organizational and computational processes are distinguished and described in that work.

Prior to the year 2000, Germany had educational programs in medical informatics that were informatics based [31]. Germans identified that there was a need to equip medical professionals with additional medical informatics skills so that medical, technological and management skills are combined in one degree program at a university level, which is an innovative way of delivering education in health informatics [31]. Educational delivery involves course delivery through a mixture of real time virtual classes, asynchronous online forums/resources, and two capstone courses which are offered each summer at a two week intensive on campus workshop and a major workplace related field research project. A capstone course is an opportunity for a student in final year to display learning of the subject by command, analysis and synthesis of knowledge and skills [32]. The European Information Society Thematic Portal outlines a number of policies and targets the implementation of electronic health cards, online services with information provision, tele-consultation, reimbursement, and health information networks to speed the flow of health information through their health systems [33].

The ability to link practice with education has been limited by the ever growing volume of information and the need to effectively disseminate that information [8]. The rapid development of medical science has advanced our understanding of health and disease. A review of the literature reveals that the medical record must contain sufficient information to identify patients, support diagnoses, justify treatment, document the course of care and results, and promote continuity of care among healthcare providers

[34]. Categories of knowledge relevant to health informatics include: specific health information knowledge, information technology knowledge, people and organizational knowledge, clinical, medical and related knowledge, and various knowledge/skills [35]. In another study conducted in Iran, the researchers found that the organizational structure of medical record departments in Iran is not appropriate for the efficient management of healthcare information [36]. Similar studies could be carried out to assess the need for health informatics professionals who could help to improve the management of health information in hospitals.

There are three main career choices in health informatics. They include the following: (a) developers of healthcare knowledge resources, (b) developers of IT and knowledge resources in healthcare, (c) researchers or developers of IT and knowledge resources in healthcare [37]. An internationally recognized framework for considering competencies in the field of health informatics considers professional training along the following continuum of expertise from novice, to advanced beginner, to competent, proficient and expert practitioners [38]. Bloom, an educational psychologist, developed a classification of the levels of intellectual behavior. “Knowledge” is at the lowest level with the simple recalling of data. “Comprehension” involves understanding the meaning while “Application” is the ability to apply a concept in a situation. Analysis refers to identifying components, and seeing patterns, while “Synthesis” refers to putting parts together to form a new whole. Evaluation is at the highest level, and involves the ability to make judgments about the value of ideas or the material learned [39].

The National Health Service [NHS] is the publicly funded healthcare system in England. The NHS consolidated their information technology departments to become

NHS Connecting for Health [40]. In Canada, Canada Health Infoway is the national organization that advances healthcare towards the electronic era [41]. In the United States, the National Office for the Coordinator of Health Information Technology has been created to lead a nationwide interoperable Health Information Technology infrastructure [42].

The American Medical Informatics Association has described the need for 10,000 healthcare professionals to be trained in applied health and medical informatics by 2010 in order to cope with the proliferation of ICTs across different healthcare settings in the United States [43]. Canada Health Infoway has estimated that an additional 1500-2000 healthcare technology, health informatics and change management personnel will be needed over the next six years as its investments are realized [44]. General remarks that have been made by the International Medical Information Association in this context are that health and medical informatics should be tailored to the student's advancement and where possible be made relevant for and used to support a given stage of a student's progression [45]. There are many approaches to providing health and medical informatics education. Two of the broadest categories are the following:

- a] The informatics based approach to health and medical informatics focuses on the processing of data, information and knowledge in healthcare and medicine with a strong emphasis on the need for advanced knowledge and skills in health and medical informatics, including mathematics as well as theoretical, practical and technical informatics/computer science. In such an approach, the knowledge and skills of informatics and computer science predominates.

- b] The healthcare based approach to health and medical informatics focuses on the processing of data, information and knowledge in healthcare and medicine. In such an approach to health and medical informatics education, the knowledge and skills of medicine, nursing and of other health sciences predominates [34].

The recommendations of the International Medical Informatics Association (IMIA) on Education in Biomedical and Health Informatics (first revision) describes the educational needs of individuals learning health informatics using a three dimensional framework:

- 1] Professionals in healthcare.
- 2] Type of specialization in health and medical informatics.
- 3] Stage of career progression.

Learning outcomes are defined in terms of knowledge and practical skills for healthcare professionals in their role as IT users and Health Management Information (HMI) specialists. This framework will be described in the next section of this paper.

A research project investigating the educational needs in health informatics was conducted by the Department of Health in June 2000 and March 2002 in the UK. The research hypothesis was that health informatics has not yet been incorporated into either formal education programs or continuing professional development. Recommendations were proposed highlighting the ways to advance education, training and development using a health informatics agenda [36].

A flexible learning approach was supported by printed distance materials, telephone tutorials, assignment feedback and a summer school in the UK. In the block

release approach, for each module, students used distance materials and attended an intensive two day session on campus. All the approaches studied produced identical end products in terms of assessed work, although the methods used for presentation of materials were different. The La Saint Union College (LSU) MSc in health informatics is also using this method. Current developments in the area of research and education are described by Bemmell [46]. The paper describes a program for students developing skills in solving problems in informatics in healthcare organizations which has been based on the development of a program using Bloom's taxonomy. There is a distinction between the Bachelors, Masters and PhD levels. The taxonomy is based on the following six hierarchical systems with six levels of complexity [47] as described below:

Knowledge: The ability to produce subject matter e.g. facts, figures and procedures [48]

Comprehension: The lowest level of intellectual abilities. It refers to the ability to apply knowledge without necessarily having a deep understanding or the ability to relate it to other areas independently. It is typically reflected when students are able to communicate abstract theory in their own words [49].

Application: The student can apply theories, principles, procedures or methods to a specific situation or concrete problem [50].

Analysis: The process which breaks down and reveals relationships between entities in a case [51].

Synthesis: The process of aggregating the broken down and analyzed parts to a new whole [48].

Evaluation: Evaluation can be done as a judgment based on internal evidence or as a judgment based on external criteria [52].

The above model reflects the level of knowledge needed for tasks in the process of technological renewal within the healthcare sector for different professions including doctors, nurses and other healthcare professionals. Health professionals should be educated about the different types of healthcare software applications, enabling them to choose the right application when facing problems specific to health informatics. Non health professionals can be classified as engineers/computer professionals or administrators. Administrators should have managerial skills, while, engineers and computer professionals should have strength in innovation and design in the technological renewal process within the healthcare sector [51]. Health informatics professionals should have a combination of skills similar to health and computer professionals.

At Aalborg University, a distance learning program is offered in Danish. The students gather four times a year for intensive lectures, laboratory exercises and oral discussions. A conference system that runs on a server at the university is also available and used to provide assistance for distance learning. Communication is achieved through lectures, a handout study plan, assignments, feedback, and various discussions. Solutions to the problems are based on the "demand pull" approach as opposed to the "technology pull" approach where systems have been developed looking for solutions [53]. The main target of this effort is to create a European teaching network for higher education in medical informatics, statistics and epidemiology, to organize and launch graduate and postgraduate education at an international level, to initiate international joint

research and development programs in the interdisciplinary field of medical informatics, statistics and epidemiology, and to cooperate closely with the healthcare sector [54].

The University of Victoria (UVic) has established a reputation across Canada and around the world as a Centre of interdisciplinary research and innovation that is making major contributions to the advancement of knowledge in health informatics and its application to societal issues. The School of Health Information Science admits 30-40 undergraduate students per year. The University of Victoria, School of Health Information Science program is considered one of the most established and advanced in the world, having been in existence since 1981 [55].

The Waterloo Institute for Health Informatics Research at the University of Waterloo in Canada is a transdisciplinary research collaborative aimed at the advancement of health through the discovery and development of new concepts and tools in health informatics [56]. This organization aims to examine future options for distance learning course development, assess student perception of gains in this field, assess their current and future training needs, and personal career development plans by allowing students to study health informatics from a distance. The Sheffield MSc health informatics program uses a problem based approach [57]. At Sheffield, a student centered approach for curriculum design and delivery was considered essential and the WISDOM model was used. The WISDOM model was described by Graham as a "pyramid to wisdom" [58]. According to this model, a problem is perceived as a gap between the existing state and a desired state, or a deviation from a norm, standard, or status quo. This is a neutral description (non-biased) of a number of phenomena or events that may be related.

The analysis of the problem is done in a seven step process by the group of selected students. The first step is to read and identify difficult terms related to the subject. Second, the group of students has to define a phenomenon. Third, the group brainstorms and fourth, an inventory of realistic explanations is made in a systemic way. The fifth step is to formulate learning objectives and sixth step consists of individual study that includes literature study, audio visual aids or questioning experts. The seventh step takes place during the next group meeting [42].

Problem based learning is one of the approaches introduced by the Faculty of Health Sciences of McMaster University in Hamilton, Canada in 1969 [59]. The main aim of this approach is to overcome some of the drawbacks of traditional methods of instruction utilized in medicine .For instance, the approach tries to address the following: the passive role of students during lectures, irrelevant subject matter in the curriculum, insufficient preparation of the students for continuing their own education after graduation, and the difficulties experienced by many graduates in practically applying what they have learned. Similar models could be considered to overcome drawbacks in methods of instruction in health informatics education. It can be argued that students in health and medical informatics should be trained to meet the demands of an increasingly international healthcare environment. There are increased opportunities for students to tailor their education to their individual needs while at the same time to become internationally oriented. International collaboration will take time to establish and also leadership continuity is of critical importance [60].

A number of resources and tools for health informatics are available for review on the website of Minnesota Department of Health [61] with the mission of protecting,

maintaining and improving the health of all Minnesota residents. These links give insight to the approach taken in Minnesota to promote and establish health informatics education. For health informatics education, there are three approaches that can be taken into consideration. One approach is to redesign the way health professionals are trained to emphasize the following aims for improvement: that care given to patients is safe, effective, patient centered, timely, efficient and equitable (which requires placing more emphasis on teaching evidence based practice and providing opportunities for interdisciplinary training). The second approach is to modify ways in which health professionals are regulated and accredited to facilitate needed changes in care delivery. The third approach is to use a liability system to support changes in care delivery while preserving its role in ensuring accountability among health professionals and organizations [62].

An online education guide to college majors in medical informatics [63] argues that this young and growing field offers many opportunities to graduates of medical informatics. Since this is a new field, it gives individuals the opportunity to enter industry that is poised to expand in usefulness and complexity. The Institute of Medicine (IOM) estimates that of the 98,000 Americans who die each year from preventable medical errors, one fifth of these errors are linked to the lack of prompt access to patient health information [64]. In addition, the recent disaster “Katrina” revealed the need for digital health records [65]. Disasters caused thousands of medical records to be damaged or lost. Patients often leave clinics with no tangible information about their medication, goals or plan of treatment [66]. The paper “Patient Health Information Management: Searching for the right model” [67] reveals that no one single

model or approach can handle all aspects of patient information. The founder of Spencer Foundation, Lyle Spencer, believes that lasting improvement in education can best be achieved through better understanding of education in all of its dimensions and that better understanding depends on a systematic and rigorous study and analysis.

The European Federation of Medical Informatics (EFMI) working group sponsored a workshop on health information and development entitled “let's face reality” in which they had short presentations on European projects [68]. Discussions were conducted in order to identify factors which lessened achievements and recommended improvements in Health Informatics. The impact of these projects in countries in transition and their needs were identified. The European Federation for Medical Informatics and the EDU Working Group on Education in health informatics conducted a conference in Goteborg, Sweden, MIE 2008 from May 25 to May 28, 2008. The main objectives were to disseminate and exchange information about educational programs and courses in health informatics; to promote creation of databases of programs and courses about health and medical informatics, to advance the knowledge of teaching methods in Europe, to produce international recommendations of the program and to support the exchange of students and teachers. The report indicates that the only practical way to reach a large population is to deliver education through distance learning and that distance learning has reached its desired level of recognition and esteem as an alternative to the traditional education.

The Klause Tschira Foundation in Heidelberg, Germany, gave the opportunity to participants to reflect on issues by visiting the Faculty of Informatics of Karlsruhe University as well as Corporate Research Center of Systems, Applications and Products

in data processing (SAP is a major European software company) and the Research Center for Informatics. It was noted that the traditional role of student and teacher are likely to change and re-conceptualizing the world of learning will take place. This will have an impact on the development of learning practices that are oriented towards the human capacity to deal with problems and interact constructively with continuous change. The author describes a “bootstrap approach out of a less than ideal world” as realistic pathways that may help to support members of the partnership to advance not from recasting past models in new molds, but rather by planting the seeds for a change in culture that will eventually lead to constructing new futures. Bootstrap approach is a self-sustaining model without external help.

The majority of published studies about Informatics systems for improved care revealed a positive impact of specific health information technology components of care [69]. The development of an educational framework for health informatics professionals would be desirable to support student mobility, trans-national and borderless education [70]. These technologies are expected to increase access, improve quality and decrease the cost of care [71]. A paper by Grade and Hovenga [70] explores the socio-technical approaches being developed in the Center for Health Informatics and Computing (CHIC) at Brunel University, Uxbridge, UK. These approaches are designed for addressing issues within healthcare that necessitate the integration of information systems with clinical and managerial development [72].

In planning and managing educational programs, it is crucial to understand the skills and qualifications needed to carry out these educational objectives. In order to understand the need to have a well-defined educational program in health informatics, it

is imperative to conduct a needs assessment. Such a needs assessment is required in order to determine what educational services should to be provided, what they are and what they should be, who will be the “customers” of the education and what are their needs and wants. One of the best times envisaged for conducting a needs assessment is at the curriculum developmental stage. The Need Assessment Tutorial [73] describes five basic steps that lead to proper needs assessment: Identifying the customers, ascertaining what customers wants, collecting data, interpreting the data and implementing changes based on the findings.

The recommendations of the International Medical Informatics Association about education in health and medical informatics (conducted in 2000) emphasized the need of such trained individuals to carry out the functions of health informaticians by appropriately training qualified people in research institutions, clinical practice and industry. Excellent job prospects for such trained people are foreseen [74]. Different kinds of educational programs for education in health informatics are available, and, as described above, the approach may be classified as being either healthcare based or informatics based [75].

An unpublished working paper on Bachelor and Masters Programs in Health Science in Pakistan was conducted by the Working Group of Dow Medical Health Sciences, Karachi, Pakistan. It states that Pakistan confronts many problems of inequity, scarcity of resources, inefficient and untrained human resources, gender insensitivity, and structural mismanagement. Pakistan has a population of over 145 million with limited resources. Serious underutilization of resources, substantial pilferages and loses in

operating assets, reflects considerable ineffectiveness and inefficiency, and a stalemated progression of the health industry [76].

A few institutes have undertaken the agenda to address factors contributing to the stalemated progression of the health industry of Pakistan by adopting different health related educational approaches on different scales. Each program varies from the other depending in terms of the objectives of the program, target market, availability of intellectual and logistical resources, the strategic position of the institute and standards. Yet these programs are not sufficiently addressing the unmet needs of Pakistan [76].

Legal aspects of health informatics are an important emerging area of study in health informatics. This area addresses the privacy, ethical and operational issues that invariably arise when electronic tools, information and media are used in healthcare delivery. It also deals with the matters that involve information technology, healthcare and interaction of information. It deals with the circumstances under which data and records are shared with other fields or areas that support and enhance patient care [77].

The University of Illinois has a unique college of applied health sciences with departments of biomedical and health information sciences. Along these lines, much emphasis is being placed on redesigning work processes and incorporating information technology and decision support in medication related work processes. A joint degree of a Masters of Science (MS) in Nursing Administration and MS in health informatics is offered with an emphasis on leadership, critical thinking, practice management and healthcare technology [7].

The online Illinois Board of Higher Education (IBHE) Masters certificate program is offered to self-motivated, experienced healthcare or IT professionals, giving them the opportunity to study the application and management of computers within the healthcare setting. Designed for people with Masters Degrees, this certificate ensures graduates are conversant in the creation, implementation, operation and control of health information systems. The online Post Baccalaureate Certificate addresses the need of professionals with BSc degree who would like to receive graduate level credit for either continuing education or a credential indicative of advanced and current knowledge in the field of health informatics [78].

The education requirements of the Master and Doctoral degree levels of Health Information Management (HIM) and American Healthcare Institute (AHI) professionals indicate that prerequisite course work is required to support advanced courses. Institutional prerogatives must be considered in implementing any academic program. The program targets whether students can obtain a Registered Health Information Administrator credential are also important. Students who opt for such programs have a genuine desire to learn and broaden their understanding of health informatics. Students who have no degree qualification are at a disadvantage in competitive situations. The different programs offered give students an opportunity to learn new skills while maintaining a full time job, hence appealing to students who wish to grow academically and grow in terms of their knowledge and abilities. AHIMA has developed a process by which organizations providing Health Information Management/Applied health informatics education can be peer reviewed against a minimum set of criteria.

According to AHIMA it is imperative for a program to have a focus and AHIMA specifically notes that focus is important [79].

Different approaches to the tasks of educating and training health information system professionals within the National Health Service (UK) [80] suggest detailed criteria to assess students who have diverse backgrounds. They include: the ability to acquire knowledge and interpret it in its own context, the application of general concepts and theory to practical situations, the skill to analyze data to create and synthesize information, the facility to develop and sustain arguments and draw constructive and supportable conclusions, and the techniques to present these conclusions as judgments and recommendations. The criteria extend to the ability to present a written document which displays all of these skills with the appropriate balance.

Many discussions regarding the provision of global collaborative health and medical informatics education at conferences have revealed a number of issues that need to be explored and resolved on an international basis. The issues are categorized as follows:

- Governance.
- Curriculum content and degree structure.
- Delivery and evaluation methods using various technologies.
- Staff and student support structure.

Programs need to focus on developing the above depending on the target market.

There are three streams that include many clinical specialties. [81]

- Business operation.

- Healthcare delivery systems.
- Information technology.

It is suggested that global education requires collaboration, alliances and partnerships among a number of organizations [82]. The choice is to be made between intellectual ownership of educational content versus the adoption of an open source model, competition, national copy right issues, and adoption of technology standards, cost/funding and administrative structures. Educational providers must comply with national government policies regarding overseas students. This may influence delivery methods, acceptable cost/funding arrangements and educational opportunities. Some of the initiatives are named as follows:

- Worldwide Universities Network (WUN) is a worldwide alliance of research led by universities of international standing, established to create a worldwide research and graduation education partnership [83].
- Commercial organizations gained support from universities in UK, USA, Australia and Canada to be global leaders in providing quality lifelong learning services, for example Informatics Holding Limited and Informatics Computer School [84].
- UNESCO established the International Association of Universities in association with universities from 150 countries to reflect and act on common concerns [85].
- A global academic faculty was developed to share the best lectures [86].

- The Academy for Educational Development has established the Global Higher Education Exchange to give access to resources such as research, policy analysis and best practices, and host an annual conference [87].
- United Kingdom's Electronic University (UKeU) provides online degrees worldwide. This is accredited by UK universities [88].
- The Office of Health, the Information Highway at Health Canada (OHIH) and the University of Victoria developed a partnership to promote health informatics education in Canada [89].
- Canadian health informatics educators from eight universities have developed a national graduate training program by pooling the expertise and resources of existing research teams [90].
- Australia's Government developed "Borderless Education" with the support of corporate, for-profit and virtual universities in United States [91].

At the School of Health Information Science at the University of Victoria in Canada, health is considered from a community perspective and encompasses the full range of programs. The aim of the school is to improve health care delivery systems by educating individuals to be effective developers, users and managers of health information resources; by advancing knowledge through research; and by providing a consultative service to the health care community. As health information is increasingly being processed by computers and transmitted by communications technology, the School's programs have added a significant technological component [92].

In summary, health informatics is a discipline that addresses all aspects of understanding management of information and aims to promote an effective organization,

analysis, management and use of information in healthcare. Promoting education in health informatics is important in order to keep up with the progress in communication, medical knowledge and information technology, to attain economic benefits, to increase the scope of education, to ensure that trained people are carrying out the functions needed in health informatics and to attain efficient information regarding the patient for the health care providers to progress towards a healthier society.

Healthcare professionals and healthcare administrators are two broad categories that need to be dealt with and considered when developing curricula for health informatics while also keeping two of the broadest perspectives in mind: the informatics based approach and the healthcare based approach, to ensure the relevancy of health informatics education to the real world of healthcare. Legal aspects of health informatics are an important emerging area of study that addresses the privacy, ethical and operational issues that invariably arise when electronic tools, information and media are used in healthcare delivery. In planning and managing educational programs, it is crucial to understand the skills and qualifications needed to carry out the educational objectives, it is thus imperative to conduct a needs assessment by: identifying the customers, ascertaining what customers wants, collecting data, interpreting the data and implementing changes based on the findings.

### **The Current Situation in Pakistan and Need for Health Informatics Education**

We need to understand the current opportunities and challenges to embrace health information technology in Pakistan. We must understand both the evolution of attitudes and accomplishments in healthcare information technology and the cultural, economic,

and structural phenomenon that constrain the abilities of a country to embrace the health information technology [93]. Pakistan is a country located in South Asia and Southwest Asia, and converges with Central Asia and the Middle East. It has a 1046 km coastline along the Arabian Sea and the Gulf of Oman in the South. It is bordered by Afghanistan and Iran in the West, India in the East, and China in the far Northeast. Pakistan is the sixth most populous country in the world and has the second largest Muslim population in the world after Indonesia [94].

Healthcare in Pakistan is provided by both the public and private sector. Services such as free screening examinations for particular diseases, prenatal care and infectious disease control are provided by provincial governments. People in Pakistan have grown healthier over the past three decades. The rates of immunization of most groups of children have more than doubled over the past decade, and knowledge of family planning has increased remarkably. Pakistan's population of almost 158 million, according to UN Population Fund (UNFPA), is increasing by 3-4 million per year which is one of the fastest growth rates in the world. Muslims make up to 97 % of the population. According to the World Bank, Pakistan has steady economic growth but a third of its population still lives in poverty. The country is ranked 134 out of 177 in the UN Development Program (UNDP) 2006 Human Development Index [95].

As per Humanitarian news and analysis printed in IRIN on Aug 7, 2007 [95], the health conditions in Pakistan have improved. However a large part of the population, especially in the rural areas, does not receive medical care. Pakistan was among the first developing countries to establish a State funded family planning program. The under-five mortality rate is 99 deaths per 1000 births, according to UNICEF and World Health

Organization (WHO). Life expectancy at birth is 64 (2005) as per WHO. Polio has not yet been eradicated and more than a third of children under five are underweight.

Nevertheless, Pakistan is committed to the goal of making its population healthier, as evidenced by the continuing strong support for the Social Action Program (SAP) and by the new vision for health, nutrition, and population outlined in the Government's National Health Policy Guidelines up to 2010.

According to the Primary Healthcare Program Concept paper, the majority of Pakistan's population relies upon Government programs to meet its healthcare needs. Poor healthcare indicators such as maternal and infant mortality rates contribute heavily to the burden of illness in Pakistan. The Basic Health Unit (BHU) is the institutional mechanism for the delivery of Primary Health Care in rural Pakistan. BHUs are presently ineffective as they are mismanaged and only meet the needs of less than 40% of the population of Pakistan. The President's task force in Pakistan conducted an analysis through workshops and individual interviews of the current delivery capacity and coverage of primary healthcare. The task force analysis highlights limited access as one of the major shortcomings of the primary healthcare system. The task force suggests policy interventions and recommends a Primary Health Care Program (PHCP) to improve access to care. As mentioned in the paper, the PHCP will be implemented through community based health committees. An example of a promising recent initiative is the Lady Health Worker (LHW) community-based program, which is bringing health information and basic healthcare and family planning services to women's doorsteps. Presently 3,000 women are serving as LHWs in their home villages [96].

Service providers will be selected and trained from within communities by Non-governmental organizations (NGOs). Although there will be specific health interventions such as immunizations and growth monitoring, the prime focus of the program will be on improving health related behaviors through health education; this in turn will lead to a significant reduction in mortality and morbidity rates. The effective implementation of the PHCP through community organizations holds potential for the improvement of health conditions in Pakistan. Communities will ensure sustainability through significant cost sharing and ownership of the program. The PHCP will expand coverage of primary healthcare and improve the quality of care, especially for vulnerable groups [97].

In 1947, at the time of independence, Pakistan had only one medical college and few practicing doctors. Over time, the system expanded and grew nationally. Now there are two healthcare sectors in Pakistan, the private and public. Due to various political reasons, the public sector was corrupted and hence services suffered and worsened over time. Today, while some have suggested Pakistan has one of the best healthcare systems in the world, others have argued it is actually one of the worst [98]. The major healthcare needs of the population are catered to by the public sector. A parallel private healthcare sector appeared in Pakistan. Its services are equivalent to those found in Western countries. The focus is however, on making a profit and it is totally unaffordable for the general public. To build a proactive approach to public sector healthcare it will be necessary to identify champions, obtain commitment from government leadership, encourage team work, allow for time for professionals to get

trained, and commit to developing experts who will be essential in order to bring a change in vision.

In order to promote education in health informatics in Pakistan, it is very important to distinguish among the types of programs, providers, teachers, learners, and educational institutions that are part of the e-health industry. The Ministries of Health, IT and education and the e-health industry will need to create environmental readiness. Examining the attitudes, policies and activities of each will contribute to promoting health informatics education [99].

Much of healthcare in Pakistan is operating at a suboptimal level as the use of information systems is very limited [100]. There is a need to improve current healthcare services by introducing information technology. The author Shehzad, [100] suggested that it will be important to design and develop a totally new system from scratch, integrating information collected by different means by almost all healthcare facilities. It is also important to organize the information and make optimal use of the data so that the data that is collected is meaningful and can be used for better decision making, can be easily applied and hence lead to improved outcomes. Healthcare applications when built without standards cannot communicate well with each other. This lack of standards hinders collaboration as organizations exchange information with national and international healthcare related organizations. A framework must be developed for minimizing incompatibility and maximizing the useful exchange of information systems. Health informatics is an emerging field in the intersection of medical informatics, public health and business. Health informatics addresses health services and information delivered or enhanced through the internet and related technologies [39].

The concept of telemedicine is very important for developing countries like Pakistan. Pakistan is a densely populated country and the ratio of doctors to the number of patients is 1:1436 as compared to 1:500 in Western countries. As a consequence, the specialized health services offered to the people in remote areas has been neglected, especially for women and children who often sacrifice their healthcare [94]. Efforts have been made to develop programs in health informatics. Although it was reported that discussion of such initiatives reached high levels of the government, the government has involved health professionals and so officials are unaware of the different demands of this field [101]. There is a need to train individuals in the field of health information management and research so that they can form new systems and introduce the concept of health informatics to hospitals in Pakistan from ground level up to the top level.

The COMSATS Institute of Information Technology, Islamabad, is the first institute in Pakistan to have launched a Master's program in medical informatics (referred to as "Track I") for physicians and pharmacists [102]. By popular demand, COMSATS is also offering a program (referred to as "Track II") for allied health workers. The School of Physicians and Surgeons has introduced health informatics into their management program and the school is working with physicians to train them in such a way that health informatics is integrated into the existing program of management, which already exists. The School of Business Management is also introducing health informatics in the health management curriculum that they offer to mid-career managers [103].

In order to understand the need for education in health informatics in Pakistan, it is important to conduct research and consider the innovations that are introduced to the

health sector. For example, the availability of the internet makes patients and their families more knowledgeable about health than before. This creates more challenges within the healthcare environment. There is a need to update information that is collected and utilized for better decision making and for the welfare and growth of patients.

Karachi is the capital of the province of Sindh and is the largest city in Pakistan which is located on the coast of the Arabian Sea, North West of the Indus River delta. The city covers 3530 sq km and is comprised largely of flat or rolling plains, with hills on the Western and Northern boundaries [104]. An unpublished market survey of healthcare facilities in Karachi was conducted by one of the private leading university's marketing department [105]. A review of the report reveals that privately owned tertiary care hospitals in Karachi provide a comprehensive range of services involving the Aga Khan University Hospital, Liaquat National Hospital and Ziauddin Hospital. All these are teaching hospitals and provide the best value for money to lower and middle income groups in Pakistan [106]. These hospitals also hold a major share of the corporate patient market (due to a heavily discounted charge structure offered to large employers and insurance companies).

The 25 to 100 bed private hospitals focusing on high margin services include the National Medical Center, the Orthopedic Medical Institute, the Park Lane Hospital, Habib Medical Center, Hill Park Hospital and Imam Clinic as well as others. Various services provided by these hospitals include cardiac surgery, orthopedic surgery, general surgery obstetrics and gynecology. Single specialty hospitals include Akhtar Eye Hospital, Hashmani Eye Hospital, The Kidney Center, A.O. Clinic, O.T. Hospital, Tabba Heart Institute, and Cardiac Care Center [107]. Quality and charges for these hospitals

vary according to their targeted income group [107]. Welfare and community hospitals play a significant role in providing the population with cheaper medical alternatives [108]. Some of these hospitals such as Sindh Institute of Urology and Transplantation (SIUT) also offer excellent quality training while the quality of education of other health informatics programs depends on the funding resources available to the hospital. Other hospitals included in this category are the Patel Hospital, the Islamic Mission Hospital and the Bantva Memon Hospital [105].

Recent initiatives taken by the local and federal Government to improve the healthcare sector in the form of the reformation of large public hospitals such as Jinnah Postgraduate Medical Center (JPMC), the National Institute of Cardiovascular Disease (NICVD), the National Institute of Child Health (NICH) and the Civil Hospital Karachi (CHK) could result in improvement of services and the quality of care offered by these facilities [105]. The Karachi Institute of Radiotherapy and Nuclear Medicine (KIRAN) is an example of a well-managed government owned institute offering highly expensive services like radiotherapy free of charge to a large number of patients [105]. The National Institute for Cardiovascular Diseases is an example of a Government hospital catering to both self-pay patients as well as those who need to use public health services [105]. A recent entrant is the Karachi Institute of Heart Disease (KIHD) which is a 350 bed cardiac hospital in Federal B. Area [105].

The objective of the National Health Management Information System of Pakistan (HMIS) is to record information on health events and to monitor the availability of critical items in first level care facilities. HMIS findings should be used for improving the quality and coverage of care, for the detection and control of diseases

through regular and timely reporting, and to ensure the availability of critical care in first level care facilities (FLCFs). The current structure of the National Health Management Information System was created in the early nineties; whereas its implementation in first level care facilities was completed in 1996. Since then, health districts have started reporting [109] the information from FLCFs on HMIS forms to the District HMIS cell for transmission to Provincial/National HMIS cells. In order to improve the flow of data, a plan has been made to hold workshops in all four provinces and get feedback to develop a system which satisfies the needs of all. A parallel community based information system was also developed in 1994, which is functioning under the National Program for Family Planning and Primary Healthcare. In addition, there are several other information systems specifically focused on the needs of vertical programs which are not fully integrated into HMIS.

In Pakistan there is a dearth of adequately qualified and trained human power to effectively manage healthcare systems at different levels of care. The scarcity of qualified and trained individuals in the health services industry has had an effect. There is a serious underutilization of resources, substantial pilferages and losses in operating assets, considerable ineffectiveness and inefficiency and stalemate in the progression of the health industry in Pakistan [110].

An educational platform is required that fulfills the need of preparing skilled informaticians who have diverse backgrounds and are able to manage healthcare institutes and provide leadership in order to improve the healthcare delivery system in our country. The purpose of such an initiative is to promote and help government and private organizations to protect the public's health, prepare individuals to conduct

research and to disseminate knowledge that will improve the organization's financing and delivery of health and medical services [111].

My study focused on eliciting the perception of managers and academic administrators regarding the importance and availability of resources for health informatics in healthcare institutions and academic institutions in Karachi. Exploring the potential of electronic health records as perceived by managers and administrators helped to identify the current status of resources and forms the basis for introducing health informatics education. My study identified the gaps and resources needed to improve the healthcare system of Pakistan. The management of information in healthcare facilities is likely to improve as more health informatics programs are available to bring innovative ideas into this field. The study focused on private, public, NGO and primary healthcare facilities and considered private and government academic institutes. It is hoped this research will help to gather the thoughts of different types of managers and will ensure there is diversity of healthcare technologies to support healthcare work. Recommendations were also made by each facility. These improvements in both the collection and compilation of data will most likely lead to improved patient care. This will hopefully create more jobs in the market and improve the utilization of health informatics skills and expertise which will then have a positive impact on the Pakistani economy.

## **CHAPTER 2 - RESEARCH QUESTIONS**

### **2.1 Purpose**

The purpose of the research described in this thesis is to assess the perceived demand for university and college level health informatics education in a developing country. In particular the study will focus on health informatics educational requirements in Karachi, Pakistan.

### **2.2 Rationale**

The healthcare industry is being inundated with a wealth of crucial information which needs to be managed in order to impact favorably on patient care. Patients' expect – rather demand – that their medical information be routinely updated and be made readily accessible to the healthcare provider in order to promote competent healthcare decision making. It is also imperative that patients' lifetime records remain safe, secure and protected within a healthcare facility [112, 113]. The patient record is designed to facilitate the sharing of data across the continuum of care, across healthcare delivery organizations, and across geographies. Information of all kinds of shapes and forms is collected in healthcare facilities in cities such as Karachi, Pakistan. The major issue is that the information collected at these facilities cannot be used across the country as there is no interconnected system that uses a standardized set of data that promotes increased communication among health professionals about patients. As a result, the quality of healthcare in many developing countries is very poor.

Information management is dependent upon the proper gathering of data so that data can be used to make informed decisions both managerially and clerically. Timely

collection of data and proper formatting improves the quality and continuing of patient care. Furthermore, quality improvement is possible if this data is shared among healthcare facilities so that redundancy is avoided and timely decisions are made to support patient care. Hence, interoperability is a part of enhancing the quality care so that health data is collected at different levels of the healthcare system. However, Pakistan's healthcare system is fragmented with silos maintaining separate portions of the patient's health record in different locations. Furthermore, there is a need to have a standard reporting system with a set of data elements that are the same across the healthcare system.

The quality of the information in the health record is also important to good decision making. Understanding the information that is collected, and having reliable and valid information will facilitate decision making by healthcare providers. This in turn will help to improve the quality of care. In Pakistan, the reason for the importance of health informatics (and education in this area) is the expectation that healthcare providers should have knowledge of all relevant patient information and in order to support this concept, there is a need for more information (as they are the custodians of knowledge and care). Health professionals rely on the information collected in the process of patient care being used to enhance their practices through better use of information resources [114]. The need for health information management is increasing with increased awareness of population health and increased need for improved healthcare. The information available to healthcare providers based on retrospective events in the medical record provides a combination of informational continuity and relational continuity. The informational continuity would lead to enhanced information that could be utilized as

clinical decision support, which actually is based on improved information gathered and then transferred to the care provider. Relational continuity is defined as the information that bridges the past, present and future through tele-health or provider-patient communication or provider-provider communication [140].

To form effective healthcare organizations, there is a need for appropriately trained and educated individuals, who will be able to perform health informatics related tasks individually, and also assign tasks to serve the community better. The focus should be on producing effective leaders in healthcare through professional health informatics education, engaging in best practices and developing self-sustaining models of healthcare delivery along with enriching the health information management system.

The rationale for assessing perceived need for education in health informatics in Karachi is to assess the demand and availability of resources for health informatics in healthcare institutes, and to ascertain the need for health informatics education in Karachi, Pakistan. Since healthcare management is not a widely recognized field in Pakistan, this research will help educators adopt health informatics within their schools and sensitize them to the educational need for and importance of teaching health informatics in Pakistan. This will help educators to understand the need for education in teaching health informatics in Pakistan. The long term goal is to utilize the knowledge gained from the study of health informatics educational needs in introducing innovative ideas in hospitals in Pakistan and in training individuals so that the third world poor population is served well. This statement of need drives me to the research questions outlined below.

### **2.3 Research Questions**

The following research questions were addressed in this thesis:

- 1) Is there a perceived demand for health informatics professionals in the healthcare institutions of Karachi by the administrators of these healthcare institutions?
- 2) Is there a perceived need for post-secondary health informatics education in Karachi by directors of academic institutions?
- 3) What types of skills and competencies will health informatics professionals need to acquire through educational programs in Karachi?

## **CHAPTER 3 - METHODOLOGY**

The study described in this thesis is a qualitative design. The researcher conducted face-to-face interviews with 15 academic directors of fifteen institutions in Karachi and face-to-face interviews with 15 administrators from fifteen healthcare facilities in Karachi.

This chapter will describe the methodology that was used in detail.

### **3.1 Study Setting**

The study was conducted in Karachi, Pakistan. Fifteen institutions that were included in the study included public and private healthcare facilities, which include public, private, NGO and primary healthcare centers in Karachi. Participants were interviewed at their workplace in their offices.

### **3.2 Participants:**

Fifteen directors from academic post-secondary institutions, teaching healthcare management were identified through referral from an expert in the field and who participated in the study. Directors of institutions which are 4 year colleges which provide degrees were of interest as they are in charge of educational programs to meet societal needs. As such, they are expected to train and prepare individuals to fill jobs in healthcare related areas.

Fifteen administrators of healthcare institutions were obtained from local yellow pages and the internet government website of the Higher Education Commission. These individuals were also invited to participate in the study. This is a government body

which gives the certification of a high standard to the educational institutes of Pakistan [115]. These administrators were of interest as they employ health informatics graduates.

### **3.2.1 Inclusion & Exclusion Criteria**

The educational institutes chosen were among the top management schools on the list of the Higher Education Commission in Pakistan. The hospitals included in the study were chosen from an unpublished report from a survey conducted by the marketing department of a private university hospital. This report included information from different kinds of healthcare facilities in Karachi. Hospitals from private, public, NGO and primary healthcare centers in Karachi were included.

### **3.2.2 Sampling Methodology**

The sampling methodology that used was snowball sampling [116], which is a non-probability type of sampling [117]. The researcher identified an expert who provided the contacts of academic directors who were invited to participate in the study. All different types of healthcare centers were taken in account, including public, private, NGO and primary healthcare centers in Karachi, and the academic institutions that include private and government institutes which are representative of the entire city.

### **3.2.4 Rationale for Selecting These Individuals**

Directors of institutions which are 4 year colleges which provide degrees are of interest as they are in charge of educational programs to meet societal needs. As such, they are expected to train and prepare human resources to fill jobs in healthcare related

areas. Heads of administration in healthcare facilities are of interest as they will employ health informatics graduates.

### **3.2.5 Rationale about saturation**

Data was collected from these individuals and analyzed throughout the study.

Data saturation was reached by the conclusion of the study since no new information was provided by participants.

### **3.3 Materials**

The COACH competency framework [118] was used to guide the design of the interview questions. The current perception is that the public and private sectors expect health information management that is capable of integrating relevant information and with the knowledge gained from this, they will be able to improve patient care. There is an increased need for institutions to handle data collected in a form such that data can be related to each other so that the quality of healthcare is improved.

#### **3.3.1 Semi structured Interview Guide for Directors of Academic Institutions in Karachi, Pakistan**

The following are the questions that were used in the semi-structured interviews with directors of academic institutions in Karachi:

Q1) What

- a) is your position?
- b) is your title?
- c) are your responsibilities?

Q2) How would you define or describe health informatics?

Q3) what do you know about:

- a) Medical records?
- b) Medical record keeping?
- c) Who is responsible for medical records?
- d) Electronic Health Records?

Q4) what kind of skills are needed for managing medical records in a systematic way to improve healthcare?

Q5) how do you manage medical records in your institution?

Q6) what do you think is the need or demand for people with health informatics skills to manage medical records containing patient information in a systematic way to improve healthcare?

Q7) what do you think is the status of health informatics education in Karachi?

Q8) In your opinion is there a further need of health informatics education programs?

Q9) what level of degree or diploma program would be appropriate to address the needs of health informatics education in Karachi?

Q10) What subjects and topics should be included in these programs?

Q11) Do you think there are enough resources available to introduce such programs? (e.g. teachers and other resources).

Q12) Do you think there is a need for Masters program in health informatics education in Karachi? If yes, why? If no, why not?

Q13) If yes there is a need, then what do you think the educational background of students entering a Masters program should be?

Q14) What topics should be covered in the curricula of a Masters program in health informatics?

### **3.3.2 Semi Structured Interview Guide for Administrators of Healthcare**

#### **Institutions of Karachi, Pakistan**

The following are the questions that were used in the semi-structured interviews with the heads of administration of healthcare institutions in Karachi:

Q1) What

- a) is your position?
- b) is your title?
- c) are your responsibilities?

Q2) How would you define or describe Health Informatics?

Q3) What do you know about:

- a) Medical records?
- b) Medical record keeping?
- c) Who is responsible for medical records?
- d) Electronic Health Records?

Q4) What kind of skills are needed for managing medical records in a systematic way to improve healthcare?

Q5) How do you manage medical records in your institution?

Q6) What do you think is the need or demand for people with health informatics skills to manage medical records containing patient information in a systematic way to improve healthcare?

Q7) What do you think is the status of health informatics education in Karachi?

Q8) In your opinion, is there a further need of health informatics education programs?

Q9) What level of degree or diploma program would be appropriate to address the needs of health informatics Education in Karachi?

Q10) What subjects and topics should be included in these programs?

Q11) Do you think there are enough resources available to introduce such programs? (Teachers/ other resources).

Q12) Do you think there is a need for Masters program in health informatics education in Karachi? If yes, why? If no, why not?

Q13) If yes, what do you think the educational background of students entering a Masters Program should be?

Q14) What topics should be covered in the curricula in a Masters program in health informatics education?

Q15) How do you manage patient and management related information in your institution?

Q16) Does your health facility consider computerization of information important?

Q17) To what extent is your facility computerized? Please explain.

Q18) Is the information collected at different locations integrated or not?

Q19) Do you have resources available to help you develop and manage health information systems in your hospital? Please describe your resources.

Q20) Do you think there are enough educational institutions available for health information management and health informatics in Karachi?

Q21) What kind of education programs in health information management and health informatics are needed?

Q22) What do you think are the major challenges in managing health information?

Q23) What qualities and characteristics of individuals are needed in prospective employees?

Q24) What knowledge, skills and resources are needed to handle the challenges facing the healthcare industry?

The study described in this thesis is a qualitative design. The method applied is face-to-face interviews. The sample size of the research is: fifteen academic directors of fifteen institutions in Karachi and fifteen heads of administration from fifteen hospitals in Karachi. The participants were interviewed at their workplace, in their offices. The sampling methodology that was used was snowball sampling. The COACH competency framework [93] was utilized to guide the design of the interview questions.

### **3.4 Procedure**

Approval was elicited from Human Research Ethics Board of University of Victoria to conduct the study in Karachi, Pakistan. The recruitment of directors of

academic institutions of Karachi was based on identifying an expert who provided the contacts. The researcher called participants. The researcher introduced herself and explained the objective of the research. The participants were invited to participate in the study. An appointment for a face-to-face interview of 30 minutes in duration was made if the participant was interested in the study. The researcher met the participants at the scheduled time and obtained written consent. Upon obtaining consent, the interview was conducted. A semi-structured interview was conducted with participants. Handwritten notes of the subject's responses were written down as literally as possible and later transcribed to aid in the analysis of data.

### **3.5 Data Analysis**

Content analysis was used to analyze the data. Content analysis or textual analysis is a methodology that is used in the social sciences for studying the content of communication. Content is anything that can be described like images or words. Content analysis is about patterns and their relationships to words [119]. Due to the fact that content analysis can be applied to examine any piece of writing or occurrence of recorded communication, content analysis is currently used in a number of fields [120]. Content analysis is a research tool used to determine the presence of certain words or concepts within texts or sets of texts. Researchers quantify and analyze the presence, meanings and relationships of such words and concepts and then make inferences about the messages within the texts. Texts can be defined broadly.

Texts in a single study may also represent a variety of different types of occurrences. To conduct content analysis on any such text, the text is first coded or

broken down, into manageable categories on a variety of levels--word, word sense, phrase, sentence, or theme--and then examined using one of content analysis' basic methods (i.e. conceptual analysis) or relational analysis [121].

The interviews were first transcribed as accurately as possible. As data was gathered and was analyzed; data collection was shaped through sequential analysis. Initially the data was read and re-read to identify index themes and categories [122]. All the data relevant to each category were identified and examined using a process called constant comparison [123], in which each item is checked or compared with the rest of the data to establish analytical categories [124]. This required a systematic approach. Interviews were coded and the statements grouped into single themes and then themes were compared [125]. All the responses for each category were reviewed one by one and the main themes from the responses from the participants were extracted. A detailed analysis was then conducted by summarizing the themes reflected in the responses. Descriptive views were noted along with conspicuous variations. Concept forming involved reading data collected to identify underlying patterns. At this initial stage, data collected through semi-structured interviews was analyzed to initially identify the current trends in education as well as to develop an in depth understanding of the participants. The questions in the semi-structured interviews were formulated in such a manner so as to capture the entire spectrum of related topics, thereby arriving at a detailed descriptive assessment. Awareness of participants regarding an understanding of the importance of health informatics was assessed and existing systems were reviewed so as to determine possible improvement criteria. The resultant data contributed towards assessing perceptions of market demand and skill requirements for health informatics professionals.

This contributed to describing requirements which encompass the comments / suggestions of the administrators of academics. As well as keeping in mind the perceptions of potential employers in the form of the Directors, with the outcome reflecting the extent of need for the establishment of an appropriate health informatics education system in Karachi Pakistan.

## **CHAPTER 4 - STUDY FINDINGS**

### **4.1 Introduction**

Based on the data collection and analysis described in previous chapters, this chapter provides an overview of the observations and study findings in assessing the need for health informatics education in Karachi, Pakistan. The chapter is organized by themes that emerged from the qualitative research. The subjects were administrators of healthcare facilities and directors of academic institutes.

### **4.2 Demographics**

In order to describe the demographics of the participants, demographic questions provided general information about the participant's institutions, job titles and work responsibilities. A total of thirty subjects were identified belonging to two categories: Administrators of healthcare institutions and directors of academic institutions.

Fifteen heads of administration of healthcare institutions in Karachi, Pakistan, were interviewed (see table 1.2). These subjects belonged to a variety of healthcare services in order to achieve a diverse mix of subject areas. Twelve of the subjects were working in a managerial capacity and three of them were involved in leading the development of healthcare related processes for a healthcare institution.

Fifteen directors of academic institutions in Karachi, Pakistan, were also interviewed. The subjects had backgrounds in education, teaching and research in a variety of subjects. One of them conducted training of health staff in the provinces and oversaw public health schools. Another subject was involved in teaching both

undergraduate and postgraduate students. One subject was involved in the teaching health informatics as well as managing a department. Two subjects were directly involved in assisting and teaching about the implementation of electronic health records. Three of the subjects were engaged in planning and management of computing infrastructure, databases and enterprise storage. Seven were directly involved in research activities (see Table 1.2 and 1.3 for more details).

**Table 1.2**

<b>Summary of Demographic Information of Administrators</b>			
<b>Subject</b>	<b>Position</b>	<b>Title</b>	<b>Responsibilities</b>
1	Health Department	Head Of Department/ Health Department	Managing chain of hospitals
2	Acting Head Community Health Integrators, AKU- CHS	Acting Head of Department	To look after the activities under the integrator
3	Consultant Obs/Gyn	Administrator	Managing Basic Health Unit
4	Department of Medicine	Director	Managing Chain of Hospital
5	Department of Health Care	Director	Managing Integrated Hospital System
6	Department of Surgery	Head of Department	Managing Basic Health unit of the hospital
7	Health care	Director	Managing multiple physician offices
8	IT	Manager	To maintain and develop Health record solutions for the hospital
9	Health Care	Director of Residency	Managing and developing program for Institute
10	Health Institute	Administrator of Institute	Managing multiple clinics of Institute
11	IT Manager	Manager	Managing and developing program related Health Informatics
12	IT	Manager	Developing processes for Health Informatics
13	Health Care	Head Of Department	Managing Health record
14	Health Care	Manager	Manage Health clinics
15	Orthodontic Surgeon.	Acting Head of Department	Manage multiple physician office

**Table 1.3**

<b>Summary of Demographic Information Directors</b>			
<b>Subject</b>	<b>Position</b>	<b>Title</b>	<b>Responsibilities</b>
<b>1</b>	Manager Infrastructure	Manager, Databases & Systems	Planning and management of computing infrastructure, databases and enterprise storage
<b>2</b>	Medical Records Department	Manager	Managing medical records at Shifa International Hospital Ltd. Including folder distribution to inpatient / outpatient areas, indexing and coding and medical transcription
<b>3</b>	Deputy Director	Trainings	To conduct trainings of Health staff of province, technical control over all public health schools of the province, and many more
<b>4</b>	IT Consultant	Director	Assist and teach in the Implementation of Electronic Health Records
<b>5</b>	Director Service	Director	Education, Care, Research of Institute
<b>6</b>	Consultant Department of Surgery	Head of Department	Clinical, Teaching Undergraduates and Post-graduates
<b>7</b>	Associate Professor.	Head of Department	Teaching and research of the Institute
<b>8</b>	Health Institute	Head of Department	Research and Education of Institute
<b>9</b>	Head of Department	Head of Department	Responsible for Health Education
<b>10</b>	Head of Department	Head of Department	Research and education
<b>11</b>	Administrator	Administrator	Responsible for research work
<b>12</b>	Head of Department	Head of Department	Responsible for Health Record
<b>13</b>	Director	Director	Director of Research and Education
<b>14</b>	Manager	Manager	Responsible for Research and education of Health Informatics
<b>15</b>	Head of Department	Deputy Manager Medical Records	Teaching of Health Informatics

### **4.2.1 Sample Size**

Thirty participants including fifteen directors of academic institutions and fifteen heads of administration of healthcare institutions participated in the study. A review of other qualitative research indicated that this number of subjects is typically needed to reach saturation.

### **4.3 Results: Directors**

This section of the thesis will present the results from the analysis of the interviews with the directors of academic institutions. The subsections of the results will be organized according to participant (i.e. director and administrator) responses to the interview prompts.

#### **4.3.1 Understanding Health Information**

The concept of health informatics was well established in the minds of the directors and in response to the question “How would you define or describe health informatics?” Most of the directors indicated that this field was about the collection, analysis and systematic dissemination of clinical information. For example, one participant indicated that health informatics is “a system of recording, storing, archiving and retrieval of patient related data.” (Director, subject 6, question 2). Another more detailed explanation given by another director was that health informatics “deals with the resources, devices and methods required to optimize the acquisition, retrieval, storage and use of information in health.” (Director, subject 13, question 2). The link with computer technology was not ignored as five participants made note of this stating that “health informatics is the study of computer science compiled with health sciences.” (Director,

subject 8, question 2). Another stated that “any information which is health related which is composed compiled, stored in a computerized fashion is called health information.” (Director, subject 14, question2). One Director stated: “I think it is the information about a patient recorded right from his/her entrance in the hospital till his/her discharge or death.” (Director, subject 3, question 2). This point of view highlights the concept of “completeness of a patient record” whereby an entire history of information is maintained throughout a patient’s life right until the very end.

One viewpoint was expressed as follows: “health informatics deals with the analysis and dissemination of data and knowledge related to health of individuals using information technology.” (Director, subject 7, question 2). An interesting comment from one participant was that “health informatics can be defined as how the information from different sources can be collected and then when required can be utilized for the betterment of the sick people in a systematic way.”(Director, subject 15, question 2). This brings to mind the fact that an orderly compilation of data has a direct effect on the outcome of disease. The word “systematic” is noteworthy in his quote as it forms the basis of health informatics from his perspective. One Director remarked that health information is “the management of data and resources for information in health and biomedicine.” (Director, subject 1, question 2). Another definition of health informatics was that it referred to “proper maintenance of patient records.” (Director, subject 2, question 2).

In summary, on being asked, “How would you define or describe health informatics?” the directors defined and described health informatics as a combination of

health and computer science which helps optimize the collection, analysis and systematic dissemination of clinical information by using information technology.

### **4.3.2 Medical Records**

The participants identified that medical records were a systematic way of recording patient information. Systematic documentation to maintain a patient record was indicated by five directors as the basis for the creation of a medical record. One definition given was that “These are patient information in a systematic manner.” (Director, subject 8 question 3 a). A similar notion was expressed as “in general it is a systematic documentation of a single patient’s individual medical history.” A very thorough explanation came from one participant who said, “The documents of the patient’s medical history, examination and diagnostic/therapeutic procedures/treatment etc. are all collected in a file for his/her next episode of care. These documents serve for medical, legal, administrative and research purposes.” (Director, subject 15, question 3 a). One participant stated the medical record was “record of a patient’s visits.” (Director, subject 7, question 3 a). One director noted the following about medical records: “It’s the record of a patient maintained in the hospital or health facility during his/her stay in the hospital, like an admission slip, ward chart, diagnosis, medicine given, daily rounds, discharge card or death certificate etc.” (Director, subject 3, question 3 a). The participant is focusing on a specific period of hospitalization i.e. inpatient stay. Until such time as the patient is discharged, all the clinical information is compiled and stored in his/her medical record. A subsequent hospitalization will result in yet another compilation of data for that particular admission. As one Director indicated the medical record “documents the complaints and illnesses of a patient and care provided to that

patient by various care providers over a period of time.” (Director, subject 4, question 3 a). Here, the point to note is the mention of various care providers. As such this could mean a “revolving patient record” with the patient visiting many facilities over a period of time. One director simply stated that medical records are “patient medical record files.” (Director, subject 11, question 3 a). Another stated that it refers to “patient’s information.” (Director, subject 12, question 3 a). This is a simple but direct answer pertaining to storage of clinical data in a folder.

In summary, participants indicated understanding with regard to health history utilized in continuity of care and grasped the basic notion that medical record compilation entails a fair bit of clinical documentation. The directors all indicated that an orderly sequencing of information led to a well-organized patient medical record. They clearly expressed thoughts regarding the medical record as a “compilation of clinical documentation.” (Director, subject 2, question 3 a).

#### **4.3.4 Medical Record Keeping**

Medical record keeping is seen as a form of storage of patient information, which should be easy to retrieve when required. One director stated that it was a “record of patient encounters collected in a central location in an organized manner.” (Director, subject 1, question 3 b). Another claimed that this was simply a method of “maintaining patient reports in an orderly manner.” (Director, subject 11, question 3 b). The privacy issue was not left unnoticed as four directors commented upon the fact that patient records must be secure. One participant stated that medical record keeping is “patient information kept securely.” (Director, subject 8, question 3 b). A similar comment was

that it is “protection and storage of patient information.” (Director, subject 9, question 3 b). A very basic response about medical record keeping was that “it is an administrative function aimed at ensuring the safe custody of patient charts and proper completion of all contents.” (Director, subject 4, question 3 b). This response evokes with it the “non-technical” element with a reference made to the administrative nature of medical record keeping.

One participant’s response was as follows:

“There are two ways of medical records storage or keeping, one is paper-based which is known, and the new one is electronic medical storage in computers.”  
(Director, subject 14, question 3 b).

In contrast, the methods for maintaining the medical records are expressed here – paper based versus electronic data.

In summary, medical record keeping is defined as being a record of patient encounters in an organized manner while ensuring that patient information remains confidential which is either electronically stored in a computer or a paper-based.

#### **4.3.5 Responsibility**

The responsibility for maintaining medical records is a huge undertaking and many directors are hesitant before expressing their views regarding medical record keeping. One director’s comment was that the “Medical Records Department is responsible for medical records as well as nurses and doctors.” (Director, subject 2, question 3c). One participant went further while commenting about the privacy of such

records. He stated, “all those entities who take part in the patient’s wellness are responsible and the medical records department is responsible for all medical record functions where the record is stored, maintained and when needed should be available. Confidentiality and privacy are the most important things for all those involved in the health of the patient.” (Director, subject 15, question 3c). One director felt that responsibility for maintaining medical records should start at the very top of the organization as noted below:

“Staff is deputed by Medical Superintendent/In charge of concerned Health Facility for maintenance of all medical record” (Director, subject 3, question 3c).

In this view, the Medical Superintendent should ultimately be the responsible party, who will ensure competent staff to maintain medical records at the facility. However, this idea may not be practical since the Medical Superintendent is more than likely burdened with more pressing matters at the institution.

Another answer was given by another director who laid the responsibility on “Health Information Management System (HIMS).” (Director, subject 7, subject 4, subject 11, subject 14 question 3c). This is important when it comes to medical record keeping with HIMS is seen as the most responsible entity for this activity. One director stated that it is the responsibility of the “organization” involved (Director, subject 1, question 3c). The “Office Manager” (Director, subject 10, question 3c) was also suggested as being a candidate in the list of those responsible individuals.

#### **4.3.6 EHR**

The concept of electronic health records appeared to be understood by the subjects with the core component being computerized patient information, which can be easily accessed. This perspective was echoed by no less than thirteen directors. One defined electronic health records as “computerized record keeping is called Electronic Health Records.” (Director, subject 3, question 3d). One participant when describing the concept stated that it was quite simply “health records in electronic form.” (Director, subject 9, question 3d). Another explanation was that “the patient’s health records is stored, maintained and retrieved via electronically by use of computerized system.” (Director, subject 15, question 3d).

With the advent of the electronic health record (EHR) the notion of a hi-tech data compilation and storage system has emerged, where clinical information could be electronically integrated and easily accessed. Statements from the directors reflected this view as one of them indicated that the EHR is an electronically managed system. The idea of access through an EHR was brought to the fore in a statement saying that this system would provide “accessibility from the point of care.” (Director, subject 7, question 3d). To summarize, the key word perspective was that the EHR is a computerized system, as one of them stated that the EHR was the:

“Record of patient information and encounters managed electronically” (Director, subject 1, question 3d).

“This is system based storage of patient medical records which can be accessed from various viewing stations within the institution” (Director, subject 2, question 3 d).

Here the emphasis is directed towards dealing with electronic health records and reflects improved ease of access to patient records. This is a definite advantage over paper based records and is the prime reason why facilities are looking to acquire electronic health records.

“It is an evolving concept defined as a systematic collection of electronic health information about individual patients.” (Director, subject 10, question 3 d).

The comment above reflects the fact that electronic health record are still in an embryonic state and there is still a long way to go.

In summary, the concept of electronic health records (EHR) is defined as one where patient records are stored in a computer and are easily accessible from various places within one institution. The EHR is seen as making patient care easier hence is viewed as an advantage over paper-based records.

#### **4.3.7 Skills Needed**

The perception of directors regarding the skills needed to manage medical records seemed somewhat varied, but most directors argued that good management skills would form a strong basis for success. This was reflected in the responses of four participants. One noted that “a certified Diploma in medical record management from any recognized institution within the country or abroad is mandatory for management staff. All the necessary skills would be incorporated in this Diploma” (Director, subject 2, question 4). Another stressed that “with basic health care/ medical background the person should have excellent management skills, networking, communications and administration skills.” (Director, subject 14, question 4). Furthermore, no less than seven subjects referred to

knowledge of medical terminology as being a prime skill needed to systemically manage medical records. As one director noted the pertinent skills related to “dealing with doctors and other health professionals, knowledge about health issues, terminology knowledge, etc.” (Director, subject 9, question 4). Still another subject stated “sharp and knowledgeable skills are required, one should be aware of medical terminologies” (Director, subject 10, question 4). The skills needed to successfully embrace the health informatics concept were discussed at length. Directors noted multiple skills are required from individuals of diverse backgrounds so those persons can be successful in this field. Apart from the basic “computer knowledge” (Director, subject 3, question 4) that was needed, the skills needed to maneuver within the healthcare system prompted consideration of “specific expertise” (Director, subject 6, subject 7 question 4), as well as a complete understanding of medical terminology.

According to the directors further skills to be nurtured included a “good understanding of the medical terminology and concepts; formal medical coding certification; communication and administrative skills to deal with customers (mostly clinicians and researchers) and skilled and unskilled staff” (Director, subject 4, question 4). The emphasis expressed here is on understanding medical related concepts and theories, which will be useful when dealing with clinicians / researchers. As well, several directors indicated that administrative skills should not be ignored as this will come in handy when attending to skilled / unskilled staff. One comment related to skills required along these lines was made by a director when he stated, “health information management requires clinical skills, technological skills and leadership/management skills. Medical records demand privacy, so those who become involved in health data

management must be detail-oriented, organized and be able to keep files confidential.” (Director, subject 15, question 4). The skills defined in this comment are specific and reflect basic aspects of Health Informatics. As well, a note is made regarding confidentiality of patient records. The reference to leadership skills was also expressed by this subject.

In summary, the perception of directors regarding the skills needed to manage medical records varied. However, most directors argued that good management skills would form a strong basis for success while also highlighting the importance of having knowledge of medical terminology as this field requires constant interaction with doctors and other health professionals. Other directors suggested that a formal medical coding certification and good communication and administrative skills are required.

#### **4.3.8 Means of Management**

Managing medical records can be an arduous task owing to the complexity of the data stored. Three directors expressed the need for seamless blending of manual records and computerized data. One director noted that management at his institution utilized a “combination of analogue (paper patient records) and electronic (soft copy laboratory and radiology record)” records (Director, subject 6, question 5). Another mentioned that his organization utilized a “mostly paper- based and partially computerized” system of management (Director, subject 14, question 5). A specific approach was adopted by one director at his institute when he explained the entire system as follows, “the patients on their first visit to the hospital are allotted a Registration Number and so all their records (doctor’s notes, labs reports etc.) are assigned this registration number and a file is

generated with this registration number and all the documents are kept in it. We have a file which has two parts in a single file; one for out-patient and the other for inpatient. The sequential filing system is maintained by coded numbers. All the visit notes etc. without admission are kept in out-patient section of the confidential medical records file. And those which are produced during admission are kept date-wise in the inpatient side”. (Director, subject 15, question 5).

Management of medical records was seen as the combined responsibility of IT and the health information management department, who were identified as key stakeholders. One director remarked that the above pertained to “manual medical records.” (Director, subject 2, question 5). Another stated that such management was only possible via “HIMS.” (Director, subject 7, question 5).

One participant working for a government organization stated the following:

“Though I am working at provincial Health Directorate, not at a hospital, but when I was working as D.M.S at a tertiary level hospital, the records were still entered manually in registers” (Director, subject 3, question 5).

It is apparent from this remark that the participant perceives that government entities are depending on old technologies (i.e. manual entry of data).

Another Director remarked:

“AKU has HIMS department with appropriate skill mix” (Director, subject 4, question 5).

Here, the subject argued that ownership of medical records is well directed with “an appropriate skill mix”. As is typical, HIMMS is the recognized body for managing medical records. The mention of “appropriate skill mix” is very relevant as this would impact on the composition of the HIMMS team, which includes leadership, management, technical, skilled and unskilled staff. A comment was made by one director regarding security of records. At his facility, “the files are placed on secure password protected servers which are accessible only to authorized personal.” (Director, subject 11, question 5). The point made here is that medical records at this facility are well protected, thereby leaving little room for inappropriate use of clinical documentation.

In summary, in order to manage the medical records efficiently, it is important that they be stored both as manual data and computerized data. Besides where the data should be stored, emphasis has been given on the skills needed by a HIMMS team: leadership, management, technical, skilled and unskilled staff.

#### **4.3.9 HI Specialist**

The general consensus among the Directors is that there is a need to cultivate a basis for establishing HI specialists. At least six directors argued for the growing need for this very specialized field of service. One participant detailed how quality at a healthcare facility could be enhanced with the introduction of trained HI specialists. He went on to say “any healthcare institution with high level of automation and engaged in research or continuous quality improvement can benefit from a health informatics specialists. In Pakistan, there are not many health care institutions that would fall in this category. However, with increasing awareness / interest in the clinical community about

the EHR / EMR demand for HI Specialists will increase in near future.” (Director, subject 4, question 6). This was again reflected in the words of another director who said, “The more specialists in this field the more better the result will be in improving health care.” (Director, subject 10, question 6). Emphasis in the need for imparting training in order to enhance quality was echoed in the words of another participant who stated “There is a huge demand for qualified staff with necessary skills to manage patient medical records, which is further supplemented with specific in-house training.” (Director, subject 2, question 6). Almost all participants identified HI specialists as being needed with a growing awareness of health information management in the population. The dearth of such specialists was clearly expressed as directors spoke of the “growing need” (Director, subject 15, question 6).

However, the place for trained health informatics personnel was not recognized by one director who commented as follows:

“Hardly any at the moment as there is no system working to accommodate them”  
(Director, subject 9, question 6).

Here, the director is referring to a perceived lack of supportive infrastructure for health informatics in this part of the world. Along these lines, another director commented that:

“First of all a proper record system has to be laid out by higher authorities, some organization/ department needs to be kept in charge to make sure that the system is followed.” (Director, subject 11, question 6).

This director argued that a support system needs to be in place before people skilled in health informatics can be absorbed into the overall scheme of things.

In summary, the quality at a healthcare facility can be enhanced with the introduction of trained HI specialists because a health informatics specialist (HI) helps the institution engage in research and continuous quality improvement. However, a major concern is the lack of accommodation or resources to accommodate HI specialists in Pakistan without which their training is irrelevant.

#### **4.3.10 HI Education**

The status of health informatics education in Karachi was seen as being in a low state by practically all fifteen participants. There were negative comments regarding the state of HI education with words like “primitive / poor”, “very bad”, “quite minimal” being used by several different directors to describe the state. One director when asked about HI education in Karachi stated that “To my knowledge, there is none” (Director, subject 12, question 7). Dependency on old ways with somewhat of a resistance to embrace the future was highlighted as the problem by one director who explained that “the status of health informatics in Karachi is at a very low standard. Because large hospitals somehow care for health informatics education but the majority of hospitals do not have a proper system and nor do they think it is necessary for them so they manage their systems an old fashioned way” (Director, subject 15, question 7). One participant stated the following:

“Its importance is being realized and the awareness is increasing but the level and quality of HI education is low and scarce” (Director, subject 1, question 7).

Although stating that the status of HI education is low, this Director was optimistic for the future and felt that the field could make a positive impact on patients’ health.

Another comment was made by one Director regarding the status of health informatics education in Karachi. He said, “nil- I don’t think that there is any institute who conduct the health informatics subject seriously” (Director, subject 14, question 7).

This is a very direct statement, which indicated that the participant perceived that there is little capacity for health informatics education in Karachi. The concept of health informatics education was identified as a weak area, with most of them rating it as “poor” (Director, subject 5, subject 6, question 7), “very bad” (Director, subject 9, question 7), and “not much” (Director, subject 10, question 7).

In summary, health informatics education is seen as being “primitive/poor,” “very bad,” and “quite minimal.” The lack of awareness of the importance of health informatics and the fear of change by healthcare institutions has led to the low standard of health informatics in Karachi, Pakistan. Even though its importance is slowly being recognized, HI education remains scarce.

#### **4.3.11 Need**

Health informatics is seen as an evolving field in most countries, more so in the developing world. The need for health informatics education programs was expressed by nearly all directors, fourteen of whom responded with “yes” when asked whether there was a need for such programs. One participant went on to say, “Yes, I strongly recommend health informatics education programs in the whole country” (Director, subject 3, question 8), cautioning against limiting it to some localities but rather arguing that this field should permeate throughout the length and breadth of the whole country. The need for a Masters program in health informatics education was seen as nascent in

this part of the world with a significant need to increase awareness about the subject. The realization was voiced by one director who claimed that the “subject needs introduction in the whole country” (Director, subject 3, question 8). At the hospital level, one director expressed need for introduction of higher level scientific training in this field in the following way:

“Yes, but meanwhile the science needs to be introduced at more and more hospitals.” (Director, subject 8, question 8).

The point made here is that health informatics needs to be introduced directly at the point where is it most needed i.e. at hospitals. This director indicated that provision should be made to encourage awareness of health informatics at healthcare facilities.

In summary, health informatics is an evolving field in developing countries like Pakistan. The directors responded positively to the need of HI education and suggested that health informatics programs should be offered in the whole country and a Masters program be introduced as well. The focal point of education in health informatics according to the participants was hospitals.

#### **4.3.12 Level of Degree / Diploma**

Multiple degree programs were noted as being needed in conjunction with increased availability of Faculty to teach these subjects. No less than four directors claimed that a Masters program was the optimum course. A Masters degree in Health informatics or related subjects was seen by six Directors as being the appropriate level of study. One Director argued for a “Masters in health related subjects” [Director, subject 7, question 9]. A more specific comment related to need for a “Masters in Health

Informatics”[Director, subject 10, question 9]. Four of the subjects expressed the need for development of a Bachelors degree. Six directors argued for a Diploma program as the choice of study with one participant noting the importance of a “medical record management diploma.” [Director, subject 2, question 9]. A most interesting comment related to a three tier strategy as expressed by one director, "It may be a three tier system:

A: Basic/Elementary level/Certificate Course

B: Advance level/Diploma Course

C: Professional level/Degree course" (Director, subject 15, question 9)".

One director argued for “proper training of managing and maintaining medical records.” (Director, subject 11, question 9). The comments above indicate that most participants focused on the Bachelors and Masters as program levels for Health Informatics. In contrast, this director argued that courses pertaining to management of medical records must not be ignored; a position that could easily be lost when looking at the bigger picture.

An interesting observation was as follows:

“To start off with a diploma program would be sufficient, but we need to educate our students at the Masters level” (Director, subject 12, question 9).

This reply reflected the opinion that knowledge specific to health informatics should be introduced at the grassroots level. The director expressed the view that a base should be formed before building up on it with higher educational programs related to Health Informatics.

### **4.3.13 Topics**

A diverse array of topics that could be included in HI education was proposed as being suitable for a degree / diploma program in health informatics. Directors provided some very interesting answers. At least eight of them made note that medical terminology must be a strong contender in the list of compulsory topics. Blended in their answers was an emphasis on computer skills with at least 7 participants noting system based topics. Ideas included topics such as, “computer, and some subjects/topics related to health terminologies.” (Director, subject 3, question 10). Another stated that such topics “should cover – medical terminology / concepts, ICT concepts such as database design, data capture, and SQL; EHR; Clinical Decision support systems; data analysis techniques and tools; and, workflow analysis and design.” (Director, subject 4, question 10). One answer given by a director was that he was “not qualified to answer” (Director, subject 5, question 10).

A variety of study topics related to multiple fields of knowledge were identified as being needed to be included in appropriate curricula. “Record keeping” was mentioned as was “knowledge about computers.” (Director, subject 8, question 10). An additional topic suggestion made by one director was that of “Mathematics, terminology.” (Director, subject 12, question 10) which he argued was needed based on multi-level mathematics competencies for data analysis.

One director who stated the following in describing a plan for introducing different topics:

“This depends upon the approach.

A: Basic/Elementary level: History, Introduction, Need/Scope of Study, as a General Awareness program for those who wants to know what the health informatics is.

B: Advanced level: In this course, some fundamental concepts would be taught such as Biology, Chemistry, Statistics and specialty about the Health Information as a subject.

C: Professional level: At this level, the thorough knowledge of Anatomy, Physiology, Chemistry, and Statistics. Also ICD-9-CM /ICD-10CM, coding system must be taught at a professional level. Besides these the Management Subject should also is included." (Director, subject 15, question 10).

The mention of relevant topics included the following:

Record keeping (manual / electronic health record), medical transcription, indexing and coding (ICD). (Director, subject 2, question 10).

Here the director has mentioned technical fields related to the basics of record keeping, thereby acknowledging the importance of varied types of courses. Another suggestion was made by one director regarding the topic when he said, "knowledge about computers, life sciences etc." (Director, subject 8, question 10) is needed. Although the topics related to computer studies were voiced by most participants, topics related to life sciences were not. This director argued for inclusion of courses related to life sciences as being needed in order to complete the health informatics curricula. In summary, knowledge of medical terminology, computer skills, database design, record keeping, medical transcription, indexing and coding were all topics that were proposed by the participants to be included in the curriculum of a degree or diploma in HI education.

#### **4.3.14 Limitations**

It is difficult to obtain resources to introduce new educational programs in HI. This was seen as a major problem by most directors, six directors stated that there were “no” resources available in this part of the world for such programs. One opinion was that “there are limited resources, may be possible for private institutions.” (Director, subject 10, question 11). Another suggestion was made by one participant who said, “As there are some resources available in the market, but a train the trainer program can increase the number of educators. And the infrastructure is mostly available at large institutions.” (Director, subject 15, question 11).” One director said, “Yes. Initially the number of students will not be significant and the limited resources available should be able handle the workload.” (Director, subject 4, question 11). The paucity of resources to support new programs was highlighted by a number of subjects who also indicated that it requires management of distributed funds. Four directors spoke about “limited resources” (Director, subject 2, subject 10, subject 14, question 11). In summary, directors identified that new educational programs in HI were seen as a major problem by most directors. The necessary infrastructure to start a HI program is only available at large institutions. Even though there is a lack of resources to start such programs in Pakistan (according to the directors), it was recommended that a train the trainer approach could increase the number of individuals prepared in HI.

#### **4.3.15 Need to Introduce Masters Program**

The answer to the question of whether there is a need to introduce a Masters program was responded to positively with a “yes” given by eleven directors. One stated,

“Yes. A local facility providing a Masters program would be feasible because many candidates then have to travel abroad to complete such a course.” (Director, subject 2, question 12). Another said, “Yes, because there is no such program in place right now.” (Director, subject 11, question 12). An answer which focused on the positive impact of a Masters program was the following: “Yes. The awareness in the institutions/physicians is increasing and the educational programs can be aligned to produce qualified persons in line as the institutions adopt this important area.” (Director, subject 1, question 12). Only one participant seemed to indicate that there was no need for a Masters program and when asked if there was a need to introduce such a program, he simply replied “no.” (Director, subject 8, question 12). One director expressed the view that there is a need to start at a lower level. He explained this by saying, “We should start off with the primary level at first so that there is awareness about health informatics and then move to a higher level.” (Director, subject 12, question 12). Another director stated:

“My wild guess is that 1 or 2 Masters will be absorbed by the local industry (either in a healthcare setting or software house). Therefore, we need to do a cost/benefit analysis of running a regular Masters Program for HI”(Director, subject 4, question 12).

It was expressed by some participants that developing capacity at the Masters level will create responsible individuals to take the lead in nurturing this field. A participant asserted that this “program be conducted by the hospital” (Director, subject 7, question 12). The need to introduce such a program was seen as vital by two directors. Such a program would “enhance efficiency of patients' healthcare” (Director, subject 15, question 12) as noted by one participant. The “shortage of skilled people” (Director,

subject 3, question 12) to introduce and maintain such a program was also seen as problematic. In summary, the need for a Masters program was viewed positively and the idea was supported by the directors as they suggested that the existence of a Masters program locally would be feasible for those members of the society who cannot afford to go abroad and also those who would need to go abroad because there is no local Masters program. It was recommended that such a program be conducted by hospitals in order to ensure that those in the field are responsible individuals while also enhancing patient healthcare.

#### **4.3.16 Background of Students**

To foster sustainable growth in the field of health informatics, some directors argued that students entering a related Masters program must have sufficient potential to move from the program and subsequently establish themselves as pioneers, thereby disseminating their knowledge about health informatics. This was the thought expressed by most participants. At least eight directors felt that students should enter the Masters program after having attained a Bachelors degree. As one participant argued, “they must hold any Bachelors Degree of relevance.” (Director, subject 9, question 13). Another participant voiced the opinion that they must have “at least a Bachelors in science with a specialty in microbiology, physiology or a BSc in health information.” (Director, subject 14, question 13). One director was more open when he argued that the prerequisite study level be “intermediate (arts or science) oriented” (Director, subject 6, question 13).

Students having diverse backgrounds with a combination of medical knowledge and IT skills were seen as desirable. Most directors indicated that a prospective student must have a “minimum qualification of a Graduate.” (Director, subject 2, question 13). Two directors discussed the ideal of students having a medical background. Those with an IT background were also seen by many of the participants as being ideally suited for selection. Another argument made by one director was that “anyone demonstrating an aptitude” (Director, subject 1, question 13) could take up the challenge and make a career in this field. In summary, in order to foster sustainable growth in the field of health informatics, some Directors argued that students entering a related Master’s program must have sufficient potential to move from the program and subsequently establish themselves as pioneers. However, in order to do so the directors suggested prerequisites ranging from having medical knowledge to IT skills and a Bachelors degree in science. While one director suggested that “anyone demonstrating an aptitude” could make a career in this field.

#### **4.3.17 Topics to be Covered in Curricula**

A variety of subjects were explored when discussing potential curriculum content for a Master’s program. Four directors noted medical terminology as one of the main courses that needed to be covered. One of them said that the program should include “subjects like medical terminology, computer science, management etc.” (Director, subject 9, question 14). Another called for courses related to “medical issues, medical terminology dealing with physicians.” (Director, subject 10, question 14). One participant detailed a variety of topics, including the topic of medical ethics.

Two more participants reflected upon courses around the area of “confidentiality concepts.” Of relevance was the observation made by one director that “terminology related to Health Informatics” (Director, subject 7, question 14) would play a key role in the development of this field. Management courses were also seen as important. Three participants argued for training in medical record “coding” practices as an essential subject in the curricula (Director, subject 2, subject 6, question 14). In summary, medical terminology, computer science, management, medical ethics, confidentiality concepts, terminology related to health informatics, and coding were recommended by various directors when discussing potential curriculum content for a Master’s program.

#### **4.4 Results: Administrators**

In this section the interview responses of administrators of healthcare institutions will be discussed, in terms of themes that emerged from the interviews with them. The findings are organized by administrator responses to interview prompts.

##### **4.4.1 Understanding Health Information**

Most of the participants expressed a more or less similar thought that health informatics is about documentation of all patient related data in an organized fashion, thereby providing a source of information which is easily accessible to healthcare providers. As one administrator pointed out “health informatics is a system that collects, manages, analyses and interpret data for decision making” (Administrator, Subject 2, question 2). This point was further addressed by another participant who stated, “Health informatics can be defined as the combination of information systems within healthcare. It deals with the resources and methods used to optimize the storage and retrieval of

information in health and biomedicine (Administrator, Subject 8, question 2). Further support for the above mentioned perspective was made by another administrator when he said, “it is defined as any documents / data related to health / pertaining to the patients which provides the information about the disease & its outcome for the future planning / activities” (Administrator, Subject 1, question 2). Another definition was given by one participant who referred to health informatics in the following way:

“System of keeping medical records in systemized way that can be accessed for future reference, research and training” (Administrator, Subject 7, question 2).

The reference to research is interesting as it indicates that health informatics is more than just the management of patient documentation in the current sense i.e. as and when the patient comes in for treatment. Although the concept that medical records can be used for research and training was noted by this administrator, it may be noted that none of the other participants picked up on this point. One participant noted that: “health informatics is an occupation dealing with computer science and healthcare” (Administrator, Subject 14, question 2). This comment indicates a link between information technology and healthcare. Another administrator expressed the above sentiment by saying, “it is an amalgamation of computer science and healthcare” (Administrator, Subject 15, question 2). Therefore, it is evident from these statements that the administrators considered that computer science is an integral part of the healthcare industry. In summary, health informatics was expressed by most of the participants as being a documentation of all patient related data in an organized fashion and being easily accessible to healthcare providers. Furthermore, it is viewed as an “occupation dealing with computer science and healthcare.”

#### **4.4.2 Medical Records**

A common theme that emerged during the interviews with the fifteen administrators is that a medical record is the proper documentation of a patient's medical journey. As one administrator put it, "Medical records: It means those personal and confidential records, which pertain to patients about his disease & related issues" (Administrator, Subject 1, question 3a). Addressing this notion further, another participant said, "These are individual patient's medical encounter records." (Administrator, Subject 2, question 3a). A direct approach was taken by one participant who argued that the medical record is "a patient confidential folder containing up to date information" (Administrator, Subject 3, question 3a).

An additional perspective was expressed by one participant as follows:

"Maintain patient confidentiality regarding health" (Administrator, Subject 6, question 3a); the confidentiality factor was addressed by this Administrator who emphasized that it must be "maintained". A further point regarding medical records was that it should: "Track history of patient's illness" (Administrator, Subject 13, question 3a); this refers to the need for systematic documentation by giving appropriate timelines and history of a patient's illness. It also brings to mind the need for a patient's illness to be documented completely and accurately. In summary, medical records are viewed by the Administrators as a confidential documentation of a patient's medical journey.

#### **4.4.3 Record Keeping**

Most of the administrators felt that medical record keeping pertains to appropriate management / maintenance of patient records in a secure manner. One participant said

that it was “the systematic approach to maintaining the medical records.” (Administrator, Subject 8, question 3b). Another administrator commented on a “specialized system/ for keeping medical records” (Administrator, Subject 7, question 3b). The reference to safety is captured by this participant who said that it was “chart keeping in safe way”. (Administrator, Subject 5, question 3b). Another Administrator supported this view by saying proper medical record keeping is needed, “to ensure proper and safe keeping of patient confidential” (Administrator, Subject 11, question 3b).

An interesting point was made by another administrator when he stated that, “It means keeping patients records for future correspondences and epidemiological / biostatistics studies” (Administrator, Subject 1, question 3b). One administrator when commenting about medical record keeping said that it was “a necessity for every hospital” (Administrator, Subject 9, question 3b). This refers to the perception that medical record keeping is a vital component of any healthcare facility. One participant touched on this when referring to, “administrative skills to maintain patient charts”. (Administrator, Subject 10, question 3b). This administrator further highlighted the need for non-technical personnel to form a reliable workforce when it comes to record keeping. In summary, most of the administrators felt that medical record keeping pertains to appropriate management of patient records in a secure manner by people with administrative skills which is “a necessity for every hospital”.

#### **4.4.4 Responsibility**

The responsibility for managing / maintaining medical records was seen as crucial and the majority of the participants [13] felt that this should be shouldered by HIMS,

which is becoming common practice throughout the world. Administrators argued for “HIMS departments” (Administrator, Subject 1, question 3c) and “HIMS staff” (Administrator, Subject 3, question 3c) to be responsible for this task. Two participants emphasized that the healthcare institution was responsible when they answered “Hospital management” (Administrator, Subject 4, question 3c) and “The relevant institution” (Administrator, Subject 14, question 3c) in response to who they felt was responsible. Regarding responsibility, one participant responded with:

“Care providers, hospital management and HIS department” (Administrator, Subject 2, question 3c).

This point of view stressed representation from the clinical perspective when assigning responsibility for managing medical records and was consistent with the argument that care providers are the principal handlers of medical records when rendering treatment. None of the other administrators provided this particular perspective.

Another administrator argued that:

“The hospital as a whole is responsible for keeping the records up to date and medical records department is responsible for the security and confidentiality of the records” (Administrator, Subject 8, question 3c).

Here, the relationship between the hospital and medical records department is highlighted through the sharing of responsibility for maintaining medical records. While stressing that the principal responsibility rests with the institution, this administrator also

argued that the medical records department is responsible for maintaining and securing the confidentiality of the stored medical records.

#### **4.4.5 EHR**

When asked about what an EHR was, twelve administrators made reference to computerized technology for maintaining medical records, which indicated an understanding of the basic function of an EHR. The above view was acknowledged by many participants with comments like “computerized information of patient records” (Administrator, Subject 11, question 3d). Another said it was a “computerized system of patient records” (Administrator, Subject 13, question 3d). A third remarked that it referred simply to “computerized information of record” (Administrator, Subject 6, question 3d).

A thought provoking remark was made by one participant when he said that the EHR is:

“The future of managing patient records” (Administrator, Subject 3, question 3d)

This administrator envisioned the ultimate goal of electronic health records.

Another administrator stated that it involved:

“Access of medical records electronically” (Administrator, Subject 7, question 3d).

This participant noted that access to medical records is facilitated when dealing with electronically maintained data and that care providers would prefer the digital format rather than manual records simply because information can be retrieved in a matter of seconds in the electronic arena. In summary, an EHR is defined by most of the

administrators as a computerized system of patient records. While one thought provoking statement by one administrator suggested that the EHR is “the future of managing patient records.”

#### **4.4.6 Skills Needed**

Several administrators stated that a combination of management skills and computer knowledge were required. One administrator mentioned “management and computer skills” (Administrator, Subject 12, question 4). Another participant came up with an array of skills that are needed, stating the following:

"Skills required may include; business knowledge, software knowledge, soft skills and data management skills” (Administrator, Subject 8, question 4)

A mixture of technical and non-technical skills was brought to light when one participant referred to “good knowledge of medical terminology of administrative skills” (Administrator, Subject 5, question 4). Similarly another administrator mentioned the need for, “Indexing Coding / administrative skills”. (Administrator, Subject 9, question 4).

One administrator also considered the following:

“Specialized training from medical record keeping” (Administrator, Subject 7, question 4)

This response is rather interesting in the sense that it touches upon a specialization directly related to the subject matter and does not consider support skills like medical

terminology or computer knowledge. He has focused directly upon the core topic of medical record management.

Another contribution came from one participant when he stated:

“Communication skills, working as a team, computer skills and medical terminology” (Administrator, Subject 15, question 4)

The essence of need for teamwork is brought out in this comment. The participant feels that proper communication is a key; a primary skill which can be supplemented with additional skills. This, he felt, is an important combination of skills for competent management of medical records. In summary, several administrators stated that a combination of management and computer skills is required for the proper management of medical records. While other suggestions included, business knowledge, software knowledge, data management skills, knowledge of medical terminology, indexing, coding, administrative skills, specialization in medical record keeping and communication skills.

#### **4.4.7 Means of Management**

As the field of health informatics evolves, there is a tendency to look towards enhanced ways to manage medical records. When asked about this, participant responses showed a tendency to focus on the manual system of managing records (6 participants). However, four administrators discussed a combination of physical and computerized records. As one participant noted records are needed “physically and computerized” (Administrator, Subject 11, question 5). Another supporting this

perspective mentioned the need for “computer / documentation”. (Administrator, Subject 1, question 5).

One administrator commented on the following:

“For urban health program, we are using EPI Data software” (Administrator, Subject 2, question 5). Here, he specifically mentioned a computerized system, although it seems that this software is utilized for a limited outreach program rather than a full-fledged electronic record in a healthcare facility. One remark related to the management of medical records was that it should be done “by a separate department” (Administrator, Subject 7, question 5). It is assumed the “separate department” is the medical records department / HIMS, but this administrator was vague in his response and did not provide further clarification. In summary, the participant responses to the evolution in the field of health informatics towards enhanced ways of managing medical records mainly focused on a manual system of managing medical records. Only four administrators discussed a combination of physical and computerized records.

#### **4.4.8 HI Specialist**

The need for health informatics specialists was emphasized in nearly all responses from the administrators. They recognized this as being a very important component in the overall healthcare system. As one participant stated, “Of course, nowadays there is an absolute need / demand to manage / keep medical record about the patients and its diseases in a properly skilled health informatics system for the improvement of poorly existing healthcare informatics system” (Administrator, Subject 1, question 6). Another administrator made a specific reference to the third world when he said, “high demand,

especially in third world countries” (Administrator, Subject 3, question 6). However, one administrator did not share the above view when he stated “There is not a big demand because most of the hospitals do not have this facility” (Administrator, Subject 15, question 6).

With regard to HI specialists, one participant mentioned the following is needed:

“Special training and certification” (Administrator, Subject 7, question 6).

The administrator felt that the HI specialists must be thoroughly competent in order to make their contribution significant in the healthcare sector.

One participant stated the following:

“This is a new concept in Pakistan but many institutions are incorporating it into their systems”. (Administrator, Subject 9, question 6).

Here, the subject felt the concept is seen as nascent in Pakistan but that it has immense potential for HI specialists in that country.

Another administrator stated the following regarding the need for HI specialists:

“A medical institute which has research set-up can benefit from health informatics specialist” (Administrator, Subject 10, question 6)

This administrator emphasized that research could be enhanced with the introduction of HI specialists. In summary, health informatics specialists are viewed as a very important component in the overall healthcare system by nearly all the administrators because they

feel that special training and certification is needed in order to improve the poorly existing health informatics systems.

#### **4.4.9 HI Education**

Regarding the current level of HI education, the view was very negative with six administrators stating that “none” existed when responding to a question about the status of health informatics education in Karachi. Supporting the notion of low status were comments made by other participants like “below par” (Administrator, Subject 3, question 7) and “below average” (Administrator, Subject 13, question 7). One even went on to say that he was “Not aware of any” (Administrator, Subject 15, question 7). Recognition of an educational program came from one participant who stated, “currently, I think that only Aga Khan University Hospital and Dow University Health and Management Sciences, Karachi are working on it with latest systemic approach” (Administrator, Subject 1, question 7). One participant stated, “There is no formal education available in Karachi”. (Administrator, Subject 4, question 7).

Another administrator stated:

“It is still in its early stages. More emphasis is required in order to provide quality education in this field” (Administrator, Subject 8, question 7).

Here, there is indication of a system in its early stages, which this administrator feels can be nurtured through a proper system of quality education. In summary, the current level of HI education is viewed as “below par” and “below average” by majority of the administrators. HI education is viewed as being in its early stage and it is suggested that the quality of education provided in this field should be given importance by increasing

awareness of the subject as only Aga Khan University Hospital and Dow University Health & Management Sciences, Karachi are working on it.

#### **4.4.10 Need**

The need for health informatics programs was noted by all fifteen administrators who participated. One participant remarked, “Yes, of course”. (Administrator, Subject 1, question 8). Yet another said, “Yes definitely” (Administrator, Subject 8, and question 8). These were noted as being very strong positive responses from all participants, which supports the idea that there is a definite need for health informatics education in Karachi, Pakistan. In summary, the responses gathered from the administrators suggest that there is a strong need for health informatics education in Karachi, Pakistan.

#### **4.4.11 Level of Degree / Diploma**

When asked about the level of education required in order to address the needs of HI education in Karachi, eight administrators argued for a Masters program. One administrator stated that the level that was needed was an MSc in Health Informatics “This should be a two year program with a diploma furnished after a year” (Administrator, Subject 2, question 9). Another participant also expressed this opinion by saying, “Masters in Health Informatics” (Administrator, Subject 5, question 9). One remark was made by another participant who simply said that the programs should be “Related to subjects” (Administrator, Subject 3, question 9), which was a somewhat vague response.

Another perspective on a proposed level of HI education was as follows:

“I think it should be a 3-4 year degree program should be introduced”

(Administrator, Subject 8, question 9).

Here a degree program seems sufficient with a length of 3-4 years.

The following remark was made by another participant.

“There should be done exposure to this field even at the college level”

(Administrator, Subject 13, question 9).

This administrator acknowledged that awareness of HI must start at the intermediate education level. This means that students will be well equipped to tackle HI programs at the higher educational level. In summary, in order to address the needs of HI education in Karachi, a Masters in Health Informatics was suggested by various administrators. While one of them suggested that HI education must start at the intermediate educational level.

#### **4.4.12 Topics**

A variety of subjects / topics were discussed with regard to topics that should be in curricula for a Masters / Diploma program in Health Informatics. An understanding of medical terminology and medical concepts was seen as a very important part of the overall program with six administrators making a case for such subjects. One such participant spoke of "Health management as an understanding of basic diseases and their vocabulary" (Administrator, Subject 7, question 10). One participant stated that the topics “Should cover medical terminology, administrative skills” (administrator, Subject 10, question 10).

Some non-technical subjects also were given consideration when one administrator stated: "Subjects might include from different fields as: a. Data warehousing, b. Business, c. Communication" (Administrator, Subject 8, question 10).

Another idea was put forth by one administrator as follows:

“All core concepts of health information are known but there must be visits to public and private facilities to expose participants to real life situations” (Administrator, Subject 2, question 10).

The reference here to practical aspects of training, which is a crucial element in any long term program. It is argued that these types of visits will give students an insight into the “real world” and enhance their experience of the program.

One participant remarked that topics covered should include:

“Subjects related to management of medical records” (Administrator, Subject 3, question 1).

Here, the administrator makes a clear argument for topics covered in a health informatics program that are specific to the management of medical records. These courses would strengthen the curricula as a whole and allow for more extensive grooming in the field of Health Informatics.

Another opinion regarding topics was the following:

“Subjects on medical record confidentiality, ethics” (Administrator, Subject 13, question 10); confidentiality of medical records is of importance, which was also noted by

this administrator who also considered the morality perspective when including ethics as a course in a health informatics masters.

In summary, an understanding of medical terminology, medical concepts, health management and management of medical records, administrative skills, business, communication, and confidentiality ethics were all subjects that were suggested to be topics that should be in curricula for a Masters / Diploma program in health informatics.

#### **4.4.13 Limitation**

The question of whether there are sufficient resources to introduce HI programs was seen as a limitation with eight Administrators stating “no”. One even went on to say, “None at all” (Administrator, Subject 15, question 11). One Administrator provided a “yes” and “no” answer when he said, “Yes for diseases but no for Specialized training for medical records keeping” (Administrator, Subject 7, question 11). Three participants responded in the affirmative, one who said, “At least in institution like AKU, yes” (Administrator, Subject 2, question 11).

One comment was expressed as follows:

“I personally think that we are still lacking in this area” (Administrator, Subject 1, question 11). The phrase “still lacking” implies that there has been meager resources when dealing with the future of health informatics in this part of the world.

One positive comment was made by an administrator:

“Maybe there are less resources but once these programs are initiated we might find good resources later on” (Administrator, Subject 8, question 11). This administrator

was optimistic and provided a sense of hope that the programs might find a lifeline once they are started. In summary, the responses received from the administrators suggest that there are little or no resources available to introduce HI programs. While one administrator suggested that once the program is initiated, it might be possible to find the resources later on.

#### **4.4.14 Need to Introduce Masters Program**

A majority of the 12 administrators said, “Yes” there is a need for introduction of a Masters program in Health Informatics. They recognized the extreme shortage of trained people in this field. One participant stated, “Yes, but not only in Karachi, there is an overall need / demand for such courses in throughout Pakistan on regular basis / refresher courses in order to not only to improve healthcare system in Pakistan but also for medical research activities”. (Administrator, Subject 1, question 12). One participant replied simply by saying “No”. (Administrator, Subject 11, question 12). He may have felt that there was no scope for a Masters program in health informatics– at least not right away.

Another administrator remarked:

“Yes. Just like any other Masters program, this field has its own aspects and we need people who can manage the health informatics”. (Administrator, Subject 8, question 12).

This administrator recognized the importance of specific subjects related to health informatics and the need to attend to these courses in detail master the topic areas. A point of note was made by one Administrator who said, “This is a relatively new field

and requires exposure” (Administrator, Subject 13, question 12). This participant is of the view that the awareness level needs to be highlighted by introducing more people to concepts from health informatics.

Another administrator noted: “Relevant Bachelors” (Administrator, Subject 14, question 12).

Here, the participant was not too eager for a postgraduate degree but rather stated that an undergraduate degree would suffice. In summary, the responses of the administrators suggests that there is a need for a Masters program in health informatics in Pakistan in order to improve the healthcare system and encourage medical research activities.

#### **4.4.15 Background of Students**

Regarding the educational background of students this was discussed by all the administrators and four of them felt that a Bachelors degree must be a prerequisite. They stated, “Bachelor degree, preferably in information or health related topics” (Administrator, Subject 2, question 13). Another participant stated, “Bachelors in biological sciences and health management” (Administrator, Subject 7, question 13). Reliance on medical concepts was brought to the fore by one Administrator who felt that students could be “Any health related qualified personnel, doctors, nurses, paramedics, pharmacist and Medical Transcriptionist with computer literate”. (Administrator, Subject 1, question 13).

A remark was made by one administrator as the following:

“Students of different backgrounds can be accommodated like business students, IT students, health informatics students or even those from medical backgrounds” (Administrator, Subject 8, question 13).

The educational diversity of perspective students is captured by this administrator who blends skills related to medicine, computer knowledge and business. A noteworthy addition to the concept was expressed as follows:

“Good communication skills, sound medical knowledge. Obviously intelligent people since this program deal with patient record” (Administrator, Subject 13 question 13).

Here, the administrator remarked upon the importance of patient records by suggesting that only “intelligent people” should be entrusted with them. A strong background of medical knowledge was also recommended by this participant.

One administrator remarked that students should have background in:

“Closely related subjects i.e. management, terminology, IT, ethics etc” (Administrator, Subject 14, question 13)

While subjects related to management, terminology and IT were mentioned by most administrators, the topic of “ethics” was not. This was the only one participant who mentioned ethics as part of the educational background of prospective students.

#### **4.4.16 Topics to be Covered in Curricula**

Topics to be covered in the curricula of a Masters program in health informatics education did include topics related to health informatics, which was mentioned by three

administrators (Administrator, subject 3, subject 4, subject 6, question 14). Systematic management of HIS was indicated as needing to be covered by one participant who included “Topics such as, framework to set up HIS, methods to assess HIS, methods of data collection and managing HIS” (Administrator, Subject 2, question 14). An array of topics was suggested by one Administrator who stated:

"Health Management, Medicine and Surgery and allied fields basic understanding" (Administrator, Subject 7, question 14)

Proper interpretation of medical language / terminology was being seen by this administrator as a relevant topic for a Masters program in health informatics. Another statement was made by one participant when he said, “I think they should be decided by looking at the programs that are being carried out by foreign universities” (Administrator, Subject 8, question 14). Reference to a survey was made by this administrator who felt that appropriate benchmarking and research should be done before deciding on topics for a Masters program in health informatics in Karachi. In summary, topics to be covered in the curricula of a Masters program in health informatics education according to the administrators should include subjects like: methods of data collection, managing HIS, Health Management and medical terminology.

#### **4.4.17 Record Keeping in Institution**

When asked about record keeping in institutions, some responses from the administrators focused on parallel systems of manual and digital records. As one participant stated this involves “partially computerized” systems. One participant stated “both by documentation / computerized” (Administrator, subject 1, question 15). The

majority of the administrators [7] were quick to point out the lack of computerized systems, thereby claiming that they rely on “physical” records i.e. paper based records.

One participant noted the following:

“For our program using Epidata for entry and SPSS for analysis” (Administrator, subject 2, question 15).”

Here, specific software was mentioned which is being utilized by this administrator at his facility. He seemed satisfied with the set-up, as it provided what he felt were acceptable results. A rather vague comment was as follows: “Through proper management of patient records” (Administrator, subject 3, question 15). It is unclear as to whether “proper management” in the above statement refers to a manual set-up, a digital framework or a combination of both. One participant stated: “We manage it through specific software, soft copies and back-up” (Administrator, subject 15, question 15). Here, the dependence is on a fully computerized system as no mention was made by this administrator about physical records.

#### **4.4.18 Extent of Computerization**

When asked if their facilities considered computerization of information important, fourteen administrators responded with a clear “yes.” Only one administrator responded with “No” (Administrator, subject 5, question 16). One administrator when discussing computerization remarked, “Yes, it is the way forward”. (Administrator, subject 13, question 16). The future of innovative technology was seen by this administrator, as leading to positive health outcomes in his facility. In summary, on inquiring about the means of keeping records in institutions, administrators either

responded that it focused on both manual and digital records combined or solely paper based records. Furthermore, the lack of computerized systems was highlighted.

#### **4.4.19 Collected Information**

Regarding the collection of information electronically, seven administrators indicated that computer systems were “partially” utilized in their institutions (Administrator, subject 4, subject 6, subject 9, subject 10, subject 13, subject 15, and question 16).

Regarding how satisfactory the current situation was, one participant provided the following explanation:

“Satisfactory, but most of health informatics systems are still lacking internet facilities as well as computer literate” (Administrator, subject 1, question 17).

The dependence on adequate IT support was brought to light in this remark. One participant stated: “It is almost fully computerized. But physical records are also maintained with IT” (Administrator, subject 8, question 17)”. Here, the administrator stressed the need to maintain manual records at his institution. Most facilities consider running parallel systems till such time as they are fully computerized.

#### **4.4.20 Information Integration**

Collected information is only viable if it can be used in an appropriate and user friendly manner. In view of the above, administrators were in consensus that healthcare information collected at different levels must allow for interoperability as information is integrated. Partially integrated systems were noted by some participants when they

stated, “partially integrated”. (Administrator, subject 9, question 18) and “somewhat, integrated” (Administrator, subject 13, question 18). Six administrators stated that collected information is integrated at their facilities while four said that it was not so at their institutions. One participant said that “It is difficult / problematic due to many reasons” (Administrator, subject 1, question 18). The challenge of establishing an integrated system for management of collected information was brought up by this administrator. Here, he referred to the enormity of the task without going into any specifics. In summary, the responses from administrators to the collection of information electronically indicate that institutions in Karachi, Pakistan partially utilize their computer systems because of the lack of IT support and internet facilities.

#### **4.4.21 Resources Available**

With regard to available resources, six administrators stated they had access to these resources by answering in the affirmative. Some admitted to a paucity of resources with comments such as “lack of resources” (Administrator, subject 1, question 19) and “not much” (Administrator, subject 5, question 19). Three participants said they had no resources to manage health information systems at their facility. One participant answered “Yes, HIMS” (Administrator, subject 7, question 19). In this answer, the administrator has clearly felt HIMS was the principal resource partner when it comes to health information systems. One notable perspective was as follows:

“Yes. Available resources include the IT team and the Medical Record Department” (Administrator, subject 8, question 19).

The point to note in this statement is the concept of teamwork of computer technology and medical record management, when it comes to maintaining health information systems. In summary, even though some administrators responded with an affirmative yes, on having access to resources in order to manage health information systems, there were others who claimed that their facilities provided no resources.

#### **4.4.22 Educational Institutions**

When asked if there were enough institutions to cater to the needs of health informatics in Karachi, 11 Administrators responded in the negative. Surprisingly one administrator responded the opposite way and answered “yes” (Administrator, subject 7, question 20) though he did not volunteer any specifics in this regard. A very strong point was brought forth by one administrator who said, “There should be more institutions for the said courses not only in Karachi but also in other major cities of Pakistan” (Administrator, subject 1, subject 7, question 20). The acute shortage of institutes for health informatics in the country is well noted by this Administrator who is cognizant of the fact that this is an evolving field which requires the necessary infrastructure to bloom. In summary, according to the responses of the Administrators, there are not enough institutions to cater to the needs of health informatics in Pakistan. The evolving nature of this field has been recognized by the Administrators and hence, establishing the necessary infrastructure is recommended by them.

#### **4.4.23 Programs Required**

With regard to programs required to form a sound curricula in this field, six administrators voiced their opinion that a “Masters” program would certainly strengthen

the cause of establishing health informatics. An interesting idea put forth by one participant was a “Diploma in medical record technician, medical transcription” (Administrator, subject 9, question 21). Two of them seemed comfortable with “related subjects” forming part of the curricula (Administrator, subject 3, subject 13, question 21).

A very distinct plan was suggested by one administrator:

“1-Regular Master & Diploma Courses. 2-Refresher Courses of Short Duration  
(Administrator, subject 1, question 21)

While Masters and Diploma courses had been advocated, the “refresher course” mentioned here is indeed a very innovative idea.

An interesting perspective was shared by one administrator who said, “Programs should be developed in view of increased demand of computerized health information management” (Administrator, subject 12, question 21).

Another unique concept was put forward by one participant as under:

“Perseverance, integrity and flair, skills etc.”(Administrator, subject 14,  
question 21)

These are more or less personality traits but it may be noted that students with the above traits are much more likely to succeed and become honest exponents of their skills. In summary, besides the usual suggestions of a Master’s program and a diploma course, a unique suggestion that was proposed by one of the administrators was the development of programs in computerized health information technology.

#### **4.4.24 Major Challenges**

In discussing major challenges in managing health information, at least five administrators elaborated on financial issues among other things. One participant commented upon "Meager resources both monetary and non-monetary" (Administrator, subject 2, question 22). Another participant noted challenges to be "Human Recourses and budget" (Administrator, subject 7, question 22). One administrator said, "Due to lack of resources, it is challenging" (Administrator, subject 4, question 22). Similarly, another participant shared this view; commented upon "lack of knowledge and resources" (Administrator, subject 5, question 22).

A fairly detailed description of challenges was put forward by this participant:

"1-Non availability of resources, 2- Improperly skilled & trained human resource, 3- Government's lack of intention, 4- High course fees, 5- No financial assistance, 6- Future / career opportunities" (Administrator, subject 1, question 22).

This participant touched upon a number of vital issues, all of which present as important challenges. The financial aspect is captured as well as training and resource issues. The most interesting point to note here is the perception of lack of enthusiasm by the government to initiate programs in this field. Keeping in mind the lack of supportive infrastructure in the health informatics sector in Pakistan, it seems that this administrator has presented a very crucial link.

Another claim was made by one administrator when he put forward challenges in managing health information in three points:

"a. Confidentiality of information, b. Security of information, c. Authenticity of information" (Administrator, subject 8, question 22).

This participant recognized maintenance of confidentiality as well as security of medical records as being of paramount importance to any healthcare institution. Privacy of patient records needs to be maintained at any cost, which is a well noted point by this administrator.

One administrator noted the following is important:

"Maintaining privacy, professionalism, attitude, competence etc." (Administrator, subject 14, question 22).

The challenge here is training a dynamic group of individuals who possess the traits mentioned by this participant. These individuals can then be dispersed into the public arena to make their presence felt in the health informatics sector. In summary, lack of resources, financial support, human resources, government support, career opportunities, authenticity of information, and the maintenance of confidentiality of information are all major challenges in managing health information according to the responses gathered from the administrators.

#### **4.4.25 Qualities in Prospective Employees**

The spectrum of qualities needed among prospective employees was viewed by administrators as being similar for other fields of interest and the mix included those with "integrity and focus" (Administrator, subject 2, question 23) as well as "Honesty and integrity". (Administrator, subject 3, question 23). It should be mentioned that two

administrators touched upon the validity of “analytic” skills (Administrator, subject 4, subject 11, question 23), which came out as an important point.

One administrator considered the following qualities:

"a Smart working, b. Hardworking, c. Passionate about their work, d. Responsible" (Administrator, subject 8, question 23).

This participant then defined an employee that any organization would like.

Another attribute mentioned by one administrator was that employees should be:

“Empathetic toward patients” (Administrator, subject 1, question 23).

This participant emphasized that when one is working at a healthcare facility, it is imperative not to lose focus of the patient. It is therefore important to maintain an empathetic attitude at all times.

One participant suggested the following qualities for prospective employees:

“Perseverance, integrity and flair, skills etc.” (Administrator, subject 14, question 23).

This unique blend of traits would certainly result in a potentially successful candidate, which is exactly what many organizations are looking for. In summary, according to the administrators, qualities needed in prospective employees include: integrity, focus, analytic skills, honesty, responsibility, an empathic attitude towards the patient and perseverance.

#### **4.4.26 Challenges Facing Healthcare Industry**

Needless to say, there are numerous challenges facing the healthcare industry, not just in the developing world but also in more established countries. It was noted by participants that a lack of skill based training, education and grooming impacts on the development of qualified, committed individuals that can work in the healthcare industry. One participant commented upon need for “Specialized education and training in health care management” (Administrator, subject 7, question 24). A diverse mix of students with different abilities is needed as was mentioned by another participant who spoke of “Computer and healthcare information, management skills, financial and human resources”. (Administrator, subject 14, question 24).

Another administrator expressed a whole spectrum of necessary attributes to handle the challenges facing the healthcare sector when he mentioned the following:

"1- Medical knowledge, 2- computer knowledge, 3- sufficient budget, 4- properly trained / skilled health employee, 5- Master trainer / facilitator." (Administrator, subject 1, question 24).

One administrator said, “There should be a grant to fund the program” (Administrator, subject 4, question 24). Procurement of adequate funds is the first step in getting a project started. This fact has been recognized by the administrator who has focused on attainment of a grant. Of note is the remarks made by one administrator when asked about the required skills

"a. Software skills, b. Business knowledge” (Administrator, subject 8, question 24)

This administrator clearly saw a basis for mentioning mastering of commerce as necessary to cope with the challenges of the healthcare industry.

One administrator made some related observations when he talked of “Government resources, stable education, integrated of health care of facilities”. (Administrator, subject 13, question 24). This administrator made a reference to integration of healthcare facilities and this is quite noteworthy as this would allow for sharing of materials / resources to sustain a healthcare facility. In summary, there are undoubtedly numerous challenges facing the healthcare industry and it was noted by participants that specialized education and training in healthcare management, computer skills, human resources, management skills, financial skills and medical knowledge are all necessary in order to ensure continued development in the healthcare industry. And in order to carry out programs that educate individuals in these areas, one administrator suggested that grants should be provided to fund such programs.

## **CHAPTER 5 – DISCUSSION AND CONCLUSION**

### **5.1 Summary of the Most Important Themes – Directors of Academic**

#### **Institutions**

The most important themes that were derived from the responses of the subjects fall under a number of different categories. Understanding of health informatics was expressed by participants as being an integration of computer science and healthcare. It was also clear that participants felt that capacity building was required for the development of skill sets related to data and system management. The status of HI education in Karachi was noted as being in its infancy, which was a constant theme in all the responses of the participants. Additionally, limited resources available along with a lack of financial assistance, lack of knowledge, manpower, educators and awareness were also a few prominent themes.

### **5.2 Summary of Most Important Themes –Administrators of Healthcare**

#### **Institutions**

The administrators had hands-on experience in managing healthcare institutions and they expressed important themes with regard to understanding health informatics as the management of data and the maintenance of patient records through computer science. The collection of encounters and compilation of clinical documentation was seen as the key concept behind medical records. Themes related to job market requirements included critical thinking, computer knowledge, understanding of medical terminology and specific expertise related to the HI field. Limited resources and scarcity of funds were seen as themes reflecting barriers for health informaticians in the

healthcare organizations. Administrators expressed the need for developing academic programs to address manpower training for prospective employees.

### **5.3 Comparison of Administrators and Directors**

The administrators discussed topics covered in Masters graduate programs. They gave reference to courses taught in Masters in Public Health (MPH), as well as Health informatics related topics, including hospital management (see Table 5.1). Courses related to computer technology were mentioned by most of the directors, less so by the administrators. Directors also supported record keeping as an important subject. A unique addition to the curricula was the subject of medical ethics, an idea mentioned by the directors.

Table 5.1: Topics Indicated by Directors and Administrators as Essential for Health Informatics Education

<b>Curricula</b>	
<b>Directors</b>	<b>Administrators</b>
Efficient record keeping, medical ethics, patient rights awareness	Computer Knowledge, Medical Transcription & MPH subjects
Computer, pharmacology, English, some subject related to record keeping and medical terminologies	Topics related to health informatics.
EMR Management / Hospital Management	Suitable Masters related topics.

Table 5.2: Skills Needed by Graduates of Health Informatics Programs

<b>Skills Needed</b>	
<b>Directors</b>	<b>Administrators</b>
Management and Established/certified skills	Medical Knowledge
A certified Diploma in Medical Record Management	Computer Knowledge
Good computer Knowledge, as well as Knowledge of Medical Terminologies	Management and Certified Skills /Data Management
Specific Expertise	

The two most important skills identified by directors and administrators were competence in computer technology and medical knowledge (see Table 5.2). A number of directors and administrators felt that these skills were necessary in order to develop competent personnel in the field of health informatics. Management skills were also mentioned by both the groups. Directors also touched upon “specific expertise” as an essential skill, whereas administrators focused on certified skills of data management.

Although references to IT involvement were made by the administrators, it was the directors who noted a more pronounced role of IT when defining health informatics. On the whole, both directors and administrators were in agreement that health informatics promotes the capturing, analysis, retrieval and dissemination of data related to patient

health. The research aspect of health informatics was seen in the responses from the administrators but not from the directors.

Both groups agreed that a medical record is a compilation of clinical documentation, thereby forming a record of the patient's medical history. The fact that these documents are confidential was mentioned by a few administrators, but not so by the directors, although one director made reference to the documents being used for legal and research purposes. The safety aspect of medical record keeping was touched upon by both directors and administrators as was the notion that medical record keeping is a methodology for maintaining medical records. Only a few directors mentioned the involvement of computers for improving safety. The necessity of safety was mentioned by only one administrator who said it was a must for every hospital. The majority of the administrators and directors placed the responsibility for medical records with HIMS / medical records department. A few of them also included the institution as a responsible partner. Clinical references for assigning responsibility were made by a few directors and one administrator.

Both administrators and directors were unanimous in conveying that the electronic health record is a computerized system for storing and maintaining patient records. One director termed it as an evolving concept, while one administrator said it was the future of managing patient records. In both views, the importance of EHR was brought to the fore. Only one administrator deviated from the above popular concept and stated that EHR was a health record form.

Management skills were seen as very important by both parties. They both also noted that the understanding of medical terminology is an important skill. Computer knowledge / skills were also referred to. Some directors touched upon "specific expertise" while administrators were more specific and spoke of "specialized training for medical record keeping" as well as considering an individual's command over medical record processes.

An equal number of administrators and directors indicated that medical records are being managed physically i.e. paper-based at their institutions. More directors commented upon computerized systems at their facilities. The partially computerized modality was also mentioned by both parties which is referred to partial usage of computers. HIMS departments were also brought into the mix by directors, whereas one administrator stated that management of medical records, as is in his institution, was conducted by a "separate department".

The demand for trained specialists in health informatics to manage medical records was seen as significant by administrators and directors as both commented on the evolving nature of this field. However, one director did not see this as a demand stating that there are no systems in place to accommodate trained HI personnel. A similar sentiment was shared by one administrator, while one director did not see any demand for these specialists in the healthcare sector. The research aspect was touched upon by a couple of administrators and one director.

Nearly all the administrators and directors noted the status of HI education to be at a low level and very scarce, although a few directors did note that awareness is

catching on. In spite the poor level of health informatics education in the country, one administrator did feel that a few reputable institutions were making their mark in this sector. All the administrators and directors were in consensus regarding the need for Health informatics education programs as they answered in the affirmative. The directors felt that the field of health informatics should be introduced at many more facilities. They felt that this science should not be limited to a few cities but rather should be promoted throughout the country. A fair number of administrators and directors argued for the need for Masters and Bachelors programs and discussed the level of degree or diploma programs related to HI education. One director felt that specific training should start from the school level, whereas one administrator felt that it should start at the college level. Business degrees were noted by one director who quoted MBA / BBA as being appropriate.

Most of the administrators and directors stated that subjects related to medical terminology / medical vocabulary should be included in health informatics educational programs. Technical courses like medical transcription, indexing and coding were also mentioned as relevant topics. The participants mentioned by both administrators and directors were subjects related to health informatics. Although, only the directors mentioned specifically about EHR ventures, computer courses were given importance by both. Only the Administrators mentioned that ethics should be included as a subject in these programs.

Most of the participants felt that there were not enough resources available for health informatics programs, although four administrators and two directors felt otherwise. A few directors were optimistic about non-monetary resources (human

resources / teaching materials), while other administrators and directors felt that adequate resources are available only within private institutions. All the administrators and directors noted the need for a Masters program in health informatics in Karachi. One administrator and one director felt that this should be tackled not only at the city level but at the country level as well. The fact that HI education would have a positive impact on the overall healthcare system was expressed by both parties. Most of the administrators and directors argued for students having a bachelors degree as suitable candidates for entering a Masters program in Health Informatics. Two administrators advocated for students with a Masters background, whereas one director thought it prudent that the health informatics program could be an add-on / diploma course for students having done their Masters in science, IT or business.

Both sides viewed the inclusion of certain subjects as mandatory for the Masters program in health informatics. These included subjects related to medical terminology, health informatics, medical record confidentiality, ethics, computer skills and management of medical records. Only the administrators thought it proper to include subjects related to Masters into the curricula. One administrator talked of a framework to set up HIS while one director mentioned about an EMR management program.

#### **5.4 Relation of findings to the research questions**

In Chapter 2 several research questions were mentioned and now that I have discussed the results of the research, I can summarize the results as follows:

- 1) Is there a perceived demand for health informatics in healthcare institutions of Karachi?

It was evident from all the 30 subjects who were interviewed that there is a demand for health informatics education in healthcare institutes in Karachi.

2) Is there a need for health informatics education to fulfill the demand of Health informatics in Karachi?

Due to the dearth of professionals in this field and lack of resources as identified by the leaders working in the academic and healthcare sectors, it was seen that there is an urgent need for health informatics education to be developed to fulfill the demand for health informaticians in Karachi.

3) What types of individuals [i.e. what educational background, knowledge, skills and judgment] are needed for health informatics in healthcare institutions?

The majority of participants argued that individuals with diversified and interdisciplinary backgrounds would be successful in this field as evident from the thoughts shared by most of the participants.

In summary, the responses to the research questions suggest that there is a demand for health informaticians in healthcare institutes in Karachi, there is a lack of resources and a dearth of professionals in this field due to which there is an urgent need for health informatics education to be developed and individuals with diversified and interdisciplinary backgrounds are the type of individuals needed for health informatics in health care institutions.

## **5.5 General Discussion**

The health literacy skills of patients and citizens in Pakistan are on the rise. With increased awareness regarding the health of the patient population in today's world due to globalization and the internet, an almost infinite amount of information is available with the click of a button while searching the worldwide web [126]. Data is not only utilized for ensuring the continuity of care but also to assist in medico-legal cases. It has become a growing trend in Karachi that healthcare institutions have started gathering data at the encounter level so as to be more prepared in dealing with the patient population that the healthcare institution is caring for. There is a need for people who manage health data [127].

Research related to needs assessment for health informatics education in Karachi was conducted with the target population being directors of academic institution and heads of departments of healthcare facilities. A set of questions were asked of the subjects and the collected data analyzed to identify common themes. Analysis of the data confirmed the demand for health informatics education in Karachi as this need was felt unanimously by study participants from academic and healthcare institutions. Skills required by individuals were highlighted by the participants. Skills that were highlighted included computer skills with a good IT background along with management, leadership and administrative abilities. It was also noted that medical terminology and medical knowledge with work experience in coding or any other allied healthcare field could provide an individual with an advantage to succeed in the field of health Informatics.

Participants from the healthcare industry were of the opinion that they preferred individuals with characteristics described by the academic community. However, additional areas highlighted by administrator participants included the need to have individuals capable of working on their own as well as the capability to be a productive team player. They should be equipped with business industry knowledge, which will promote informed decisions.

The healthcare industry in Karachi currently manages medical records on paper, with many of them maintaining hybrid records (partially in paper and partially in electronic form) [128]. Transition to the paperless scenario has begun at a very slow pace. The need to introduce health informatics education was emphasized by both groups of participants. Recognizing this as a new concept, specialized training to develop human resources in this subject has evolved as an urgent need as new information technologies are introduced in healthcare institutions but are underutilized. Capacity building in Karachi will save extravagant fees paid for outsourcing support from outside of Pakistan. Trained individuals that understand the cutting edge technologies are few and far between because this specific field requires individuals with expertise in IT and healthcare and the blending of the two.

The status of health informatics education in Pakistan is at a low level. Its introduction is nascent as it is taught as a support subject in some academic institutions and as on the job training given by some healthcare facilities. Currently, there is only minimal exposure to HI [12, 129]. A fully-fledged degree program with a major in health informatics is recognized as being urgently needed. It is imperative to introduce

an academic program in order to respond to the demands of health informatics in healthcare institutions.

The healthcare delivery system in Pakistan is developing rapidly with the initiatives undertaken by the government to open new facilities for underprivileged populations, thereby recognizing that healthcare is a basic and essential requirement for every citizen. Healthcare industry representatives (i.e. administrators) responded to the question of degree or diploma level for HI education by stating that their requirement is mostly at college level with a preference for a Masters degree. The component of internship and hands-on training should be a vital part of the curriculum. The academic industry representatives were of the opinion to introduce the subject at a college entry level program and then offer it as a major at the Masters level.

Knowledge and skills are best learnt through a variety of experiences including lectures, seminars / discussion groups, team projects, independent study, experiential learning, residency training, professional mentoring, and use of a "capstone" course / project. Each teaching method plays an important part in the education and personal development of students. The use of diverse teaching modalities enables students to understand issues from different perspectives. These skills should be cultivated via close, collegial working relationships between students and faculty. Health Informaticians require knowledge and skills from diverse disciplines. Training is required to fully understand design, develop, deploy and use the many techniques and technologies. Unproductive investments made in IT with no expertise available to maintain the implemented system is the dilemma faced by many organizations. Physicians are required to use medical information for decision support and

administrators need to be able to link healthcare activities with the results they produce. Researchers also need this data to be utilized to develop new concepts and practices related to healthcare [130].

Institutions may enter into agreement with other international universities in North America, Europe and Australia for preparation of curriculum, providing visiting faculty, and inter-transfer of students between the two campuses. Foreign universities could also help in upgrading local faculty for providing such services. Academic participants in the study highlighted clinical management, medical terminology, information technology basic concepts, and medical data base management as additional subjects to a curriculum that includes health science subjects as core subjects i.e. biostatistics, epidemiology, policy analysis, health promotion and disease prevention, health economics, the organization of health and medical care systems, strategic management, organizational behavior, health finance, health information technology, law and ethics.

Healthcare industry participants additionally shared the need to address potential for unethical behavior in the field which highlights the requirement of ethics as a subject. Further requirements included knowledge about technology, about machines, and their uses, along with practical knowledge of managing hospitals. Decision making, negotiations, costing and interpersonal skills with concentration on communication are the key requirements to the success of individuals in this field. Both types of participants agreed that there was a lack of resources available to educate and train such individuals with diverse knowledge. A lack of funds for specialized training for capacity building is the key reason for the slow growth in this area. Teaching material and

teachers in this subject are scarce. Recent trends of utilizing the internet to reach out to field specialists in different parts of the world are encouraging [131]. In response to facility specific questions to focus on existing healthcare data management systems utilized in healthcare facilities, all participants agreed on the importance of computerization of information that is collected at all levels. At present hybrid record management systems exist in which there is a combination of paper and computer based data is utilized. This is typical of any transition phase when old and new systems are run concomitantly until issues of change management are addressed. Electronic patient information is partially integrated in some institutions and in some they are not.

Lack of resources is a major issue giving rise to challenges to continue maintaining existing systems. There are no educational institutions in Karachi available to teach health information management and health informatics. Diploma and Masters Programs in health informatics should be introduced to promote this emerging field. The healthcare industry representative group (i.e. administrators) identified that people choosing to work as health informaticians should be responsible, committed, empathetic towards patients, hardworking, honest, eager to learn; passionate about the work they do, and should possess strong analytical skills.

### **5.6 Study Limitations**

The city conditions in Karachi were such that it was difficult to travel to meet with people for interviews due to riots occurring in the city during the study period. Cultural barriers were another obstacle that was encountered which included delays in getting appointments scheduled. Even after finally reaching the place for the

appointment, the subject sometimes did not show up and no updates were provided. There were no answering machines and even if we left a verbal message, we often did not receive a return call. The option to audio tape interviews was refused by most subjects, which required taking verbatim notes and transcribing all subject responses by hand as accurately as possible.

Major challenges to maintaining health information in healthcare facilities in Karachi were identified as lack of manpower, maintaining privacy and confidentiality of information, security, budget, space allocation, scarcity of specific qualified skills, lack of knowledge, finances, lack of government interest, documentation errors, lack of relevant laws, market monitoring and lack of awareness of the importance of maintaining and managing health information. To address these challenges it is vitally important to develop educational programs in local academic institutions and adequately train and built manpower to address the demand of health informaticians [132, 133]. Grants, incentives and financial contributions should be made to establish health institutions for such courses and this should be recognized by the country's leadership.

Another limitation is the sample size. The sample size was small and so it may not be possible to generalize and the results may not be representative of the population. The results could be biased because directors and administrators were chosen for the study and may not actually reflect the needs of those who wish to learn about health informatics.

### **5.6.1 Strengths**

The methodology of interviewing academic directors and administrators lead to answers pertaining to the research questions being answered regarding assessing the demand and availability of resources for health informatics in healthcare institutes of Karachi and determining the need for health informatics education in Karachi. As far as strengths are concerned, no such research has gone through to a practical level in Pakistan up until now. The focus of this research was to conduct a needs assessment of health informatics education in Karachi, Pakistan. This is a growing field and being proactive in it will create professionals ready before a shortage is felt.

### **5.7 Implications of Health Informatics Education in Pakistan**

The need to introduce education in this specific field was identified by directors and administrators. With increased awareness of the importance of health informatics education, the need to create HI programs has emerged as urgent [134, 135]. However, the participants in this study are of the opinion that such programs should be introduced all over Pakistan and not only in Karachi. This will impact the healthcare delivery system all over Pakistan. Health informatics is a combination of health information systems and communication systems, and information and communication technology (ICT) is basically the tool that supports health informatics [136]. The analogy is made that “Health Informatics is as much about computers as cardiology is about stethoscopes” [136]. By this token, the focus of health informatics lies in health systems and the handling, organization and management of knowledge [136]. In order to ensure that there is a basic commonality to health informatics training that meets the requirements of

the profession, it would be desirable if an agreed set of health informatics competencies could first be identified by monitoring bodies and institutions involved in the field, followed by the development of a concurrent set of core courses that health informatics training should cover. This approach would better equip students for the profession by improving the relevance of health informatics training to the roles and responsibilities they will be expected to undertake [137]. Health informatics has to shift its priorities, as the capability of hospital servers to be able to communicate data, increases. Also increasing is the storage and availability of all the patient data at one, single place in the hands of the patient, personally owned, mobile and entirely independent from operating systems of local or institutional systems. The patient may not understand the data but data availability at the point of care can enhance the continuity of care.

### **5.8 Implications for Developing Countries**

A number of developing countries have recently undertaken structural reforms to the healthcare delivery system. An important component of these management processes is the establishment of reliable, timely and effective information systems. A model for understanding organizational change, based on the contextualized principles is utilized to analyze case studies in a number of country situations. One can recognize in almost all the cases that the content and process are linked. The process issues relate to poor management support, lack of managerial (and information management) skills, and poor motivation and leadership in the system.

### **5.9 Implications for HI Education Research**

The volume of health and medical informatics literature has increased 5-fold since 1987, with around 320,000 potentially relevant papers published between 1987 and 2003. Among the research types classified by MeSH, reviews dominate and there are relatively few controlled trials. Most research is unclassified. Papers on most topics are rising but some areas, such as clinical laboratory information systems, have shown signs of decline, while others such as computer-assisted diagnosis, and have shown a marked recent increase, reflecting a change in emphasis from systems and database architectures to support applications [119]. Confidentiality and security of data is probably a greater concern for researchers than clinicians, although clinical researchers need to live with the concept of governance in both worlds. Data collected for patient care may only be used to produce research evidence with adequate safeguards for the patients. Legislation varies between countries, but the highest standards apply to use of personally identifiable data, where explicit signed, informed consent is often required. Some jurisdictions relax this standard if it is impossible or extremely difficult to obtain consent. In other countries, acceptable anonymisation and adherence to rules of good epidemiological practice allow the use of clinical data for research purposes [138].

### **5.10 Implications for Health Informatics Practice**

Health informatics is a field developed from the merger of IT and the health fields. It requires students from diverse backgrounds. Healthcare providers which include physicians, nurses, allied health professionals and information technology experts can have a promising career as health informaticians [117]. Information management

constitutes a major activity of the health care professional. After many years of development of information systems to support the infrastructure of medicine, greater focus on the needs of physicians and other health care managers and professionals is occurring to support education, decision making, communication, and many other aspects of professional activity. Health informatics is the field that concerns itself with the cognitive, information processing, and communication tasks of medical practice, education, and research, including information science and technology to support these tasks [119]. An intrinsically interdisciplinary field, health informatics has a highly applied focus and also addresses a number of fundamental research problems as well as planning and policy issues. Health informatics is now emerging as a distinct academic entity. Healthcare institutions are considering, and a few are making large-scale commitments to information systems and services that will affect every aspect of their organizations' function. While academic units of health informatics are presently established internationally, increasing numbers of schools are considering this academic program and many traditional departments are seeking to attract individuals with health informatics skills [117]]. Health informaticians, whether implicitly or explicitly, exist in three different environments: academic, clinical (user), and industrial (informatics developer). All three environments must be considered when trying to predict the future of this new multidisciplinary area [139].

### **5.11 Conclusion**

There is the need to specifically build capacity and develop high quality, standard, accessible and convenient educational programs corresponding to the demands of the target market and stakeholders in the healthcare industry. The health informaticians

who graduate from such programs should be sensitized to the economic realities, their society, and assume responsibility for, and become accountable to, the population they serve. This proposed work is extremely important for the people of Pakistan. It will serve as a contribution towards enhancing the approach of training professionals in the field of health informatics in Pakistan. This field will require well trained individuals with competent problem solving skills, who will get the work done. It is the innovative field which will nourish the concepts of honoring and respecting human lives in the long run. Education as a whole opens venues for more knowledge in the field. Health informatics needs people with diverse backgrounds. This field needs to be introduced to create a blended mix of both talents of IT professionals and individuals from health related fields. It is hoped this research will help educators to adopt health informatics in their schools. This will encourage knowledgeable persons to teach in this field thus disseminating knowledge to local people. Since healthcare management is not a widely recognized field in Pakistan, my long term goal is to utilize the skills in introducing innovative ideas in hospitals of Pakistan and also train others so that the Third World poor population is served well in this capacity. A component of the human condition is the social need to stay connected, to engage in self-improvement and to aim to be the best at one's chosen field. It is often the case that the citizens of the Third World travel to the developed world to attain higher education, which is extremely scarce in one's own country – and at times nonexistent. This enables them to return to their homeland with unique skills and in turn train native people to be competent in the accepted methodologies of the developed world. The main aim of students is to acquire quality assured qualifications, which is market led, that meets the needs of the individual and the

organization. It provides an opportunity to explore many issues related to the application of information technology to problems of information management within the healthcare system. It is clear that there is a need to develop a path for future students who wish to advance health informatics locally and globally.

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